SITE MANAGEMENT PLAN

Brownfield Cleanup Program

46-70 McLean Avenue Auto Repair Laundry
46-70 McLean Avenue, Yonkers, New York
Westchester County Tax Map Designation: Section 1, Block 203, Lot 51.61
NYSDEC BCP Site Number: C360211

Prepared for:

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Submitted to:

New York State Department of Environmental Conservation
Chief, Site Control Section
Region 3, Division of Environmental Remediation
625 Broadway, Albany, NY 12233-7020

August 2023 (*Revised November 2025*)
IEC Project Number: 15514

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CERTIFICATION STATEMENT

I, Brad Summerville, certify that I am currently a NYS registered professional engineer as in defined in 6 NYCRR Part 375 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).

_____ P.E.

_____DATE

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List of Acronyms

AMSL	Above Mean Sea Level	**OER**	Office of Environmental Remediation
AST	Aboveground Storage Tank	**ORP**	Oxidation-Reduction Potential
ASTM	American Society for Testing and Materials	**PPM**	Parts Per Million
AOC	Area of Concern	**PPB**	Parts Per Billion
ASP	Analytical Services Protocol	**PCB**	Poly Chlorinated Biphenyl's
BCP	Brownfield Cleanup Program	**PAH**	Poly Aromatic Hydrocarbons
BGS	Below Grade Surface	**PCE**	Tetrachloroethene
BTEX	Benzene Toluene Ethylbenzene and Xylenes	**PGW**	Protection of Groundwater
BER	Business Environmental Risk	**PID**	Photo Ionization Detector
CPP	Citizen Participation Plan	**PFAS**	Per- and Polyfluoroalkyl Substances
CO	Certificate of Occupancy	**PVC**	Polyvinyl Chloride
CSM	Conceptual Site Model	**QAQC**	Quality Assurance Quality Control
cVOC	Chlorinated Volatile Organic Compound	**QAPP**	Quality Assurance Project Plan
CREC	Controlled Recognized Environmental Condition	**RIWP**	Remedial Investigation Work Plan
CEQR	City Environmental Quality Review	**RCRA**	Resource Conservation and Recovery Act
CAMP	Community Air Monitoring Program	**REC**	Recognized Environmental Condition
CLP	Contract Laboratory Program	**RAO**	Remedial Action Alternative
DER	Division of Environmental Remediation	**RAWP**	Remedial Action Work Plan
DOB	Department of Buildings	**RIR**	Remedial Investigation Report
DNAPL	Dense Non-Aqueous Phase Liquid	**SF**	Square Feet
DUSR	Data Usability Summary Report	**SHWS**	State Hazardous Waste Site
DO	Dissolved Oxygen	**SVOC**	Semi-Volatile Organic Compound
EDR	Environmental Data Resources	**SCO**	Soil Cleanup Objective
EIS	Environmental Impact Statement	**SSDS**	Sub-Slab Depressurization System
ELAP	Environmental Laboratory Accreditation Program	**TAGM**	Technical and Administrative Guidance Memorandum
ESA	Environmental Site Assessment	**TCE**	Trichloroethylene
FWRIA	Fish and Wildlife Risk Impact Analysis	**TCL**	Target Compound List
FBG	Feet Below Grade	**TIC**	Tentatively Identified Compound
AWQS	Ambient Water Quality Standard	**TAL**	Target Analyte List
GPR	Ground Penetrating Radar	**USGS**	United States Geological Survey
GPS	Global Positioning System	**USFWS**	United states Fish and Wildlife Service
HREC	Historical Recognized Environmental Condition	**µg/kg**	Micrograms Per Kilogram
HASP	Health and Safety Plan	**µg/m³**	Micrograms Per Cubic Meter
LLC	Limited Liability Corporation	**USCS**	Unified Soil Classification System
MW	Monitoring Well	**UST**	Underground Storage Tank
MS	Matrix Spike	**USEPA**	United States Environmental Protection Agency
MSD	Matrix Spike Duplicate	**VCP**	Voluntary Cleanup Program
NYSDEC	New York State Department of Environmental Conservation	**VOC**	Volatile Organic Compound
NYC	New York City		
NYCDEP	New York City Department of Environmental Protection		
NYSDOH	New York State Department of Health		
NYCRR	New York Codes Rules and Regulations		
NAPL	Non-Aqueous Phase Liquid		
NYSDOT	New York State Department of Transportation		

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:	**C360211, 46-70 McLean Avenue Auto Repair Laundry**
Institutional Controls:	1. The property may be used for restricted residential use;
	• The property may be used for: restricted residential 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 NYSDOH or the Westchester County Department of Health 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 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 buildings developed in the area within the IC boundaries noted on Figure 14, and any potential impacts that are identified must be monitored or mitigated; • Vegetable gardens and farming on the site are prohibited; and

	• 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.	
	3. All ECs must be inspected at a frequency and in a manner defined in the SMP.	
Engineering Controls:	1. Cover system	
Inspections:		**Frequency**
1. Cover inspection		Annually
Monitoring:		
1. Groundwater Monitoring Wells MW-1, MW-2, MW-3, MW-4, MW-5, and MW-6		Quarterly
2. Soil Vapor Intrusion Evaluation for New Buildings		Post construction completion, within the NYSDOH Heating Season
Reporting:		
1. Periodic Review Report		Annually

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 46-70 McLean Avenue Auto Repair Laundry Site located in Yonkers, 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. C360211, which is administered by New York State Department of Environmental Conservation (NYSDEC or Department).

SNL Yonkers, LLC entered into a Brownfield Cleanup Agreement (BCA) on May 11, 2021, with the NYSDEC to remediate the site. 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 Westchester 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 #C360211-05-21; Site #C360211) 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 Impact Environmental Engineering and Geology, PLLC (IEEG) on behalf of SNL Yonkers, LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, 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:

8. 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 Brownfield Cleanup Agreement (BCA), and all approved work plans and reports, including this SMP.

9. 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 A below 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 A: Notifications*

Name	**Contact Information**	**Required Notification****
Matthew Hubicki	(518) 402-9605 Matthew.hubicki@dec.ny.gov	All Notifications
Keiran McCarthy	(518) 402-9185 Keiran.mccarthy@dec.ny.gov	All Notifications
Kerry Maloney	(518) 402-9629 Kerry.maloney@dec.ny.gov	Notifications 1 and 8
Jim Sullivan	(518) 402-5584 Jim.sullivan@health.ny.gov	Notifications 4, 6, and 7
Kelly Lewandowski	(518) 402-9569 Kelly.lewandowski@dec.ny.gov	

* 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 Yonkers, Westchester County, New York and is identified as Section 1 Block 203 and Lot 51.61 on the Westchester County Tax Map (see **Figure 3**). The site is an approximately 0.87-acre area and is bounded by Sutherland Park to the north, McLean Avenue and an active gasoline station to the south, Van Cortland Park and Pelton Park to the east, and McLean Avenue and several commercial properties (including Advance Auto Parts, Chase Bank, Hollywood Florist, and Malecon Restaurant) to the west (see **Figure 2** – Site Layout Map). The boundaries of the site are more fully described in **Appendix A** –Environmental Easement. The owner(s) of the site parcel(s) at the time of issuance of this SMP is:

SNL Yonkers, LLC

2.2 Physical Setting

2.2.1 Land Use

Currently, the Site consists of a single newly constructed three-story self-storage building due for completion and occupancy within the next 2 months. The portion of the building that fronts along McLean Avenue was previously composed of six (6) commercial units: 46 McLean Avenue (formerly occupied by JS Garage); 48 McLean Avenue (formerly occupied by Simax Transmissions); 50 McLean Avenue (formerly occupied by Claudio Transmissions); 60 Mclean Avenue Suite 1 (formerly occupied by Victor and Rene); 60 McLean Avenue Suite 2 (formerly occupied by VP Tires); and 70 McLean Avenue (formerly occupied by Pizza Barn). The second story of the building that extends into the northern segment of the Site is accessible via ramp or stairwell from McLean Avenue and is addressed 60 McLean Avenue Suite 200. This area was predominantly inactive storage space for former occupant, including collectible dolls and toys, frames, leather goods, office supplies, antiquated printing machines or vacant space. A small portion of the 2nd floor was, until July 2022, still operable and utilized for heating sealing to

customize jerseys, sweatshirts, and performance wear. The building encompasses the entire Lot and has a footprint of approximately 37,897 square feet (SF).

The surrounding land parcels have a combination of residential, commercial, and municipal uses. Commercial uses are predominantly along collector roadways. The Site is bordered to the north by Sutherland Park, to the east by Van Cortland Park Avenue followed by Pelton Park, to the south by McLean Avenue followed by an active gasoline station and auto repair shop (Global Automotive), a food distribution center and several single-family residential dwellings, and to the west by McLean Avenue and several commercial properties (including Advance Auto Parts, Chase Bank, Hollywood Florist, and Malecon Restaurant)..

2.2.2 Geology

Soil borings during the RI were advanced to a minimum depth of approximately 2-feet bgs, and a maximum depth of 15-feet bgs at the Site during the May 2022 investigation.

The geology of the shallow soil down to approximately 3-5 fbg (in areas where bedrock was encountered) consists predominantly of fine to medium grained sand. No evidence of anthropogenic material (brick, wood, or glass) was observed. In the southeastern portion of the Site where bedrock was not encountered, consisted of brown to gray fine sand and silt.

A geologic cross section is shown in **Figure 4**. Site specific boring logs are provided in **Appendix C**.

2.2.3 Hydrogeology

Control Point (CP) conducted a well elevation survey of the monitoring wells on May 24, 2022. This data was used in conjunction with the groundwater well gauging data collected on May 5, 2022, to prepare the sample location plan and groundwater contour map. Based off NAVD88 elevations (based off GPS observations taken at the time of the field survey, utilizing NYSNET) the elevation of the water table across the Site ranges from 1.29 fbg in MW-5A, located in the central portion of the site (within 50 McLean Avenue), to 10.57 fbg in MW-9A, located on the southeastern side of the Site (70 McLean Avenue), and is a result of the TOC elevation measurements minus the measured depth to water (DTW) readings. Based on the potentiometric surface map contours, groundwater flow direction is generally to the southeast in the eastern

portion of the site and southwest in the western portion of the site due to the presence of a shallow bedrock ridge in the central portion of the Site.

A groundwater contour map is shown in **Figure 5**. Groundwater elevation data is provided in **Table 1**. Groundwater monitoring well construction logs are provided in **Appendix D**.

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.

Structural Engineering Technologies, P.C. (SET) Phase I ESA, October 2, 2018

Below is a summary of the findings of the SET Phase I ESA:

- The historic use of the Property as a printing company from 1951 to at least 1956, as Willow Laundry Company in 2010 and as various auto repair facilities from 1987 to the present time. Since the use and storage of hazardous chemicals and petroleum products used by these facilities is unknown their historic presence should be considered a REC.
- The presence of a Potential Vapor Encroachment Condition from the adjacent property to the south – The Unnamed Gasoline Station. This unnamed gasoline station is associated with four closed NYSDEC Spills. One of the spills is reported to have impacted the groundwater and the three other spills are reported to have impacted the soil. Since the unnamed gasoline station is located within 200 feet of the Property there is a potential for the closed NYSDEC spills to impact upon the soil vapor quality beneath the Property. Therefore, the presence of the adjacent gasoline station should be considered a potential vapor encroachment condition (PVEC).
- The presence of an active UST in the eastern portion of the Site. The UST may be impacting upon the environmental quality of the Property and its presence should therefore be considered a REC.
- The listing of closed NYSDEC Spill # 93-10281 for the Property. The spill is related to the release of petroleum during a fuel oil delivery to the underground fuel oil storage tank. The database indicates the spill was cleaned up immediately. The presence of a closed NYSDEC associated with the Property should be considered an HREC and no further action is required regarding this spill.

Structural Engineering Technologies, P.C. (SET) Phase II ESA, April 22, 2020

Below is a summary of the SET Phase II ESA:

- A Ground Penetrating Radar (GPR) survey was performed in accessible areas of the Site. One anomaly indicative of the 5,000-gallon fuel oil UST was identified in the parking garage ramp at 60 McLean Avenue. The tank is buried in the parking garage ramp and is not located in the basement.

- Eight (8) soil probes (designated SP-1 through SP-7 and SP-9) were installed by PG Environmental Corp with a Geoprobe. The soil probes were installed to investigate the historic use of the site as a suspect laundry and printing facility, the current and historic use of the site as an auto repair facility and the presence of the 5,000-gallon UST.

- Soil probe SP-1 was installed at 46 McLean Avenue, soil probe SP-2 and SP-3 were installed at 48 McLean Avenue, soil probe SP-4 was installed at 50 McLean Avenue, soil probe SP-5 was installed at 60 McClean Avenue at the Tire Shop, soil probe SP-6 was installed at 60 McLean Avenue at the southern side of the parking garage ramp, soil probe SP-7 was installed to the south of the 5,000-gallon UST and soil probe SP-9 was installed in the basement directly to the north of the 5,000-gallon UST.

- The soil probes were installed until the groundwater table or refusal was encountered. Refusal was encountered at less than 1 foot below grade at SP-2, SP-3, and SP-4. Several attempts were made to install the probes in nearby locations; however, after three failed attempts at each location, it was determined that bedrock was present directly beneath the slab in the western portion of the site and soil probes could not be installed within the eastern portion of 46 McLean Avenue, throughout 48 McLean Avenue and throughout 50 McLean Avenue; therefore, soil samples were not collected from these areas.

- Soil probes SP-1, SP-5 and SP-6 were installed until groundwater was encountered at 15 feet below grade. Soil probes SP-7 and SP-9 were installed to 5 feet below grade. Refusal was encountered at 5 feet below grade in SP-7 and SP-9 was intended to investigate the area to the north of the UST. Since SP-9 was present in the basement below the UST depth it was only installed to 5 feet. A total of five (5) soil samples were submitted for laboratory analysis.

- The groundwater investigation consisted of the installation and sampling of two temporary monitoring wells designated MW-5 and MW-7. Groundwater was encountered at 10 feet below grade in MW-5 and MW-8. Monitoring well MW-5 was installed at 60 McLean Avenue in the tire shop. Monitoring well MW-8 was installed at 60 McLean Avenue in the southern portion of the parking garage ramp. Two (2) groundwater samples were submitted for laboratory analysis.

- A total of six sub slab probes (designated SV-1 to SV-6) were installed during the investigation with a Geoprobe. It should be noted that the SET report incorrectly states that SV-7 was one of the collected samples. Following a review of the Sample Location Plan, Tabulated Soil Vapor results, and raw analytical data report, IEC concluded that SV-7 was not one of the collected samples. The sub-slab probes were installed beneath the foundation slab. Sub-Slab SV-1 was

installed at 46 McLean Avenue, Sub-Slab Vapor Probes SV-2 and SV-3 were installed at 48 McLean Avenue, Sub-Slab Vapor Probe SV-4 was installed at 50 McLean Avenue, Sub-Slab Vapor Probe SV-5 was installed at 60 McLean Avenue and Sub-Slab Vapor Probe SV-6 was installed at the southern portion of the parking garage ramp. Additionally, two indoor air samples (designated IA-1 and IA-2) and one outdoor air sample (designated OA-1) were collected during the investigation.

- Volatile organic compounds (VOCs) were detected in SP-9, 2.5 to 5 feet at concentrations exceeding their respective UUSCO. Acetone was detected in SP-1 (7.5 to 10 feet), SP-5 (5 to 7.5 feet), SP-6 (7.5 to 10 feet) and SP-7 (2.5 to 5 feet) at concentrations exceeding its respective method detection limit (MDL) but less than its UUSCO (and Protection of Groundwater standard (PGW)) of 0.05 mg/kg. No other VOCs were detected in SP-1 (7.5 to 10 feet), SP-5 (5 to 7.5 feet), and SP-7 (2.5 to 5 feet) at concentrations exceeding their respective MDL.

- Several VOCS including, 1,2,4-Trimethylbenzene (0.0900 mg/kg), 1,3,5-Trimethylbenzene (0.0320 mg/kg), Ethyl Benzene (0.00980 mg/kg), Isopropylbenzene (0.00670 mg/kg), Methylcyclohexane (0.00930 mg/kg), n-Butylbenzene (0.0130 mg/kg), n-Propyl benzene (0.0120 mg/kg), o-Xylene (0.0120 mg/kg), m & p xylene (0.0310 mg/kg), p-isopropyltoluene (0.0150 mg/kg), sec-Butylbenzene (0.00750 mg/kg) were detected in SP-6, 7.5 to 10 feet. The remaining VOCs in SP-6, 7.5 to 10 feet were detected at concentrations less than their respective MDL.

- No semi-volatile organic compounds (SVOCs) were detected in the soil at concentrations exceeding their respective MDL.

- The VOC, acetone, was detected in MW-5 at a concentration exceeding its respective MDL. The remaining VOCs in MW-5 were detected at a concentration less than their MDL.

- Eleven (11) VOCs were detected in MW-8 at a concentration their respective GQS. These VOCs include the following compounds: 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, ethyl benzene, isopropyltoluene, n-butylbenzene, n-propylbenzene, o-xylene, p/m-xylene, p-isopropyltoluene, sec-butylbenzene, toluene, and total xylenes.

- The compound, Carbon Tetrachloride, was detected in SV-1 (1.2 µg/m3), SV-3 (10 µg/m3), SV-4 (0.720 µg/m3), SV-5 (0.390 µg/m3) and in the indoor air IA-1 (1 µg/m3) and the outdoor air, OA-1 (0.490 µg/m3). According to the NYSDOH Decision Matrix A and based upon the concentrations detected mitigation is recommended for Carbon Tetrachloride.

- The compound, trichloroethene (TCE), was detected in SV-4 at a concentration of 2.5 µg/m3. Trichloroethene was not detected in any other sub-slab probe, the indoor air samples, or the outdoor air sample. According to the NYSDOH Decision Matrix A and based upon the concentrations detected no further action is required for trichloroethene.

- The compound, methylene chloride, was detected in SV-4 (5.6 µg/m3). Methylene chloride was not detected in any other sub-slab probe, the indoor air samples, or the

outdoor air sample. According to the NYSDOH Decision Matrix B and based upon the concentrations detected no further action is required for methylene chloride.

- The compound, tetrachloroethene (PCE), was detected sub-slab samples SV-1 (30 µg/m3), SV-2 (210 µg/m3), SV-3 (220 µg/m3), SV-4 (110 µg/m3), SV-5 (3.6 µg/m3) and the indoor air sample, IA-1 (4 µg/m3), and the outdoor air sample, OA-1 (0.890 µg/m3). Tetrachloroethene was not detected in SV-6 or IA-2. According to NYSDOH Decision Matrix B and based upon the concentrations detected, the levels of PCE should be monitored over time.

- The compound, Vinyl Chloride, was detected in the sub-slab sample SV-5 at a concentration of 0.270 µg/m3. Vinyl Chloride was not detected in any other sub-slab probe, indoor air samples or the outdoor air sample. According to NYSDOH Decision Matrix C and based upon the concentrations detected, the levels of Vinyl Chloride require no further action at this time.

- The compounds 1,1,1-Trichloroethane, cis 1-2-dichloroethene, 1,1-Dichoroethylene, were not detected in the sub slab vapor samples or indoor air sample.

- An evaluation of the analytical results indicated elevated levels of VOCs were detected in SV-6. These VOCs include Cyclohexane (190,000 µg/m3), Ethyl Benzene (13,000 µg/m3), n-Heptane (300,000 µg/m3), n-Hexane (280,000 µg/m3), o-Xylene (4,300 µg/m3), m & p xylene (22,000 µg/m3) and Toluene (4,500 µg/m3).

- The results of the Phase II ESA indicate that the historic use of the site and the presence of an active 5,000-gallon UST do not appear to have impacted upon the environmental quality of the Property. This is evidenced by the soil screening and soil analytical results of SP-1, SP-5, SP-7 and SP-9 and the groundwater analytical results from MW-5. No VOCs or SVOCs were detected in the soil or the groundwater at concentrations exceeding regulatory standards from beneath the auto repair shops or around the 5,000-gallon UST. Additionally, the sub-slab vapor data collected from beneath the auto repair facilities shows only low-level exceedances in the soil vapor. These concentrations may be related to the current use of the Property as auto repair facilities.

- The results of the Phase II ESA indicated that the presence of an unnamed gasoline station adjacent to the Property is most likely impacting upon the vapor quality and groundwater quality of the Property. This is evidenced by the presence of gasoline and solvent related VOCs in the groundwater beneath the bottom of the parking garage ramp (MW-8) in the eastern portion of the property at concentrations exceeding the Groundwater Quality Standard. The gas station is located in the presumed downgradient direction; however, its gasoline tanks are within a 50 feet radius of influence of MW-8 and based upon the distance and the presence of historic spills documented to have impacted upon the groundwater the unnamed gasoline station is most likely the source of the VOCs identified in the groundwater.

- No evidence of a petroleum release was identified in the soil around MW-8 as evidenced by the soil screening results of SP-6. No olfactory/visual evidence of petroleum and no elevated levels of organic vapors were identified from zero to 10 feet below grade. However,

olfactory evidence of petroleum was identified in the saturated soil from 10 to 15 feet below grade. Additionally, while the soil collected from SP-6 at 7.5 to 10 feet below grade had levels of VOCs exceeding the MDL but less than the UUSCO, these concentrations can be attributed to fluctuations in the groundwater table.

- Based on the results of the Phase II ESA, SET made the following recommendations:

  - During future construction activities it is recommended the active 5,000-gallon UST be removed in accordance with local, state and federal guidelines.

  - A soil vapor mitigation system should be designed and installed within the new building to prevent vapors from the adjacent gasoline station from impacting the indoor air.

  - The NYSDEC should be notified of a release from the adjacent property, 67 McLean Avenue. A copy of this report should then be provided to the NYSDEC for their review and comment.

  - Soil excavated during construction activities should be disposed of in accordance with local, state and federal regulations.

<u>Structural Engineering Technologies, P.C. (SET) Supplementary Phase II ESA (Phase IIb), July 6, 2020</u>

Below is a summary of the SET Supplemental Phase II ESA:

- Six (6) soil probes (designated SP-10 through SP-15) were installed by PG Environmental, Corp with a Geoprobe. The soil probes were installed to further delineate levels of VOCS and SVOCs previously detected.

- Soil probe SP-10 was installed at 48 Mclean Avenue in the previous location of SP-2/SV-2. Soil probe SP-11 was installed at the parking of the parking garage ramp at 60 Mclean Avenue in a similar location of SP-6/SV-6. Soil probe SP-12 is located on the sidewalk to the south of the parking garage ramp along Mclean Avenue. Soil Probe SP-13 was installed to the west of SP-12 and soil probe SP-14 was installed to the east of SP-12. Soil probe SP-15 was installed in VP-Discount Tire (60 Mclean Avenue) in a similar location as SP-5/MW-5/SV-5.

- Refusal was encountered at 5 feet in SP-10A and SP-15A. Several attempts were made to install the probes in nearby locations; however, after three failed attempts at each location, it was determined that the probe could not be installed any deeper. Soil probes SP-11 through SP-14 were installed until 15 feet below grade. Groundwater was encountered at approximately 10 feet below grade.

- A total of 10 soil samples were submitted for laboratory analysis.

- During the investigation five (5) permanent monitoring wells designated WP-10A, WP-11, WP-12, WP-13, and WP-14 were installed. WP-10A was installed in the western portion of the site within 48 Mclean Avenue. Monitoring Wells WP-12, WP-13 and WP-14 were installed

on the sidewalk along Mclean Avenue. Monitoring Well WP-15 was installed in the Tire Shop at 60 Mclean Avenue and Monitoring Well MW-11 was installed at the bottom of the parking garage ramp.

- Land survey was used to identify the location of the monitoring wells. The elevations of all installed monitoring wells were surveyed relative to a permanent surface benchmark. The results of the survey indicate groundwater is flowing towards the southwest.

- A total of five (5) groundwater samples were submitted for laboratory analysis.

- No SVOCs were detected in the soil at concentrations exceeding their respective UUSCO.

- Several VOCs were detected in WP-11, WP-12, WP-13, and WP-14 at concentrations exceeding their respective GQS. The VOC, 1,2,4-Trimethylbenzene was detected in at concentrations ranging from 130 µg/L in WP-13 to 700 µg/L in WP-11, which exceeds the GQS of 5 µg/L. The VOC, 1,3,5-Trimethylbenzene range from 40 µg/L in WP-13 to 230 µg/L in WP-11. The VOC Benzene was detected in WP-11 at a concentration of 3.2 µg/L which exceeds the GQS of 1 µg/L. The VOC, Ethyl Benzene was detected at concentrations ranging from 0.740 µg/L in WP-10A to 340 µg/L WP-11. The GQS for Ethyl Benzene is 5 µg/L. Isopropyl benzene was detected at concentrations ranging from 21 µg/L in WP-13 to 85 µg/L in WP-11. The GQS for Isopropyl benzene is 5 µg/L. The VOC, o-Xylene was detected at a concentration ranging from 12 µg/L in WP-14 to 340 µg/L in WP-11 and the VOC p-& m-Xylene was detected at concentrations ranging from 3.2 in WP-10A to 1,000 in WP-11. The GQS for o-Xylene and p-m-Xylene is 5 µg/L. The VOC, p-Isopropyl toluene was detected at concentrations ranging from 19 µg/L in WP-12 to 35 µg/L in WP-11. The GQS for p-Isopropyl toluene is 5 µg/L. The VOC sec-Butylbenzene was detected at concentrations ranging from 11 µg/L in WP-12 to 18 µg/L in WP-11. The GQS from sec-Butylbenzene is 5 µg/L. Toluene was detected at concentrations ranging from 3 µg/L in WP-10A to 52 µg/L in WP-11. The GQS for Toluene is 5 µg/L.

- The SVOC, Naphthalene, was detected in WP-12 (48 µg/L) and WP-14 (67.6 µg/L) at concentrations exceeding their respective GQS of 10 µg/L. No other SVOCs were detected at concentrations exceeding their respective GQS.

- Based upon the nature of the contaminants, the documented NYSDEC Spill incidents at the suspect gasoline station and the potential radius of influence of these gasoline releases, the suspect gasoline station at 67 Mclean Avenue still appears to be the source of the gasoline contamination on-site. This is evidenced by the fact that no levels of VOCs were identified in the unsaturated soil during the Phase II performed in April 2020 or this current Phase II(B). Additionally, based upon the chemical inventory performed in June 2020, there does not appear to be a source of VOCs on the Property. Furthermore, the suspect gasoline station located at 67 Mclean Avenue is associated with four closed NYSDEC Spills. One of the spills is reported to have impacted the groundwater and the three other spills are reported to have impacted the soil. There is no record of a cleanup being performed at 67 Mclean Avenue.

Structural Engineering Technologies, P.C. (SET) Fourth Round Groundwater Testing, November 5, 2020

Below is a summary of the SET 4th Quarter Groundwater sampling event for 2020:

- The groundwater sampling event was performed on May 4 and 52022, and consisted of the gauging and sampling of six (6) permanent groundwater monitoring wells installed as part of the Phase IIb ESA.

- No water was present in wells WP-10A and WP-15. Groundwater depth was measured at between 9.10 and 10.88 fbg in the remaining four (4) monitoring wells.

- The results of the quarterly sampling event indicated the levels of VOCs in the groundwater had generally significantly decreased with the exception of the results of MW-11. Specifically, levels of BTEX in WP-12 had decreased from 562.60 µg/L in June 2020 to 142 µg/L in October 2020 and levels of total VOCS had decreased from 1,433 µg/L in June 2020 to 857.5 µg/L in October 2020. Levels of BTEX in WP-13 had decreased from 256.80 µg/L in June 2020 to 2 µg/L in October 2020 and levels of total VOCS had decreased from 560.30 in June 2020 µg/L to 123.5 µg/L in October 2020. Levels of total BTEX and levels of total VOCs were not detected in WP-14 in October 2020.

- However, the levels of total BTEX in WP-12 had increased from August 2020 to October 2020 and levels of total VOCs in WP-12 and WP-13 had increased from August 2020 to October 2020. Specifically, levels of BTEX in WP-12 had increased tom 100 µg/L in August 2020 to 142 µg/L in October 2020 and levels of total VOCs had increased from 829.6 µg/L to 857.5 µg/L in October 2020. Levels of total VOCs in WP-13 had increased from 69.6 µg/L in August 2020 to 123.5 µg/L in October 2020. Additionally, the levels of total BTEX in WP-11 had increased from 1,798.20 µg/L in June 2020 to 3,500 µg/L in October 2020 and levels of total VOCs had increased from 3,369.20 µg/L to 11,359 µg/L in October 2020.

- WP-15 was sampled for the first time during August 2020. The total BTEX concentration was identified to be 1,222.3 µg/L and the total VOC concentration was 3,345.5 µg/L in WP-15. WP-10A and WP-15 were dry during the October sampling event and could not be sampled.

<u>IEEG Remedial Investigation Report (RIR), June 22, 2023</u>

Below is a summary of the IEEG RIR:

- Field Observations: The general Site topography was observed to slope from northwest to southeast across the Site and is likely influenced by bedrock. The current on-site building was constructed on top of bedrock, which can be observed in outcroppings directly north and west of the Site.

- Stratigraphy: Due to the abundance of bedrock refusals encountered in soil borings, soil recovery was limited, however where soils were present, they generally consisted of

fine to medium grained sand, and in the southeastern portion of the property where bedrock was not encountered to a depth of 15 feet, generally consisted of silty sand.

o Hydrogeology: Synoptic water-level measurements recorded at onsite wells ranged from 1.29 fbg in MW-5A, located in the central portion of the site (within 50 McLean Avenue), to 10.57 fbg in MW-9A, located on the southeastern side of the Site (70 McLean Avenue). The difference in depth to water elevation is the result of shallow bedrock located across the majority of the site.

o Soil Vapor Contamination: In soil vapor, PCE and a number of VOC compounds were identified. One location was found in exceedance of the NYSDOH minimum guidelines for PCE however the indoor air level for that location indicated low levels of PCE in indoor air and yielded a no further action response when compared to the NYSDOH Decision Matrices. The VOC compounds identified in soil vapor do not have NYSDOH air guidelines.

o Soil: The heavy metals, lead, nickel, zinc, mercury and chromium, two PCB compounds, and two Pesticide compounds were found in exceedance of Soil Cleanup Objectives. The heavy metal Chromium was found above Protection of Groundwater Standards in two locations, in SB-1 and SB-2, located in the northwestern portion of the Site on the second floor on top of shallow bedrock. Mercury was found above PGW standards in SB-3 and SB-4 on the second floor above shallow bedrock, and in Sb-8B, SB-10A and Sb-11, in units 48 McLean Avenue and 50 McLean Avenue located on the first floor. Mercury was also found in SB-18 within the ramp in the southeastern portion of the site, downgradient from the UST. Nickel was found exceeding the Restricted Residential SCO in Sb-1, and above the Unrestricted SCO in SB-10B, SB-11 and SB-12. Lead and Zinc were found above their respective UUSCOs in SB-1. Lead was also found exceeding the UUSCO in SB-18. Two Pesticides were found exceeding their respective UUSCOs in SB-12. Two PCBs were found exceeding their respective UUSCOs in SB-8B.

o Groundwater: No non-aqueous phase liquids or DNAPL was detected in the 9 groundwater monitoring wells at the Site, however a sheen was observed in MW-4A. Volatile organic compounds (VOCs), primarily BTEX compounds and their breakdown compounds were detected at concentrations above the TOGS Class GA SGVs in four (4) groundwater samples collected from MW-4A, MW-7A MW-9A and WP-11. Three of those monitoring wells (MW-7A, MW-9A and WP-11) are located downgradient from the UST located within the access ramp that leads the second floor of the building. It should be noted that wells located further downgradient, in the sidewalk (WP-12, WP-13 and WP-14) did not contain VOC exceedances therefore an off-site source can likely be ruled out. Other contaminates including some PAHs and Metals were marginally detected above the referenced standard and are typical of regional groundwater conditions in urban areas. Pesticides, PCBs and 1,4-dioxane were not detected in any of the groundwater samples collected during this RI.

o Perfluorooctanoic Acid (PFOA) was detected at concentrations exceeding the Draft Guidance Value of 0.0067 ug/L at 0.0788 µg/L, 0.0448 µg/L and 0.0214 ug/L in MW-4A, MW-7A and MW-9A, respectively.

o Perfluorooctanesulfonic Acid (PFOS) was detected at concentrations exceeding the Draft Guidance Value of 0.0027 ug/L at 0.00499 µg/L, 0.0082 µg/L and 0.00826 ug/L in MW-4A, MW-7A and MW-9A, respectively.

Perfluorinated Alkyl Acids (PFAS), specifically PFOA and PFOS, were detected at 0.0214 ug/L to 0.0788 ug/L in three (3) samples collected from the groundwater monitoring wells, which exceeded the NYSDEC standard of 0.0067 µg/L (or 67 pg/L). However, due to there being no exceedances in the soil samples collected, by comparison, these detections of PFOA and PFOS are not determined to be attributable to the Site. In addition, no other individual PFAS (excluding PFOA and PFOS) were detected at concentrations exceeding the NYSDEC Standard of 100 ng/L, and total concentrations of PFAS did not exceed 500 ng/L in all samples collected.

o Source Area: The most prevalent COCs identified during previous investigations and this RI are petroleum related VOCs and SVOCs in soil and groundwater located proximal to and hydraulically downgradient from the UST located in the entrance ramp to the second floor of the site building.

See **Figure 6** for a Soil Vapor Analytical Map, **Figure 7** for a Soil Analytical Map, and **Figure 8** for a Groundwater Analytical Map.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated April 15, 2025, 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

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

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated 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

Between December 19, 2022, and July 15, 2025, a total of 2,075.63 tons of contaminated soil/fill was removed from the Site. Of this total:

- 167.72 tons were removed during IRM hot-spot excavations (HS-1, HS-3, HS-10a): 156.80 tons transported to and disposed of at Impact Reuse & Recovery Center (IRRC), 1000 Page Avenue, Lyndhurst, NJ (NJDEP #CBG170002), and 10.92 tons transported to and disposed of at Clean Earth of Carteret, LLC (CEC), Carteret, NJ.
- 87.16 tons were removed during IRM hydraulic-lift removal activities and transported to and disposed of at CEC, Carteret, NJ.
- 118.05 tons were removed during IRM UST removal/closure (5,000-gallon former fuel oil UST) and transported to and disposed of at IRRC, Lyndhurst, NJ.
- 142.72 tons of gasoline-impacted material generated during removal/closure of the four (4) 550-gallon former gasoline USTs were transported to and disposed of at Pure Soil Technologies, Inc., Jackson Township, Ocean County, NJ (NJDEP #CBG190003).

In total, 515.65 tons were removed as part of IRM and RAWP remedial activities, with only the gasoline-impacted materials from the four UST removals generated under the approved RAWP.

One (1) 5,000-gallon underground storage tank (UST) was removed from the southeast corner of the property on October 21, 2022, as part of the IRM. Two (2) confirmatory bottom and one (1) confirmatory south sidewall endpoint samples were collected from the tank grave following its removal. Sidewall samples from the east, west, and north of the tank excavation could not be collected due to the presence of concrete retaining walls. The three (3) samples were placed in laboratory provided clean glassware, stored on ice, and were delivered via lab courier to ELAP-certified Phoenix Analytical Laboratories of Manchester, CT (ELAP Certification #11301). The samples were analyzed for NYSDEC CP-51 list VOCs and SVOCs in accordance with USEPA Methods 8260 and 8270.

Based on a review of the post UST Removal bottom and sidewall endpoint samples, the VOC n-butylbenzene was detected at a concentration of 3.4 microgram per kilogram (ug/kg) in sample Tank Bottom East, below the NYSDEC CP-51 standard of 12,000 ug/kg. No other VOCs were detected in the three (3) samples. The SVOCs chrysene, phenanthrene, and pyrene were detected at concentrations of 140 ug/kg, 270 ug/kg, and 210 ug/kg respectively in sample Tank Bottom East, below their CP-51 standards of 1,000 ug/kg and 100,000 ug/kg respectively. No other SVOCs were detected in the three (3) samples. See **Figure 9** for UST Endpoint Sample Location Map.

Four (4) hydraulic lift pistons and associated reservoirs were encountered during construction related activities, in the northeast corner of the Site building. The hydraulic lift apparatus was removed from the Site between November 28 and November 30, 2022, in accordance with an NYSDEC approved IRM Addendum. Four (4) confirmatory bottom end point samples were collected from beneath the removed hydraulic apparatus. The samples were placed in laboratory provided clean glassware, stored on ice, and were delivered via lab courier to ELAP-certified Phoenix Analytical Laboratories of Manchester, CT (ELAP Certification #11301). The samples were analyzed for NYSDEC CP-51 list VOCs and SVOCs, and TCL PCBs, in accordance with USEPA Methods 8260 and 8270, and 8082A, respectively.

Based on a review of the post hydraulic lift piston/reservoir removal bottom endpoint samples, while a number of VOCs (including 1,2,4-trimethylbenzene, 1,3,5-trimenthylbenzene, n-butylbenzene, naphthalene, p-isopropyltoluene, and sec-butylbenzene) and SVOCs (including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, chrysene, fluoranthene, phenanthrene, and pyrene) were detected in the samples, no compounds were detected in exceedance of their respective NYSDEC CP-51 Standards. The PCB 1260 was detected at a concentration of 140 ug/kg in sample HL-1, 180 ug/kg in HL-2, and 130 ug/kg in HL-4, below its CP-51 standard of 1,000 ug/kg. No other VOCs, SVOCs, or PCBs were detected in the four (4) samples. See **Figure 10** for Hydraulic Lift Endpoint Sample Location Map.

In addition to the above activities, three (3) hotspots were also excavated as part of the IRM, due to elevated concentrations of Trivalent Chromium and Mercury, detected during the Remedial Investigation. Between December 13, 2022, and April 10, 2023, three (3) hotspots, designated HS-1, HS-3, and HS-10a, were excavated to between 2 and 3-feet below grade, at which point bedrock was encountered. One (1) confirmatory sidewall sample (south) was collected from HS-1. Four (4) confirmatory sidewall samples (north, east, south, and west) were collected from HS-3. Three (3) confirmatory sidewall samples (north, east, and west) were collected from HS-10a. In each

instance, sidewall and/or bottom samples could not be collected due to the abundant presence of bedrock at the Site. The samples were placed in laboratory supplied glassware, stored on ice, and delivered via lab courier to ELAP-certified Phoenix Analytical Laboratories of Manchester, CT (ELAP Certification #11301). The samples were analyzed Target Analyte List (TAL) Metals / Part 375 List metals (including cyanide, and hexavalent and trivalent chromium) by USEPA Methods 6010C/7471B/9010C/7196A.

Based on a review of the HS-1 endpoint samples, while a number of metals exceeded the NYSDEC Part 375 Unrestricted Use SCOs (including copper, nickel, and trivalent chromium), no compounds, including trivalent chromium, were detected in exceedance of their respective NYSDEC Part 375 Restricted Residential SCOs. Based on a review of the HS-3 endpoint samples, while a number of metals exceeded the NYSDEC Part 375 Unrestricted Use SCOs (including mercury, nickel, and trivalent chromium), no compounds, including mercury, were detected in exceedance of their respective NYSDEC Part 375 Restricted Residential SCOs. Based on a review of the HS-10A endpoint samples, three (3) metals exceeded the NYSDEC Part 375 Restricted Residential Use SCOs (including Barium and Lead in the East sample, and Mercury, in the northern sample).

Due to the elevated concentrations of Barium, Lead, and Mercury, further excavation of Hotspot HS-10A was performed, approximately 5-feet to the north, and 5-feet to the east. Two (2) additional confirmatory endpoint samples were collected from the northern extent and eastern extent of HS-10A. Based on a review of the secondary HS-10A endpoint samples, two (2) metals, barium, and lead, exceeded the NYSDEC Part 375 Restricted Residential Use SCOs in the northern EP sample. No exceedances of RRSCOs were detected in the eastern sample.

Due to the presence of the northern first floor retaining wall and abundance of bedrock, no further excavation of HS-10A could be conducted to the north. This information was provided to Mr. Hubicki by phone on April 18, 2023, and Mr. Hubicki indicated that no additional remedial actions would be required for HS-10A. See **Figure 11** for Hotspot Endpoint Sample Location Map.

Tables 2, **3**, **4a-4d**, **10**, and **11**, and **Figures 9**, **10**, **11, 17,** and **18** summarize the results of all soil samples collected that exceed the CP-51, Unrestricted Use SCOs, and the Restricted Residential Use SCOs at the site after completion of Interim Remedial Measures/Remedial Action.

2.5.2 Groundwater

On December 20, 2022, IEEG conducted a round of post UST removal groundwater sampling from hydraulically downgradient monitoring wells, including WP-11 through WP-14, located south of the former UST.

It should be noted that several of the monitoring wells installed by IEEG during the RI (including MW-4A, MW-5A, MW-7A, and MW-9A) were damaged during demolition and construction activities, and thus could not be sampled during this event.

One (1) representative groundwater sample was collected from each well using a peristaltic pump and dedicated Teflon-coated tubing. Groundwater samples collected from WP-11, WP-12, WP-13, and WP-14 were submitted to Alpha Analytical laboratory of Westborough MA, a New York State certified ELAP laboratory, for analysis of Full Target Compound List (TCL) parameters for Volatile Organic Compounds (VOCs) via EPA Method 8260 and Semi-VOCs via EPA Method 8270.

Below is a table showing the exceedances of the NYSDEC TOGS 1.1.1 GA Table 1 standards for ambient groundwater quality for wells WP-11, WP-12, WP-13, and WP-14. Exceedances of the TOGS GA standards are highlighted gray, and the table also shows the Total BTEX and Total VOCs present in each well.

Collection Date			12/20/2022		12/20/2022		12/20/2022		12/20/2022	
Client Id			WP-11		WP-12		WP-13		WP-14	
Matrix			GROUND WATER		GROUND WATER		GROUND WATER		GROUND WATER	
Project: 60 MCLEAN AVE YONKERS NY	Units	TOGS 1.1.1 WQ/GA Table 1	Result	RL	Result	RL	Result	RL	Result	RL
Semivolatiles (SIM) - SW8270D (SIM)										
Benz(a)anthracene	ug/L	0.002	0.02	0.02	< 0.02	*0.02*	< 0.02	*0.02*	< 0.02	*0.02*
Benzo(b)fluoranthene	ug/L	0.002	0.02	0.02	< 0.02	*0.02*	< 0.02	*0.02*	< 0.02	*0.02*
Chrysene	ug/L	0.002	0.02	0.02	< 0.02	*0.02*	< 0.02	*0.02*	< 0.02	*0.02*
Bis(2-ethylhexyl)phthalate	ug/L	5	28	0.94	12	0.94	35	0.94	< 2.4	2.4
Naphthalene	ug/L	10	34	4.7	-	-	-	-	-	-
Volatiles - SW8260C										
1,2,4-Trimethylbenzene	ug/L	5	98	2	270	5	3.7	1	9.8	1
1,3,5-Trimethylbenzene	ug/L	5	37	2	110	5	1.5	1	2.2	1
Benzene	ug/L	1	< 0.70	0.7	2.2	1.3	< 0.70	0.7	< 0.70	0.7
Ethylbenzene	ug/L	5	21	2	28	5	0.27	1	0.65	1
Hexachlorobutadiene	ug/L	0.5	< 0.50	0.5	< 1.3	*1.3*	< 0.40	0.4	< 0.40	0.4
Isopropylbenzene	ug/L	5	12	2	42	5	0.3	1	1.6	1
n-Butylbenzene	ug/L	5	3.7	2	12	5	< 1.0	1	0.73	1
n-Propylbenzene	ug/L	5	16	2	52	5	0.46	1	1.6	1
Naphthalene	ug/L	10	24	2	38	5	< 1.0	1	2.2	1
o-Xylene	ug/L	5	31	2	33	5	0.45	1	2.9	1
p-Isopropyltoluene	ug/L	5	5.7	2	20	5	0.73	1	1.7	1
sec-Butylbenzene	ug/L	5	3.4	2	13	5	0.34	1	0.98	1
Total Xylenes	ug/L	5	112	2	173	5	1.7	1	9.9	1
TOTAL BTEX	ug/L		245		376.2		3.62		11.29	
TOTAL VOCs	ug/L		457.72		970.5		14.55		43.34	

While several SVOC and VOC exceedances of the standards are present in primarily WP-11 and WP-12, total VOCs are below 1,000 ug/L in both wells. Based on the In the December 2022 groundwater sampling event, total VOCs ranged from 14.55 ug/L in WP-13 to 970.5 ug/L in WP-12, and Total BTEX concentrations ranged from 3.62 ug/L in WP-13 to 376.2 ug/L in WP-12, with some variation from the 2021 groundwater sample results likely due to exposed under slab areas and stormwater influences due to infiltration. When comparing IEEG December 2022 groundwater sampling results to the Structural Engineering Technologies, P.C. (SET) Third Round Groundwater Testing report, dated September 11, 2020 (in which groundwater sampling was performed on August 18, 2020), total VOCs in WP-11 have decreased by approximately 86%, and in WP-12 by approximately 32%. Total BTEX concentrations in WP-11 have decreased by 86%, and in WP-12 by approximately 33%. **Figure 12** shows Post UST Removal Groundwater Sample Results.

On December 9, 2022, IEEG staff collected two (2) apparent perched groundwater samples from standing water within the hydraulic lift piston excavations, as requested by NYSDEC BCP Project Manager Mr. Matthew Hubicki, to determine if the groundwater was impacted from the previous hydraulic lifts. Sample volumes were obtained using a bailer, placed in laboratory provided clean glassware, stored on ice, and were delivered via lab courier to ELAP-certified Phoenix Analytical Laboratories of Manchester, CT (ELAP Certification #11301). The samples were analyzed for NYSDEC TCL list VOCs and SVOCs, and TCL PCBs, in accordance with USEPA Methods 8260 and 8270, and 8082A, respectively.

Based on a review of the post hydraulic lift piston/reservoir removal groundwater samples, no VOC, SVOC, or PCB compounds were detected in exceedance of their respective NYSDEC TOGS 1.1.1 WQ/GA Table 1 Standards. See **Figure 10** for Perched Groundwater Sample Results.

Tables 5 and **6** summarize the results of all samples of groundwater that exceed the SCGs after completion of the remedial action.

On September 19, 2025, IEEG mobilized to the Site to gauge, purge, and sample the three (3) pre-existing and five (5) newly installed monitoring wells. Firstly, each of the eight (8) wells were gauged for depth to water, depth to bottom, and if present, depth to product, using an electrical depth to water meter and interface probe. The results of the pre-sample well gauging are presented in the table below:

MW Identifier	MW Diameter (inches)	Depth to Bottom (feet)	Depth to Water (feet)	Pre-Sample Purge Quantity (gallons)
MW-1B	2	9.92	NA*	NA*
MW-2B	2	10.21	4.081	1
MW-3B	2	8.06	NA*	NA*
MW-4B	1	17.39	11.15	10
MW-6B	2	16.94	12.10	10
MW-12	1	18.23	10.36	10
MW-13	2	17.91	10.52	10
MW-14	1	18.62	10.18	10

*Wells were found dry, thus the well was not purged or sampled

Using a peristaltic groundwater pump connected to clean polyethylene tubing, the viable wells were purged of a minimum of three well volumes through a Granulated Activated Carbon (GAC) Bucket. The flow rate did not exceed 1 liter per minute. During purging the tubing was connected to a Horiba water quality meter flow-through cell, and water quality measurements were recorded every 3-5 minutes, in accordance with NYS Low Flow Sampling protocols, until the turbidity read less than 50 NTUs, and other parameters had stabilized for three consecutive readings.

Once the parameters stabilized, the Horiba was disconnected, and groundwater samples were directly placed in laboratory supplied clean glassware, stored on ice, and transported by laboratory courier, under proper chain of custody procedures, to Pace Analytical Services of Westborough MA (and ELAP Certified Laboratory) for analysis of TCL VOCs (8260) and TCL SVOCs (8270). As shown in the table above, two wells (MW-1B and MW-3B) did not contain any groundwater, thus could not be purged, nor samples analyzed.

The table below provides a summary of the compounds which exceed the NYSDEC AWQS:

LOCATION			MW-4B		MW-6B		MW-14		MW-12		MW-2B	
SAMPLING DATE			9/19/2025		9/19/2025		9/19/2025		9/19/2025		9/19/2025	
LAB SAMPLE ID			L2559574-01		L2559574-02		L2559574-03		L2559574-04		L2559574-05	
SAMPLE TYPE			WATER		WATER		WATER		WATER		WATER	
SAMPLE DEPTH (ft.)												
	NY-AWQS	Units	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
Semivolatile Organics by GC/MS												
Bis(2-ethylhexyl)phthalate	**5**	ug/l	3	U	3	U	3	U	**38**		3	U
Phenol	**1**	ug/l	**5**	U	**2.3**	J	**6.1**		**5**	U	**1.3**	J
Naphthalene	**10**	ug/l	0.07	J	**31**		**13**		**15**		3	
Benzo(a)anthracene	**0.002**	ug/l	**0.1**	U	**0.04**	J	**0.1**	U	**0.04**	J	**0.03**	J
Volatile Organics by GC/MS												
Benzene	**1**	ug/l	**1.8**		**230**		0.5	U	**5.9**		**2.6**	
Toluene	**5**	ug/l	2.5		**36**		2.5	U	**8.8**		1.4	J
Ethylbenzene	**5**	ug/l	**15**		**99**		2.5	U	**21**		**8.8**	
p/m-Xylene	**5**	ug/l	**45**		**120**		2.5	U	**65**		**24**	
o-Xylene	**5**	ug/l	**11**		**27**		1.4	J	**37**		4.8	
n-Butylbenzene	**5**	ug/l	**0.88**	J	**8.5**		2.5	U	**5.4**	J	2.5	U
sec-Butylbenzene	**5**	ug/l	0.93	J	**11**		2.5	U	**8.5**		2.5	U
Isopropylbenzene	**5**	ug/l	3.6		**73**		2.5	U	**40**		1.4	J
p-Isopropyltoluene	**5**	ug/l	1.5	J	**14**		2.5	U	**13**		2.5	U
Naphthalene	**10**	ug/l	4.1		**56**		2.5	U	**42**		1.6	J
n-Propylbenzene	**5**	ug/l	4		**80**		2.5	U	**40**		1.5	J
1,3,5-Trimethylbenzene	**5**	ug/l	**8**		**27**		2.5	U	**68**		2.4	J
1,2,4-Trimethylbenzene	**5**	ug/l	**22**		**120**		2.5	U	**210**		**7.4**	
1,2,4,5-Tetramethylbenzene	**5**	ug/l	1.2	J	**23**		2	U	**13**		2	U
* Comparison is not performed on parameters with non-numeric criteria.												
U = Non Detect												
AWQS = NYSDEC Ambient Water Quality Standards												
ug/L = micrograms per liter												
NY-AWQS: New York TOGS 111 Ambient Water Quality Standards & Guidance Values Criteria per Standards & Guidance Values including all addenda through February 2023.												

Based on a review of the laboratory data, the monitoring wells located south and southeast from the property exhibit the highest concentrations of petroleum related VOCs, however, MW-14, located between MW-12 and MW-6B, was mostly non-detected for the same compounds. Furthermore, when compared to the results of the post 5,000-gallon UST removal ground water sampling, many of the compounds have decreased, some by more than half. See **Table 9**.

IEEG will attempt to perform a second round of post remedial groundwater sampling in the month of October 2025, to further determine the effectiveness of the remedy.

2.5.3 Soil Vapor

A soil vapor intrusion evaluation was completed as part of the Remedial Investigation. A total of 9 soil vapor samples were collected from locations across the Site. Results of the soil vapor samples are summarized in **Table 7**, and VOC detections are shown on **Figure 13**. Results of the soil vapor analysis indicated that the cVOC PCE was detected at varying concentrations throughout the site. However, when compared to Indoor air concentrations and the NYSDOH decision Matrices guidelines the indoor air levels do not warrant action be taken at this time. Moreover, multiple petroleum compounds were detected in soil vapor in the southeastern portion of the Site, and located downgradient from the UST located in the ramp that leads to the 2nd floor of the building.

There are currently no standards for soil vapor established by either the NYSDEC or the NYSDOH. The NYSDOH has established guidance for evaluating soil vapor intrusion in which the results of soil vapor samples are compared to corresponding indoor air quality results. The NYSDOH has established guidance for evaluating soil vapor intrusion in which the results of soil vapor samples are compared to corresponding indoor air quality results. The guidance is presented in Matrix A, Matrix B, and Matrix C from the NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the

State of New York, October 2006 (matrices were updated in May 2017). The matrices provide guidance relative to carbon tetrachloride, cis-1,2-dichloroethene, 1,1-dichloroethene, TCE, PCE, 1,1,1-trichloroethane, methylene chloride, and vinyl chloride.

The soil vapor results reported from the samples collected during the RI indicate PCE and TCE concentrations are present in subsurface vapors. Additionally, multiple petroleum compounds were found present in soil vapor. Chlorinated VOCs, specifically carbon tetrachloride and PCE, have been detected in soil vapor beneath the Site at concentrations that return a "No Further Action" decision according to the NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion decision matrices.

As part of this SMP (see **Section 4.0 - Monitoring and Sampling Plan**), following completion of Site redevelopment, and prior to occupancy of the building, IEEG will conduct a post remedial soil vapor intrusion evaluation within the NYSDOH Designated Heating Season (November 15 through March 31), to support or dispute the requirement for an active or passive sub-slab depressurization system.

Table 7 and **Figure 13** summarize the results of all samples of soil vapor that exceed the SCGs prior to 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;
- 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 RAWP 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 Restricted Residential 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 14**. These ICs are:

- The property may be used for: restricted residential 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 NYSDOH or the Westchester County Department of Health 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 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 buildings developed in the area within the IC boundaries noted on **Figure 14**, and any potential impacts that are identified must be monitored or mitigated;
- Vegetable gardens and farming on the site are prohibited; and
- 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.

3.3 Engineering Controls

3.3.1 Cover (or Cap)

As per NYSDEC 6 NYCRR Part 375-3.8(e)(2)(iv), a Track 2 Soil Cleanup Objective remedy does not require a Cover or Cap system, and states that "*the remedial program shall not use long-term institutional or engineering controls to achieve the restricted residential soil cleanup objectives"*. **Figure 15** presents the location of the non-remedial cover system and applicable demarcation layers.

Procedures for operating and maintaining the composite cover (or cap) system 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 G** – Operations and Maintenance Manual. **Figure 15** 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).

As discussed below, the NYSDEC may approve termination of a groundwater monitoring program. When a remedial party receives this approval, the remedial party will decommission all site-related monitoring, injection and recovery wells as per the NYSDEC CP-43 policy.

The remedial party will also conduct any needed site restoration activities, such as asphalt patching and decommissioning treatment system equipment. In addition, the remedial party will conduct any necessary restoration of vegetation coverage, trees, and wetlands, and will comply with NYSDEC and United States Army Corps of Engineers regulations and guidance. Also, the remedial party will ensure that no ongoing erosion is occurring on the site.

3.3.2.1 - Cover (or Cap)

The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

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 H**.

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 standards, criteria, and guidance (SCGs), particularly groundwater standards and Part 375 SCOs for soil; 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;
- Monitoring well decommissioning procedures; 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 at a minimum of once per year. 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 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 I** – 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;
- Whether stormwater management systems, such as basins and outfalls, are working as designed;
- 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 Post-Remediation Media Monitoring and Sampling

Samples shall be collected from the re-installed groundwater monitoring wells following the completion of the remedial actions/IRMs. Soil vapor samples will be collected as part of a soil vapor intrusion evaluation during the 2023/2024 NYSDOH designated Heating Season, following completion of the Site redevelopment. Sampling locations, required analytical parameters, and schedule are provided in **Table A** – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

Table A – Post Remediation Sampling Requirements and Schedule

Sampling Location	**Analytical Parameters**				**Schedule**
	TCL VOCs (EPA Method 8260)	TCL SVOCs (EPA Method 8270)		VOC (EPA Method TO-15)	
Groundwater Monitoring Well Locations - TBC	X	X			Quarterly
Soil Vapor, Indoor Air, Outdoor Air locations - TBC				X	Following Site redevelopment, prior to occupancy, within the 2025/26 heating season

Detailed sample collection and analytical procedures and protocols are provided in **Appendix J** – Field Activities Plan and **Appendix H** – Quality Assurance Project Plan.

4.3.1 Groundwater Sampling

Groundwater monitoring will be performed quarterly to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

The network of monitoring wells will be installed to monitor upgradient, on-site and downgradient groundwater conditions at the site. The network of on-site wells has been designed based on the following criteria:

The monitoring well network will include six (6) standard monitoring wells that will monitor groundwater conditions across the Site following the Interim Remedial Measure relating to removal of a 5,000-gallon UST from the Site..

Table B summarizes the wells' identification numbers, as well as the purpose, location, depths, diameter, and screened intervals of the wells. As part of the groundwater monitoring, six (6) on-site wells (one (1) side gradient, three (3) upgradient, and two (2) downgradient from the former UST location) will be sampled to evaluate the effectiveness of the IRM. The remedial party will measure depth to the water table for each monitoring well in the network before sampling.

Table B – Monitoring Well Construction Details

Monitoring Well ID	Well Location	Approximate Coordinates (longitude/ latitude)	Well Diameter (inches)
MW-1	Side Gradient	40°55'8.82"N 73°53'39.40"W	2
MW-2	Upgradient	40°55'8.32"N 73°53'37.96"W	2
MW-3	Upgradient	40°55'7.93"N 73°53'37.85"W	2
MW-4	Upgradient	40°55'7.95"N 73°53'37.35"W	2
MW-5	Downgradient	40°55'7.54"N 73°53'38.15"W	2
MW-6	Downgradient	40°55'7.11"N 73°53'37.30"W	2

See Figure 17 for new monitoring well locations. The wells were installed to a depth of approximately 15-feet bgs, or down to bedrock (whichever is encountered first). The wells were constructed of 2-inch diameter schedule 40 PVC, with approximately 10-feet of 0.010 slotted screen, and 5-feet of solid riser. Groundwater is known to flow towards the southwest, with a possible component of flow to the southeast.

The monitoring wells in the program will be sampled using USEPA Region II Low Stress (i.e., low flow) Purging and Sampling technique. The low-flow method produces samples with lower turbidity and smaller volumes of purge water than using conventional bailer techniques. Low-flow sampling also produces less agitation of the groundwater. As a result, the low-flow method provides a more representative sample, in relation to actual groundwater conditions, by not drastically altering the chemistry of the groundwater while withdrawing the sample.

Groundwater monitoring well samples will be collected for laboratory analysis of Full Target Compound List (TCL) parameters for VOCs via EPA Method 8260 and Semi-VOCs via EPA Method 8270. Subsequent groundwater monitoring requirements or additional remedial efforts after the initial two (2) rounds will be determined in consultation with the NYSDEC. The remedial goal is to document enhanced natural attenuation of groundwater contamination. The data generated from the groundwater sampling will be used to evaluate post-excavation and post-

treatment conditions and establish dissolved-phase contaminant trends over time. A minimum of four (4) rounds of sampling over a period of one year is anticipated.

Upon completion of the groundwater monitoring described, a report will be provided to the NYSDEC to summarize the events and include sampling data, discussion of results, isopotential map, and analytical data presented as tables and maps.

If biofouling or silt accumulation occurs in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC project manager will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC project manager. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC project manager.

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 groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

4.3.2 Soil Vapor Sampling

Soil vapor sampling will be performed once following Site redevelopment, and prior to occupancy, to assess the performance of the remedy, and to determine whether an active or passive SSDS is required. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

Seven (7) sub-slab soil vapor samples (i.e., SV-1 through SV-7) as shown in **Figure 18**, were be installed following installation of the new building foundation. The sub-slab points were installed using a hand-held hammer drill. A ⅜-inch core hole was advanced through the concrete slab and approximately 3 inches into the sub-slab material to create an open cavity. New Vapor-Pin® sampling points were inserted into the concrete slab at each sample location, approximately 1 inch above the sub-slab material. Each sample point was capped with a stainless-steel, airtight Swagelok® fitting until tracer testing is conducted.

Sub-slab samples will be collected following the successful passing of the helium tracer test described above. Sub-slab samples will be collected over a commercial occupant period of approximately 2 hours. Samples will be collected using passive (less than -28 inches of mercury [in. Hg]) 2.75- liter, stainless-steel SUMMA canisters supplied from a laboratory with current Environmental Laboratory Approval Program (ELAP) certification. The canisters will be individually certified clean by the laboratory and supplied with vacuum gauges and pre-set flow controllers capable of collecting a sample at a rate not to exceed 0.2 liter per minute to minimize outdoor air infiltration during sampling. Once a canister is full (i.e., -5 in. Hg remaining, as measured by an analog pressure gauge), it will be sealed and labeled with the sample identification number for the sub-slab vapor point. Each canister shipment will be sealed with chain-of-custody tape, and chain-of-custody forms will be completed in triplicate. Samples will be either shipped via overnight carrier or driven directly to the analytical laboratory on the day that collections are completed.

Sub-slab vapor samples will be analyzed by an ELAP-certified laboratory using United States Environmental Protection Agency Method TO-15 (Determination of volatile organic compounds [VOCs] in Air Collected in Specially Prepared Canisters and Analyzed by Gas Chromatography Mass Spectrometry). Whole-air samples will be analyzed for VOCs using a quadrupole or ion-trap gas chromatograph/mass spectrometer system to provide compound reporting limits of at or below the NYSDOH guidance values.

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 sampling program are specified in Section 7.0 – Reporting Requirements.

4.3.3 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in **Appendix I** - Site Management Forms. Other observations (e.g., groundwater monitoring well 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 J** of this document.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

The site remedy does not rely on any mechanical systems, such as groundwater treatment systems, sub-slab depressurization systems or air sparge/soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP.

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 summary of vulnerability assessments that will be conducted for the site during periodic assessments, and briefly summarizes the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding.

- The Site is located at an elevation of approximately 80 feet above mean sea level (amsl) on the southeast portion of the site, and 90 feet amsl on the northwest portion of the Site; therefore, the Site has an approximate 10-foot elevation change between the northwest and southeast. Groundwater has been encountered at between 1.29 and 10.6 feet below grade surface, and is thought to be perched, due to the abundant presence of bedrock beneath the Site. Stormwater is directed to municipal storm drains located along Van Cortland Park Avenue to the east, and McLean Avenue to the south. During intense rain events, localized street flooding is possible due to the low permeability of paved areas, and lack of natural drainage.
- The nearest surface body of water is the Hudson River, located approximately 0.82 miles (or 4,350 feet) to the west of the Site. According to the Federal Emergency Management Agency (FEMA) flood zone data, the Site is not located in any flood zones.

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 of the SMP provides a summary of any green remediation evaluations to be completed for the site during site management, and as reported in the Periodic Review Report (PRR).

- As no mechanical engineering controls are proposed, the site management meets the goal of improving the sustainability of the cleanup and providing a net environmental benefit.
- The Site engineering control consists of a cover system; therefore, frequent maintenance is not required.
- Annual inspections will be completed with site monitoring sampling to minimize the number of visits to the Site, and travel to the Site can be completed via mass transit.
- The Site previously operated as several auto-repair facilities, along with a restaurant, and a light manufacturing operation, and has been redeveloped with an energy efficient self-storage facility; therefore, no negative energy effects were identified for the Site.
- While several municipal parks are located directly north, and adjacent to the east, the redevelopment has encompassed the original design and footprint of the former building; therefore, there is no effect on the existing ecosystems.
- 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

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 I**. These forms are subject to NYSDEC revision. All site management inspection, maintenance, and monitoring events will be conducted by a qualified environmental professional as defined in 6 NYCRR Part 375, 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 C** and summarized in the Periodic Review Report.

Table C: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Inspection Report	Annually
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 or equivalent 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 (groundwater, soil vapor, 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:

- Trend monitoring graphs that present groundwater contaminant levels from before the start of the remedy implementation to the most current sampling data;
- Trend monitoring graphs depicting system influent analytical data on a per event and cumulative basis;
- O&M data summary tables;
- A current plume map for sites with remaining groundwater contamination; and
- A groundwater elevation contour map for each gauging event.

- 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™ 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 Remedial Action Work Plan (RAWP), ROD or 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 evaluation of trends in contaminant levels in the affected media to determine if the remedy continues to be effective in achieving remedial goals as specified by the RAWP, ROD or Decision Document; and
  - The overall performance and effectiveness of the remedy.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional as defined in 6 NYCRR Part 375 or 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 for the site."

"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."

- *No new information has come to my attention, including groundwater monitoring data from wells located at the site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of off-site contamination are no longer valid; and*
- *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

No remedial systems are utilized as an engineering control, therefore, RSO is not applicable to the Site unless there is a change in use or future redevelopment of the Site that would require a revised conceptual site model with recommendations.

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

Structural Engineering Technologies, P.C. – Phase I ESA, October 2, 2018

Structural Engineering Technologies, P.C. – Phase II ESA, April 22, 2020

Structural Engineering Technologies, P.C. – Supplementary Phase II ESA, July 6, 2020

Structural Engineering Technologies, P.C. – Fourth Roung Groundwater Testing, November 5, 2020

Impact Environmental Engineering and Geology, PLLC – Remedial Investigation Report, June 22, 2023

New York State Department of Environmental Conservation (NYSDEC) – Decision Document, XXXX, 2023

NYSDEC – Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006

NYSDEC – Updates to Soil Vapor/Indoor Air Decision Matrices, May 2017

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

NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".

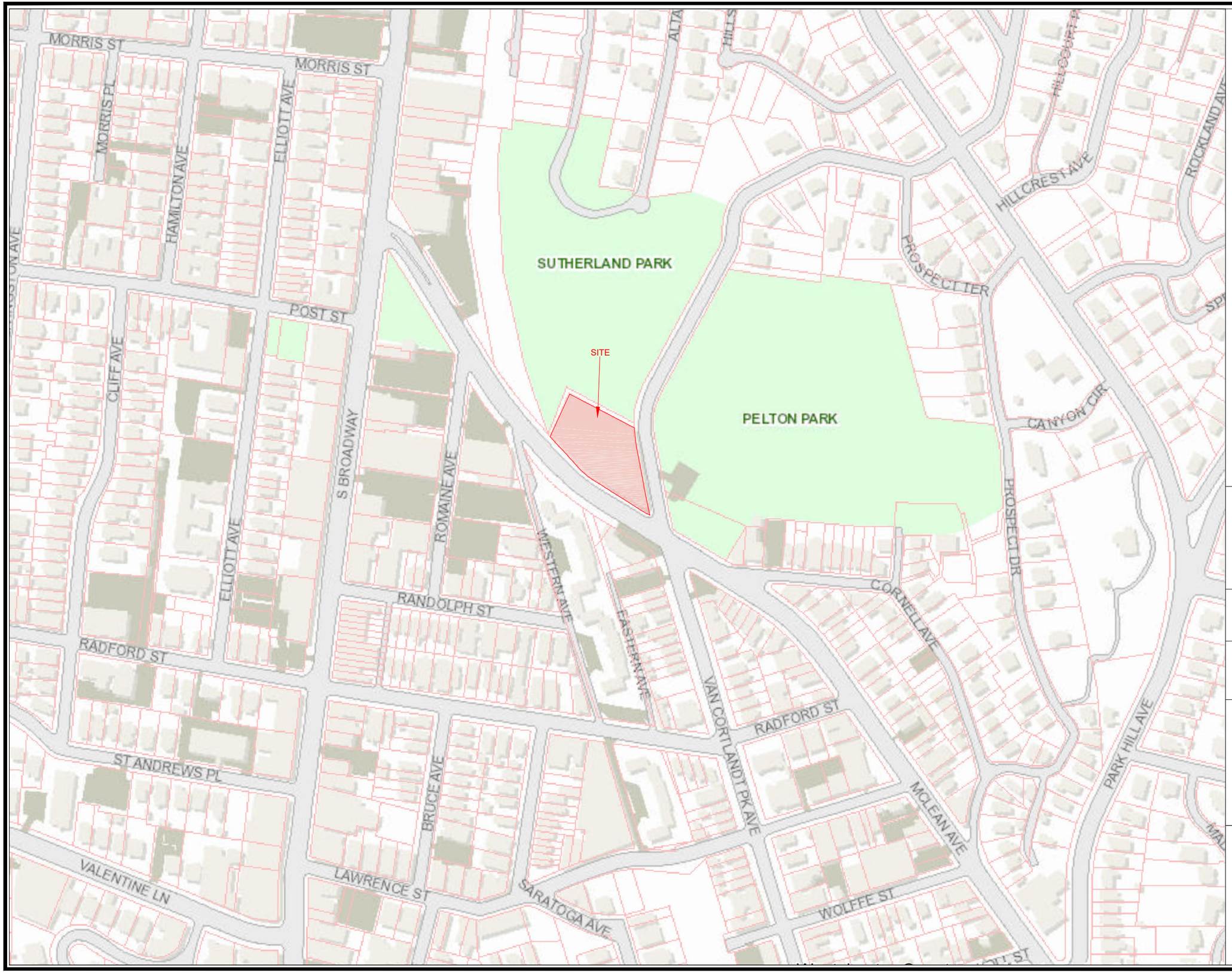
NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

FIGURES

46-70 McLean Avenue, Yonkers, NY

Site Management Plan
NYSDEC BCP #C360211

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
TEL: (631) 268-8800
FAX: (631) 269-1599



NOTES:

Base Map Source: Westchester GIS Mapper

SITE LOCATION MAP

60 McLean Avenue
Yonkers, New York

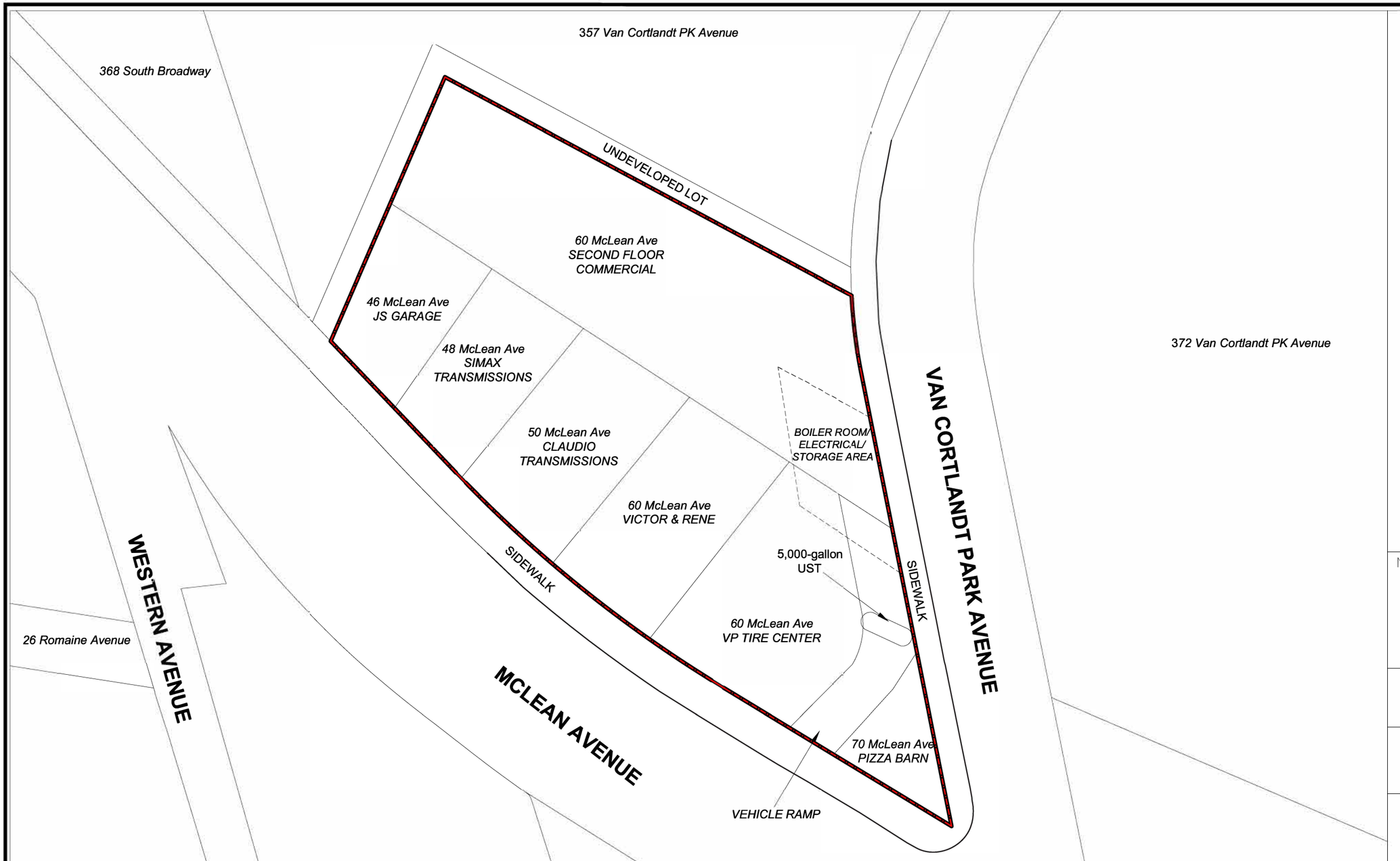
Figure No:01

PROJECT NO.	15514-01
DESIGNED BY:	LR
DRAWN BY:	LR
CHECKED BY:	CC
DATE:	12/14/2020
SCALE:	N.T.S
REVISIONS	

PROJECT NORTH

IMPACT ENVIRONMENTAL ENGINEERING & GEOLOGY

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800
FAX (631) 269-1599



LEGEND

PROPERTY LINE

PROJECT NORTH

0' 10' 20' 50'

NOTES:

SITE BOUNDARY MAP

60 McLean Avenue
Yonkers, New York

Figure No: 02

PROJECT NO.	15514-01
DESIGNED BY:	LR
DRAWN BY:	LR
CHECKED BY:	CC
DATE:	12/11/2020
SCALE:	SEE ABOVE

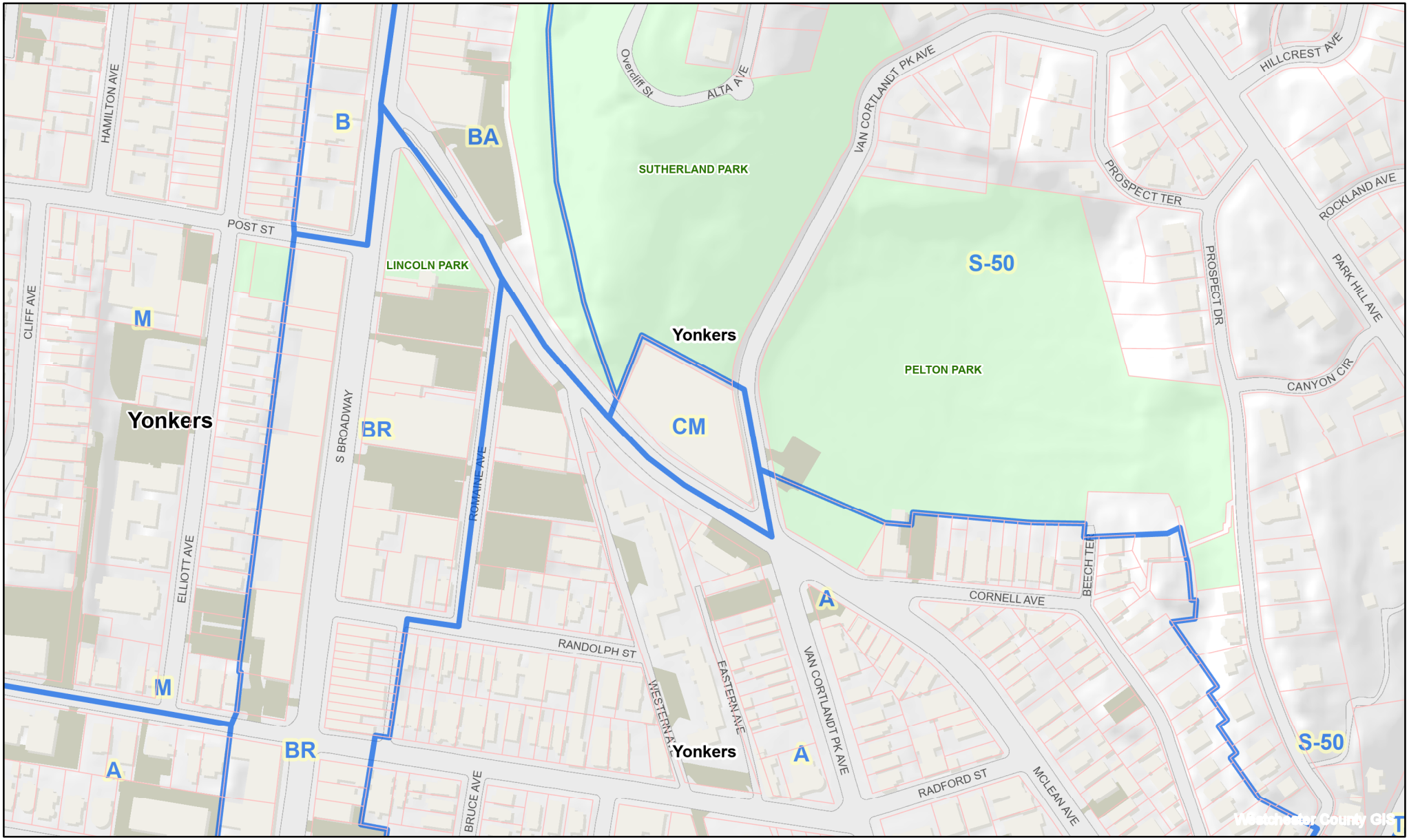
REVISIONS

IMPACT ENVIRONMENTAL ENGINEERING & GEOLOGY

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800
FAX (631) 269-1599

Figure 3 - Westchester County Tax Map

(Yonkers)



August 16, 2023

1:3,000

0 145 290 580 ft

N

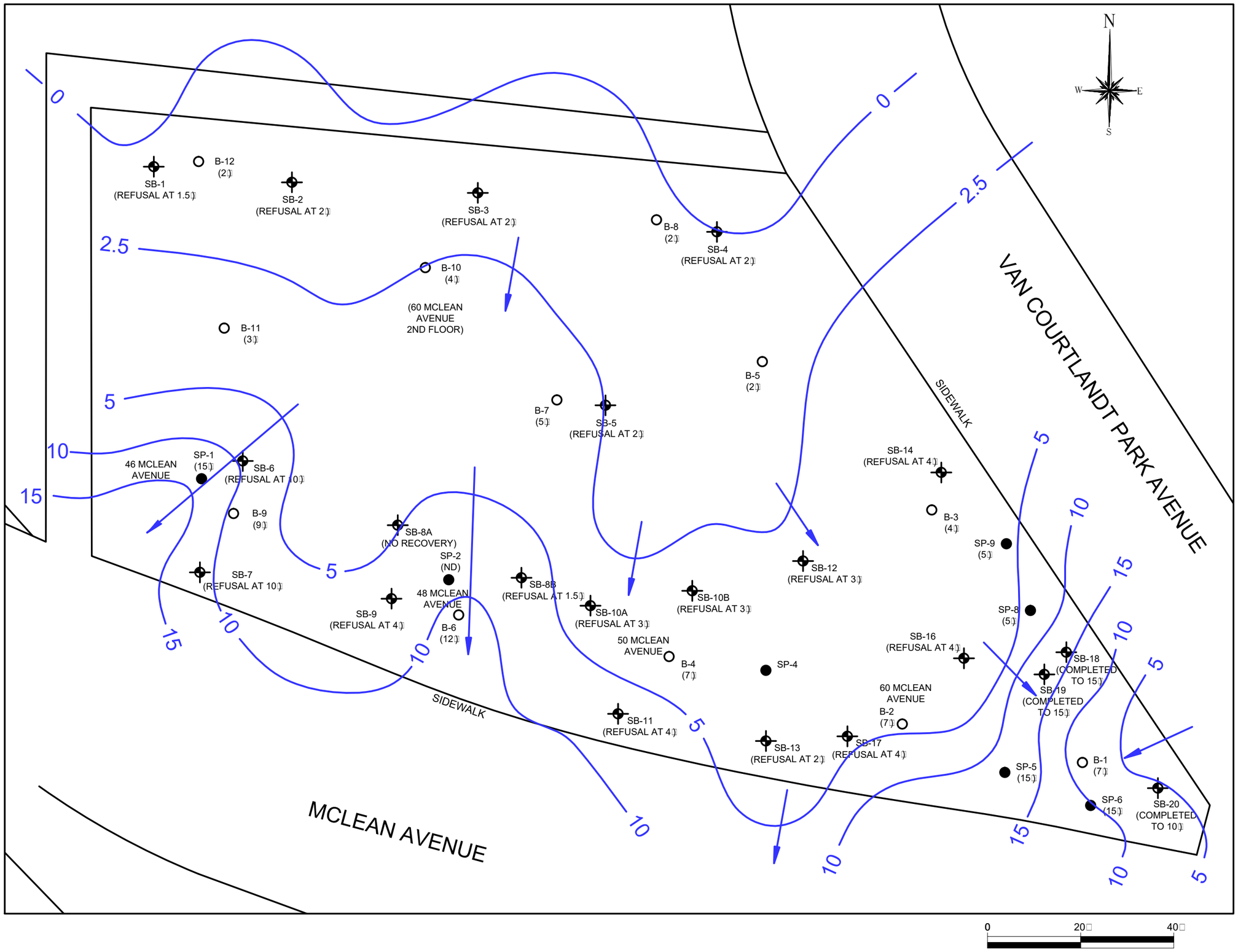
Tax parcel data was provided by local municipality. This map is generated as a public service to Westchester County residents for general information and planning purposes only, and should not be relied upon as a sole informational source. The County of Westchester hereby disclaims any liability from the use of this GIS mapping system by any person or entity. Tax parcel boundaries represent approximate property line location and should NOT be interpreted as or used in lieu of a survey or property boundary description. Property descriptions must be obtained from surveys or deeds. For more information please contact local municipality assessor's office.

Westchester County GIS

GIS GEOGRAPHIC INFORMATION SYSTEMS

http://giswww.westchestergov.com

Michaelian Office Building
148 Martine Avenue Rm 214
White Plains, New York 10601



LEGEND:

- —10— CONTOUR (FEET)
- SURFACE SLOPE
- IEEG 2022 RI SOIL BORING
- PG ENVIRONMENTAL 2018 GEOTECH BORING
- SET 2020 PHASE II SOIL BORING

BEDROCK SURFACE MAP

60 McLEAN AVENUE
YONKERS, NEW YORK

FIGURE NO. 04

PROJECT NO.	15514
DESIGNED BY:	AK
DRAWN BY:	JRS
CHECKED BY:	JRS/CC
DATE:	7-21-22
SCALE:	1:20

REVISIONS NO:	DATE:

IMPACT ENVIRONMENTAL
170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800 FAX (631) 269-1599

1000 PAGE AVENUE
LYNDHURST, NEW JERSEY 07071



LEGEND:

- Groundwater Sampling Location
- Previously Installed Groundwater Well Location

NOTES:

GROUNDWATER CONTOUR MAP

60 McLean Avenue
Yonkers, New York

Figure No: 05

PROJECT NO.	15514-01
DESIGNED BY:	AK
DRAWN BY:	AK
CHECKED BY:	CC
DATE:	05/13/2022
SCALE:	SEE ABOVE
REVISIONS	

IMPACT ENVIRONMENTAL CLOSURES, INC.

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800
FAX (631) 269-1599

LOCATION	IA-1A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	**0.61**
PCE	0.231
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	21.21
Total VOCs	138.614

LOCATION	SV-2A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**44.1**
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Carbon tetrachloride	ND
Methylene chloride	ND
Total BTEX	8.417
Total VOCs	142.097

LOCATION	SV-3A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**32.9**
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Carbon tetrachloride	ND
Methylene chloride	ND
Total BTEX	5.48
Total VOCs	294.03

LOCATION	OA-2A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	**0.566**
PCE	0.156
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	5.04
Total BTEX	3.301
Total VOCs	38.864

LOCATION	IA-2A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	**0.547**
PCE	0.264
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	90.62
Total VOCs	255.091

LOCATION	SV-4A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**28**
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Carbon tetrachloride	ND
Methylene chloride	ND
Heptane	**1320**
Total BTEX	ND
Total VOCs	1413.82

LOCATION	SV-10A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**41.2**
Carbon tetrachloride	ND
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	59.8
Total VOCs	562.33

LOCATION	SV-5A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**368**
Carbon tetrachloride	2.23
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	15.899
Total VOCs	486.98

LOCATION	IA-4A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	**0.642**
PCE	1.28
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	17.62
Total VOCs	114.982

LOCATION	SV-6A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**96.3**
TCE	3.14
CIS-1,2-DCE	ND
1,1,1-TCA	2.65
Carbon tetrachloride	ND
Methylene chloride	ND
Total BTEX	28.732
Total VOCs	730.484

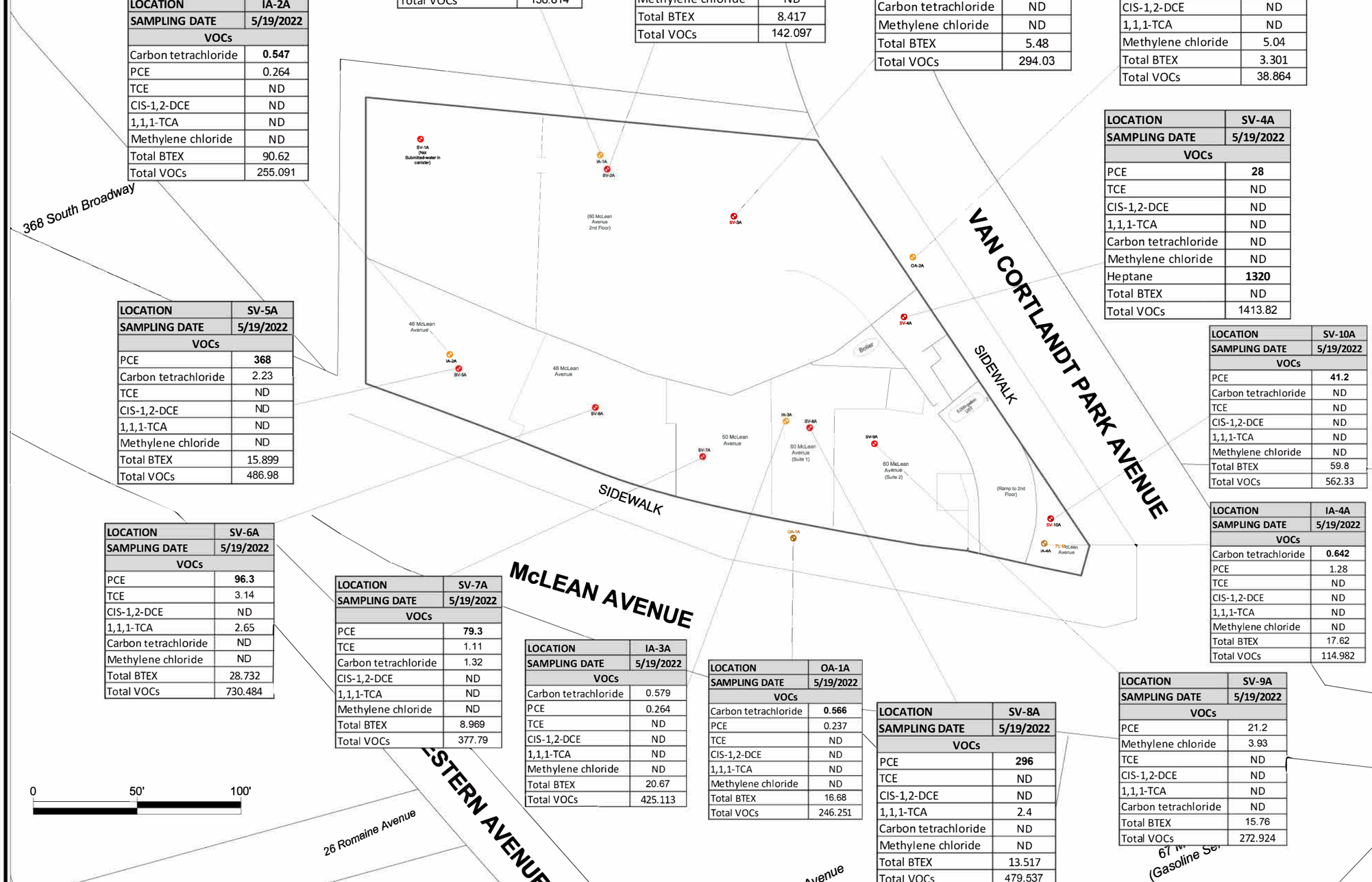
LOCATION	SV-7A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**79.3**
TCE	1.11
Carbon tetrachloride	1.32
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	8.969
Total VOCs	377.79

LOCATION	IA-3A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	0.579
PCE	0.264
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	20.67
Total VOCs	425.113

LOCATION	OA-1A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	**0.566**
PCE	0.237
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	16.68
Total VOCs	246.251

LOCATION	SV-8A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**296**
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	2.4
Carbon tetrachloride	ND
Methylene chloride	ND
Total BTEX	13.517
Total VOCs	479.537

LOCATION	SV-9A
SAMPLING DATE	5/19/2022
VOCs	
PCE	21.2
Methylene chloride	3.93
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Carbon tetrachloride	ND
Total BTEX	15.76
Total VOCs	272.924



LEGEND:

- Sub Slab Soil Vapor Sampling Point
- Indoor/Outdoor Air Sampling Location

NOTES: *Units in ug/m^3

SUB-SLAB & INDOOR/OUTDOOR AIR ANALYTICAL MAP

60 McLean Avenue
Yonkers, New York

Figure No: 06

PROJECT NO.	15514-01
DESIGNED BY:	LR
DRAWN BY:	AK
CHECKED BY:	CC
DATE:	05/11/2022
SCALE:	SEE ABOVE
REVISIONS	

IMPACT ENVIRONMENTAL CLOSURES, INC.

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800
FAX (631) 269-1599

LOCATION	SB-1 (0-2)
SAMPLING DATE	5/3/2022
GENERAL CHEMISTRY	
Chromium, Trivalent	**720**
Chromium, Hexavalent	2
METALS, TOTAL	
Copper, Total	62.1
Nickel, Total	143
Zinc, Total	**110**

LOCATION	SB-22 (0-2)
SAMPLING DATE	12/9/2022
GENERAL CHEMISTRY	
Chromium, Total	25.2
METALS, TOTAL	
Lead, Total	65.1

LOCATION	SB-2 (0-2)
SAMPLING DATE	5/3/2022
GENERAL CHEMISTRY	
Chromium, Trivalent	35
Chromium, Hexavalent	ND
METALS, TOTAL	
Copper	120
Nickel	28.5
Zinc	60.1

LOCATION	SB-3 (0-2)
SAMPLING DATE	5/3/2022
METALS, TOTAL	
Mercury	**2**

LOCATION	SB-4 (0-2)
SAMPLING DATE	5/3/2022
METALS, TOTAL	
Mercury	0.547

LOCATION	SB-21 (0-2)
SAMPLING DATE	12/9/2022
GENERAL CHEMISTRY	
Chromium, Total	29.1
METALS, TOTAL	
Lead, Total	172
Mercury, Total	0.19
Zinc, Total	112

LOCATION	SB-10A (0-3)
SAMPLING DATE	4/21/2022
METALS,TOTAL	
Mercury	1.27

LOCATION	SB-12 (0-4)
SAMPLING DATE	4/21/2022
METALS,TOTAL	
Nickel	**35.8**

LOCATION	SB-8B (0-3)
SAMPLING DATE	5/3/2022
PCBs	
Aroclor 1254	0.328
Aroclor 1260	0.349
PCBs, Total	0.677
METALS, TOTAL	
Mercury	0.428
Zinc	217

LOCATION	SB-11 (0-4)
SAMPLING DATE	4/21/2022
METALS,TOTAL	
Nickel	365
Mercury	0227

LOCATION	SB-12 (0-4)
SAMPLING DATE	4/21/2022
METALS,TOTAL	
Nickel	**35.8**
PESTICIDES	
4,4' -DDT	**0.0462**
4,4'-DDE	**0.00589**

LOCATION	SB-18 (0-2)
SAMPLING DATE	4/21/2022
METALS,TOTAL	
Lead	219
Mercury	0.474

LOCATION / SAMPLING DATE	NY-UNRES	NY-RRES	NY-PGW
Miscellaneous/Inorganics			
Chromium, Trivalent	30	**180**	~
Chromium, Hexavalent	1	**110**	**19**
Total Cyanide	27	**27**	**40**
METALS,TOTAL			
Copper	50	**270**	**1,750**
Manganese	1,600	**2,000**	**2,000**
Mercury	0.18	**0.81**	**0.73**
Nickel	30	**310**	**130**
Zinc	109	**10,000**	**2,480**
VOCs			
PCE	1,300	**19,000**	**0.47**
TCE	470	**21,000**	**0.47**
CIS-1,2-DCE	250	**100,000**	**0.25**
SVOCs			
Benz(a)anthracene	1,000	**1,000**	**1**
Benzo(a)pyrene	1,000	**1,000**	**22**
Benzo(b)fluoranthene	1,000	**1,000**	**1.7**
Benzo(k)fluoranthene	800	**3,900**	**1.7**
Chrysene	1,000	**3,900**	**1**
Dibenz(a,h)anthracene	330	**330**	**1,000**
Indeno(1,2,3-cd)pyrene	500	**500**	**8.2**
PESTICIDES			
4,4' -DDD	0.0033	**62**	**14**
4,4' -DDE	0.0033	**92**	**17**
4,4' -DDT	0.0033	**47**	**136**
PCBs			
Aroclor 1254	0.1	**1**	**3.2**
Aroclor 1260	0.1	**1**	**3.2**

*Units in mg/kg

LEGEND:

Soil Boring Location

NY UNRES- NY PART 375 UNRESTRICTED RESIDENTIAL

NY RRES- NY PART 375 RESTRICTED RESIDENTIAL

NY PGW- NY PART 375 PROTECTION OF GROUNDWATER

SB-1, SB-2, SB-3, SB-4, SB-5, SB-6, SB-7, SB-8A, SB-8B, SB-9, SB-10A, SB-10B, SB-11, SB-12, SB-13, SB-14, SB-16, SB-17, SB-18, SB-19, SB-20, SB-21, SB-22

(60 McLean Avenue 2nd Floor)

46 McLean Avenue

48 McLean Avenue

50 McLean Avenue

60 McLean Avenue (Suite 1)

60 McLean Avenue (Suite 2)

70 McLean Avenue

Boiler

5,000-gallon UST

(Ramp to 2nd Floor)

VAN CORTLANDT PARK AVEN

SIDEWALK

SIDEWALK

MCLEAN AVENUE

0 30' 60'

SOIL ANALYTICAL MAP

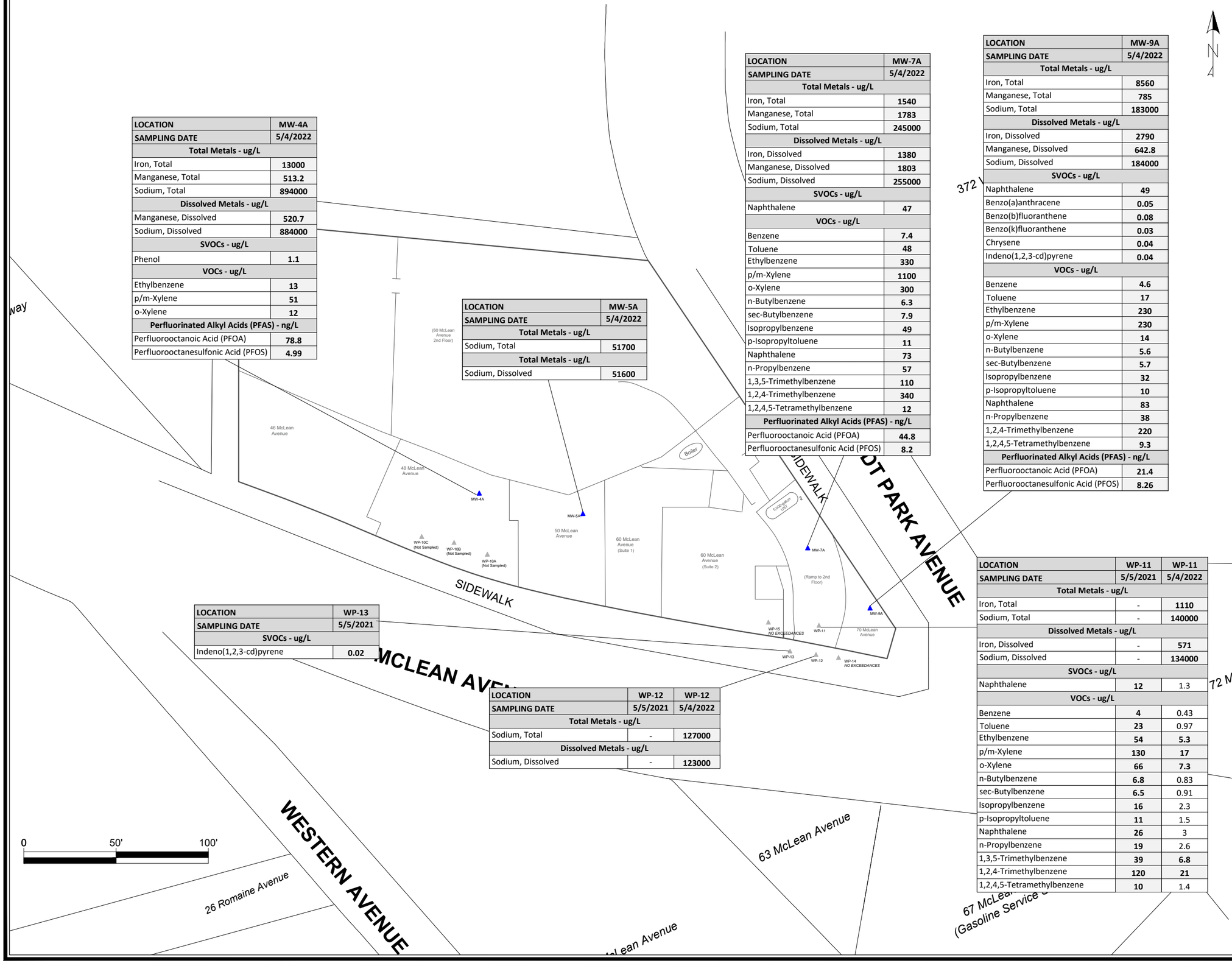
60 McLean Avenue
Yonkers, New York

Figure No: 07

PROJECT NO.	15514-01
DESIGNED BY:	LR
DRAWN BY:	AK
CHECKED BY:	CC
DATE:	05/11/2022
SCALE:	SEE ABOVE
REVISIONS	

IMPACT ENVIRONMENTAL CLOSURES, INC.

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800
FAX (631) 269-1599



LOCATION	MW-4A
SAMPLING DATE	5/4/2022
Total Metals - ug/L	
Iron, Total	13000
Manganese, Total	513.2
Sodium, Total	894000
Dissolved Metals - ug/L	
Manganese, Dissolved	520.7
Sodium, Dissolved	884000
SVOCs - ug/L	
Phenol	1.1
VOCs - ug/L	
Ethylbenzene	13
p/m-Xylene	51
o-Xylene	12
Perfluorinated Alkyl Acids (PFAS) - ng/L	
Perfluorooctanoic Acid (PFOA)	78.8
Perfluorooctanesulfonic Acid (PFOS)	4.99

LOCATION	MW-5A
SAMPLING DATE	5/4/2022
Total Metals - ug/L	
Sodium, Total	51700
Total Metals - ug/L	
Sodium, Dissolved	51600

LOCATION	MW-7A
SAMPLING DATE	5/4/2022
Total Metals - ug/L	
Iron, Total	1540
Manganese, Total	1783
Sodium, Total	245000
Dissolved Metals - ug/L	
Iron, Dissolved	1380
Manganese, Dissolved	1803
Sodium, Dissolved	255000
SVOCs - ug/L	
Naphthalene	47
VOCs - ug/L	
Benzene	7.4
Toluene	48
Ethylbenzene	330
p/m-Xylene	1100
o-Xylene	300
n-Butylbenzene	6.3
sec-Butylbenzene	7.9
Isopropylbenzene	49
p-Isopropyltoluene	11
Naphthalene	73
n-Propylbenzene	57
1,3,5-Trimethylbenzene	110
1,2,4-Trimethylbenzene	340
1,2,4,5-Tetramethylbenzene	12
Perfluorinated Alkyl Acids (PFAS) - ng/L	
Perfluorooctanoic Acid (PFOA)	44.8
Perfluorooctanesulfonic Acid (PFOS)	8.2

LOCATION	MW-9A
SAMPLING DATE	5/4/2022
Total Metals - ug/L	
Iron, Total	8560
Manganese, Total	785
Sodium, Total	183000
Dissolved Metals - ug/L	
Iron, Dissolved	2790
Manganese, Dissolved	642.8
Sodium, Dissolved	184000
SVOCs - ug/L	
Naphthalene	49
Benzo(a)anthracene	0.05
Benzo(b)fluoranthene	0.08
Benzo(k)fluoranthene	0.03
Chrysene	0.04
Indeno(1,2,3-cd)pyrene	0.04
VOCs - ug/L	
Benzene	4.6
Toluene	17
Ethylbenzene	230
p/m-Xylene	230
o-Xylene	14
n-Butylbenzene	5.6
sec-Butylbenzene	5.7
Isopropylbenzene	32
p-Isopropyltoluene	10
Naphthalene	83
n-Propylbenzene	38
1,2,4-Trimethylbenzene	220
1,2,4,5-Tetramethylbenzene	9.3
Perfluorinated Alkyl Acids (PFAS) - ng/L	
Perfluorooctanoic Acid (PFOA)	21.4
Perfluorooctanesulfonic Acid (PFOS)	8.26

LOCATION	WP-13
SAMPLING DATE	5/5/2021
SVOCs - ug/L	
Indeno(1,2,3-cd)pyrene	0.02

LOCATION	WP-12	WP-12
SAMPLING DATE	5/5/2021	5/4/2022
Total Metals - ug/L		
Sodium, Total	-	127000
Dissolved Metals - ug/L		
Sodium, Dissolved	-	123000

LOCATION	WP-11	WP-11
SAMPLING DATE	5/5/2021	5/4/2022
Total Metals - ug/L		
Iron, Total	-	1110
Sodium, Total	-	140000
Dissolved Metals - ug/L		
Iron, Dissolved	-	571
Sodium, Dissolved	-	134000
SVOCs - ug/L		
Naphthalene	12	1.3
VOCs - ug/L		
Benzene	4	0.43
Toluene	23	0.97
Ethylbenzene	54	5.3
p/m-Xylene	130	17
o-Xylene	66	7.3
n-Butylbenzene	6.8	0.83
sec-Butylbenzene	6.5	0.91
Isopropylbenzene	16	2.3
p-Isopropyltoluene	11	1.5
Naphthalene	26	3
n-Propylbenzene	19	2.6
1,3,5-Trimethylbenzene	39	6.8
1,2,4-Trimethylbenzene	120	21
1,2,4,5-Tetramethylbenzene	10	1.4

NYSDEC Part 375 Standards	
Compound	Technical Operational Guidance Standards (TOGS) 1.1.1 Class G.A. Ambient Water Quality Standards (AWQS)
Total Metals - ug/L	
Iron, Total	300
Manganese, Total	300
Sodium, Total	20000
Dissolved Metals - ug/L	
Iron, Dissolved	300
Manganese, Dissolved	300
Sodium, Dissolved	20000
SVOCs - ug/L	
Phenol	1
Naphthalene	10
Benzo(a)anthracene	0.002
Benzo(b)fluoranthene	0.002
Benzo(k)fluoranthene	0.002
Chrysene	0.002
Indeno(1,2,3-cd)pyrene	0.002
VOCs - ug/L	
Benzene	1
Toluene	5
Ethylbenzene	5
p/m-Xylene	5
o-Xylene	5
n-Butylbenzene	5
sec-Butylbenzene	5
Isopropylbenzene	5
p-Isopropyltoluene	5
Naphthalene	10
n-Propylbenzene	5
1,3,5-Trimethylbenzene	5
1,2,4-Trimethylbenzene	5
1,2,4,5-Tetramethylbenzene	5
Perfluorinated Alkyl Acids (PFAS) - ng/L	
Perfluorooctanoic Acid (PFOA)	6.7
Perfluorooctanesulfonic Acid (PFOS)	2.7

NOTE:
GROUNDWATER SAMPLES COLLECTED IN MAY 2021 WERE ANALYZED FOR VOCS, SVOCS AND METALS ONLY

LEGEND:

- Groundwater Sampling Location
- Previously Installed Groundwater Well Location

GROUNDWATER ANALYTICAL MAP

60 McLean Avenue
Yonkers, New York

Figure No: 08

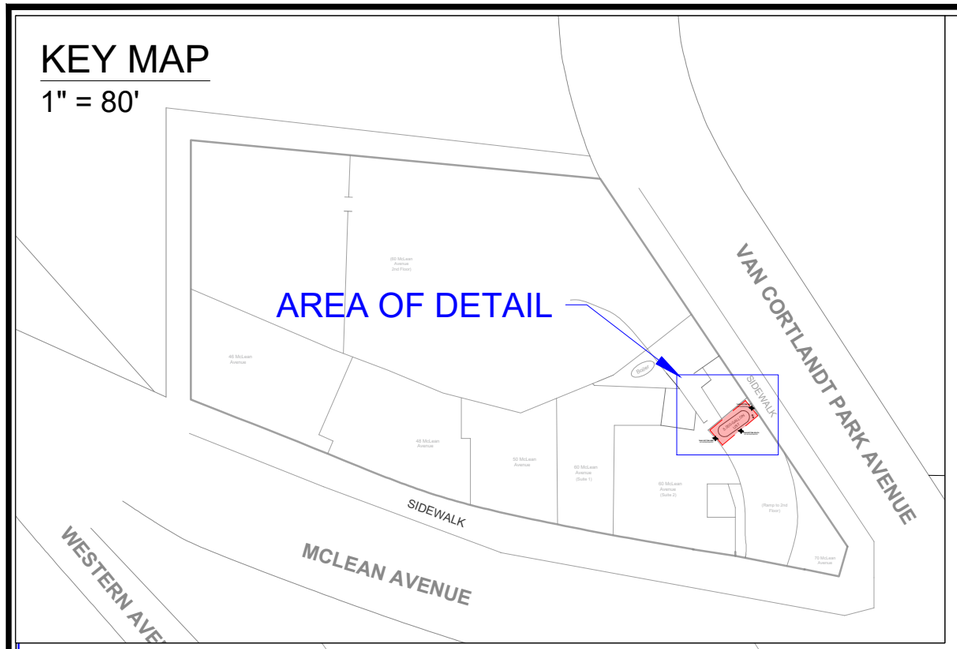
PROJECT NO.	15514-01
DESIGNED BY:	LR
DRAWN BY:	AK
CHECKED BY:	CC
DATE:	04/27/2023
SCALE:	SEE ABOVE

REVISIONS

IMPACT ENVIRONMENTAL CLOSURES, INC.

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800
FAX (631) 269-1599

KEY MAP
1" = 80'



SIDEWALK

N

TANK BOTTOM EAST
NO EXCEEDANCES

5,000-GALLON UST

TANK BOTTOM SOUTH
NO EXCEEDANCES

TANK BOTTOM WEST
NO EXCEEDANCES

0 4' 8'

LEGEND:

UST EXCAVATION ENDPOINT SAMPLE

UST EXCAVATION

NOTES:

UST ENDPOINT SAMPLE LOCATION MAP

40-70 McLean Avenue
Yonkers, New York
BCP #360211

Figure 9

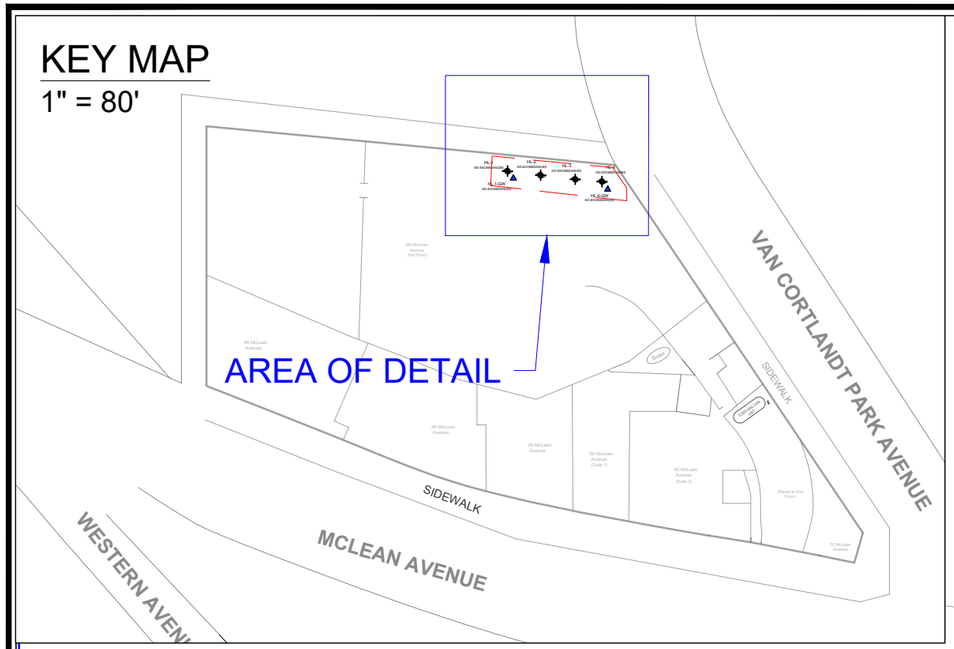
PROJECT NO.	15514-01
DESIGNED BY:	AK
DRAWN BY:	AB
CHECKED BY:	CC
DATE:	07/25/2023
SCALE:	AS SHOWN

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KEY MAP
1" = 80'



N

HL-1
NO EXCEEDANCES

HL-2
NO EXCEEDANCES

HL-3
NO EXCEEDANCES

HL-4
NO EXCEEDANCES

HL 1-GW
NO EXCEEDANCES

HL 4-GW
NO EXCEEDANCES

0 8' 16'

LEGEND:

PERCHED WATER SAMPLE

HYDRAULIC LIFT ENDPOINT SAMPLE

NOTES:

HYDRAULIC LIFT ENDPOINT AND PERCHED WATER SAMPLE LOCATION MAP

40-70 McLean Avenue
Yonkers, New York
BCP #360211

Figure 10

PROJECT NO.	15514-01
DESIGNED BY:	AK
DRAWN BY:	AB
CHECKED BY:	CC
DATE:	07/25/2023
SCALE:	AS SHOWN

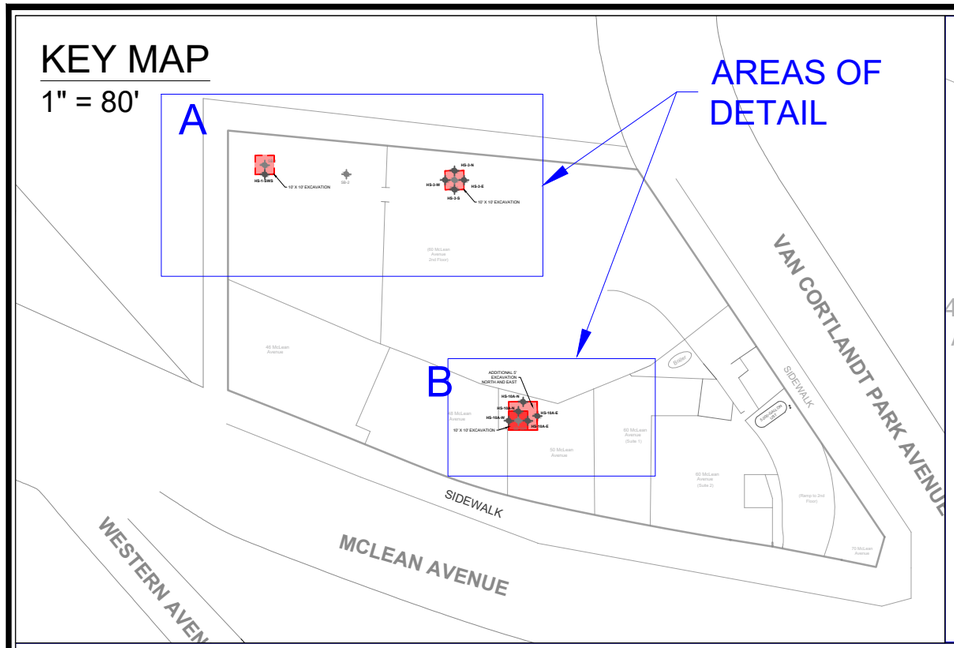
REVISIONS

IMPACT ENVIRONMENTAL CLOSURES, INC.

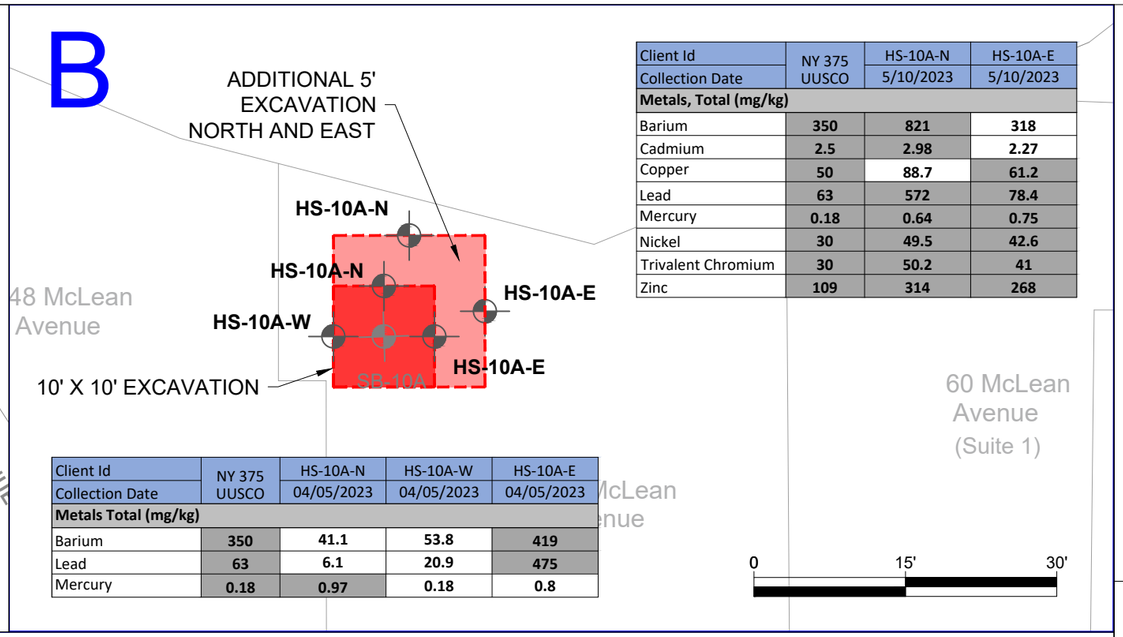
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BOHEMIA, NEW YORK 11716
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KEY MAP

1" = 80'



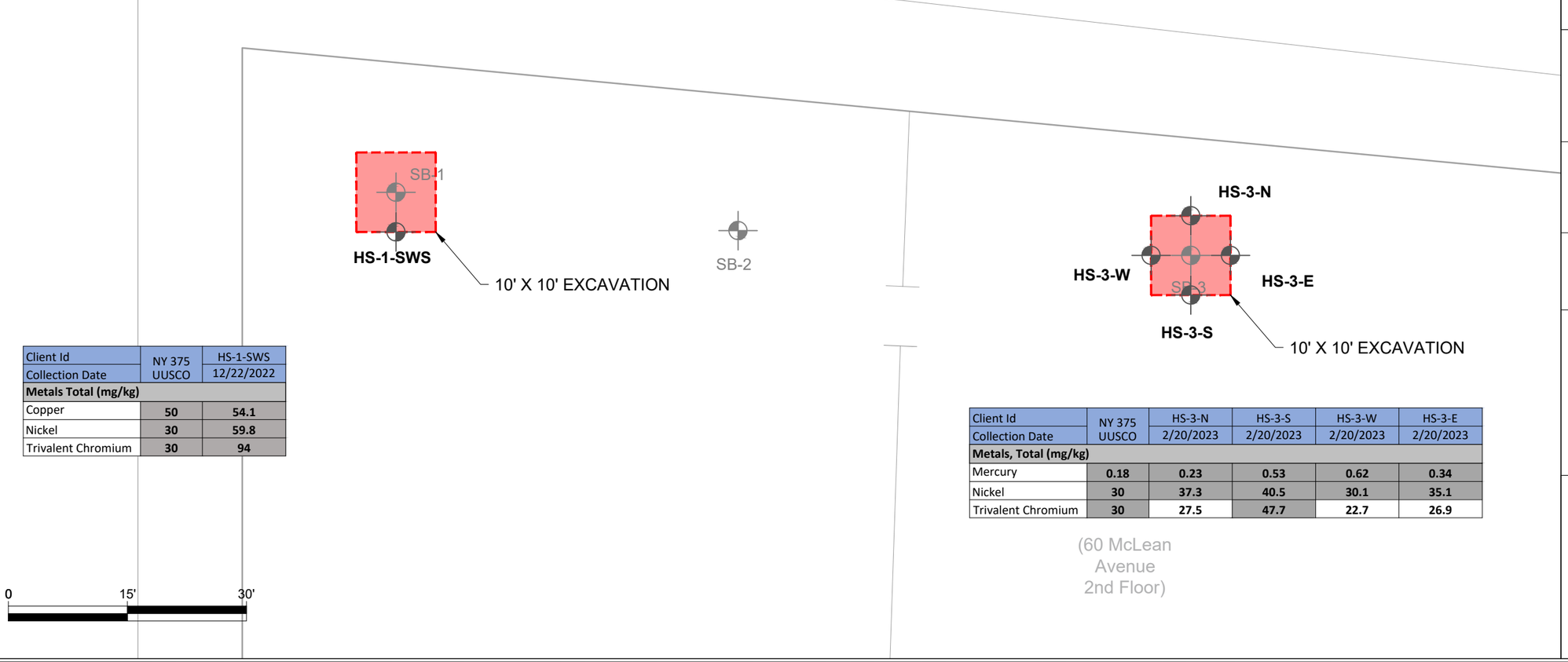
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Client Id	NY 375 UUSCO	HS-10A-N	HS-10A-W	HS-10A-E
Collection Date		04/05/2023	04/05/2023	04/05/2023
Metals Total (mg/kg)				
Barium	**350**	**41.1**	**53.8**	**419**
Lead	**63**	**6.1**	**20.9**	**475**
Mercury	**0.18**	**0.97**	**0.18**	**0.8**

Client Id	NY 375 UUSCO	HS-10A-N	HS-10A-E
Collection Date		5/10/2023	5/10/2023
Metals, Total (mg/kg)			
Barium	**350**	**821**	**318**
Cadmium	**2.5**	**2.98**	**2.27**
Copper	**50**	**88.7**	**61.2**
Lead	**63**	**572**	**78.4**
Mercury	**0.18**	**0.64**	**0.75**
Nickel	**30**	**49.5**	**42.6**
Trivalent Chromium	**30**	**50.2**	**41**
Zinc	**109**	**314**	**268**

A



Client Id	NY 375 UUSCO	HS-1-SWS
Collection Date		12/22/2022
Metals Total (mg/kg)		
Copper	**50**	**54.1**
Nickel	**30**	**59.8**
Trivalent Chromium	**30**	**94**

Client Id	NY 375 UUSCO	HS-3-N	HS-3-S	HS-3-W	HS-3-E
Collection Date		2/20/2023	2/20/2023	2/20/2023	2/20/2023
Metals, Total (mg/kg)					
Mercury	**0.18**	**0.23**	**0.53**	**0.62**	**0.34**
Nickel	**30**	**37.3**	**40.5**	**30.1**	**35.1**
Trivalent Chromium	**30**	**27.5**	**47.7**	**22.7**	**26.9**

N

LEGEND:

HOTSPOT ENDPOINT SAMPLE

NOTES:

HOTSPOT SAMPLE LOCATION MAP

40-70 McLean Avenue
Yonkers, New York
BCP #360211

Figure 11

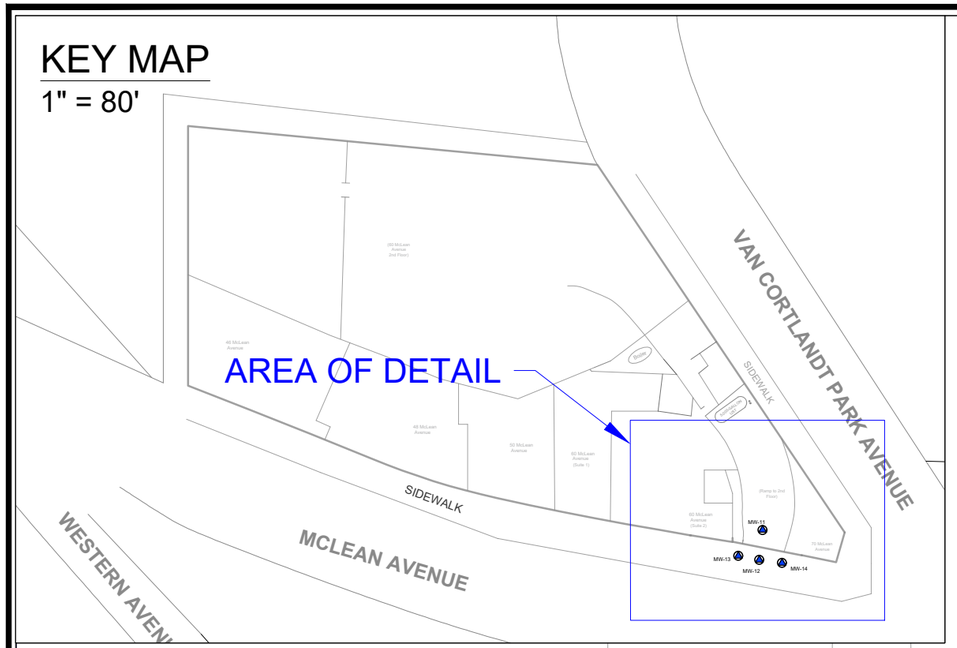
PROJECT NO.	15514-01
DESIGNED BY:	AK
DRAWN BY:	AB
CHECKED BY:	CC
DATE:	07/25/2023
SCALE:	AS SHOWN
REVISIONS	

IMPACT ENVIRONMENTAL CLOSURES, INC.

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800
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KEY MAP

1" = 80'



(Ramp to 2nd Floor)

60 McLean Avenue (Suite 2)

70 M Av

Client Id	TOGS 1.1.1	WP-11
Collection Date	WQ/GA Table 1	12/20/2022
Semivolatiles (ug/L)		
Benz(a)anthracene	**0.002**	**0.02**
Benzo(b)fluoranthene	**0.002**	**0.02**
Chrysene	**0.002**	**0.02**
Bis(2-ethylhexyl)phthalate	**5**	**28**
Naphthalene	**10**	**34**
Volatiles (ug/L)		
1,2,4-Trimethylbenzene	**5**	**98**
1,3,5-Trimethylbenzene	**5**	**37**
Ethylbenzene	**5**	**21**
Isopropylbenzene	**5**	**12**
n-Propylbenzene	**5**	**16**
Naphthalene	**10**	**24**
o-Xylene	**5**	**31**
p-Isopropyltoluene	**5**	**5.7**
Total Xylenes	**5**	**112**
TOTAL BTEX		**245**
TOTAL VOCs		**457.72**

Client Id	TOGS 1.1.1	WP-13
Collection Date	WQ/GA Table 1	12/20/2022
Semivolatiles (ug/L)		
Bis(2-ethylhexyl)phthalate	**5**	**35**
Volatiles (ug/L)		
NO EXCEEDANCES		
TOTAL BTEX		**3.62**
TOTAL VOCs		**14.55**

Client Id	TOGS 1.1.1	WP-14
Collection Date	WQ/GA Table 1	12/20/2022
Semivolatiles (ug/L)		
NO EXCEEDANCES		
Volatiles (ug/L)		
1,2,4-Trimethylbenzene	**5**	**9.8**
Total Xylenes	**5**	**9.9**
TOTAL BTEX		**11.29**
TOTAL VOCs		**43.34**

Client Id	TOGS 1.1.1	WP-12
Collection Date	WQ/GA Table 1	12/20/2022
Semivolatiles (ug/L)		
Bis(2-ethylhexyl)phthalate	**5**	**12**
Volatiles (ug/L)		
1,2,4-Trimethylbenzene	**5**	**270**
1,3,5-Trimethylbenzene	**5**	**110**
Benzene	**1**	**2.2**
Ethylbenzene	**5**	**28**
Isopropylbenzene	**5**	**42**
n-Butylbenzene	**5**	**12**
n-Propylbenzene	**5**	**52**
Naphthalene	**10**	**38**
o-Xylene	**5**	**33**
p-Isopropyltoluene	**5**	**20**
sec-Butylbenzene	**5**	**13**
Total Xylenes	**5**	**173**
TOTAL BTEX		**376.2**
TOTAL VOCs		**970.5**

0 10' 20'

LEGEND:

GROUNDWATER MONITORING WELL

NOTES:

GROUNDWATER MONITORING WELL LOCATION MAP

40-70 McLean Avenue
Yonkers, New York
BCP #360211

Figure 12

PROJECT NO.	15514-01
DESIGNED BY:	AK
DRAWN BY:	AB
CHECKED BY:	CC
DATE:	07/25/2023
SCALE:	AS SHOWN
REVISIONS	

IMPACT ENVIRONMENTAL CLOSURES, INC.

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
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LOCATION	IA-1A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	**0.61**
PCE	0.231
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	21.21
Total VOCs	138.614

LOCATION	SV-2A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**44.1**
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Carbon tetrachloride	ND
Methylene chloride	ND
Total BTEX	8.417
Total VOCs	142.097

LOCATION	SV-3A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**32.9**
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Carbon tetrachloride	ND
Methylene chloride	ND
Total BTEX	5.48
Total VOCs	294.03

LOCATION	OA-2A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	**0.566**
PCE	0.156
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	5.04
Total BTEX	3.301
Total VOCs	38.864

LOCATION	IA-2A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	**0.547**
PCE	0.264
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	90.62
Total VOCs	255.091

LOCATION	SV-4A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**28**
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Carbon tetrachloride	ND
Methylene chloride	ND
Heptane	**1320**
Total BTEX	ND
Total VOCs	1413.82

LOCATION	SV-10A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**41.2**
Carbon tetrachloride	ND
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	59.8
Total VOCs	562.33

LOCATION	SV-5A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**368**
Carbon tetrachloride	2.23
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	15.899
Total VOCs	486.98

LOCATION	IA-4A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	**0.642**
PCE	1.28
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	17.62
Total VOCs	114.982

LOCATION	SV-6A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**96.3**
TCE	3.14
CIS-1,2-DCE	ND
1,1,1-TCA	2.65
Carbon tetrachloride	ND
Methylene chloride	ND
Total BTEX	28.732
Total VOCs	730.484

LOCATION	SV-7A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**79.3**
TCE	1.11
Carbon tetrachloride	1.32
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	8.969
Total VOCs	377.79

LOCATION	IA-3A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	0.579
PCE	0.264
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	20.67
Total VOCs	425.113

LOCATION	OA-1A
SAMPLING DATE	5/19/2022
VOCs	
Carbon tetrachloride	**0.566**
PCE	0.237
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Methylene chloride	ND
Total BTEX	16.68
Total VOCs	246.251

LOCATION	SV-8A
SAMPLING DATE	5/19/2022
VOCs	
PCE	**296**
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	2.4
Carbon tetrachloride	ND
Methylene chloride	ND
Total BTEX	13.517
Total VOCs	479.537

LOCATION	SV-9A
SAMPLING DATE	5/19/2022
VOCs	
PCE	21.2
Methylene chloride	3.93
TCE	ND
CIS-1,2-DCE	ND
1,1,1-TCA	ND
Carbon tetrachloride	ND
Total BTEX	15.76
Total VOCs	272.924

368 South Broadway

VAN CORTLANDT PARK AVENUE

McLEAN AVENUE

SIDEWALK

SIDEWALK

ESTERN AVENUE

26 Romaine Avenue

0 50' 100'

LEGEND:

- Sub Slab Soil Vapor Sampling Point
- Indoor/Outdoor Air Sampling Location

NOTES: *Units in ug/m^3

SUB-SLAB & INDOOR/OUTDOOR AIR ANALYTICAL MAP

60 McLean Avenue
Yonkers, New York

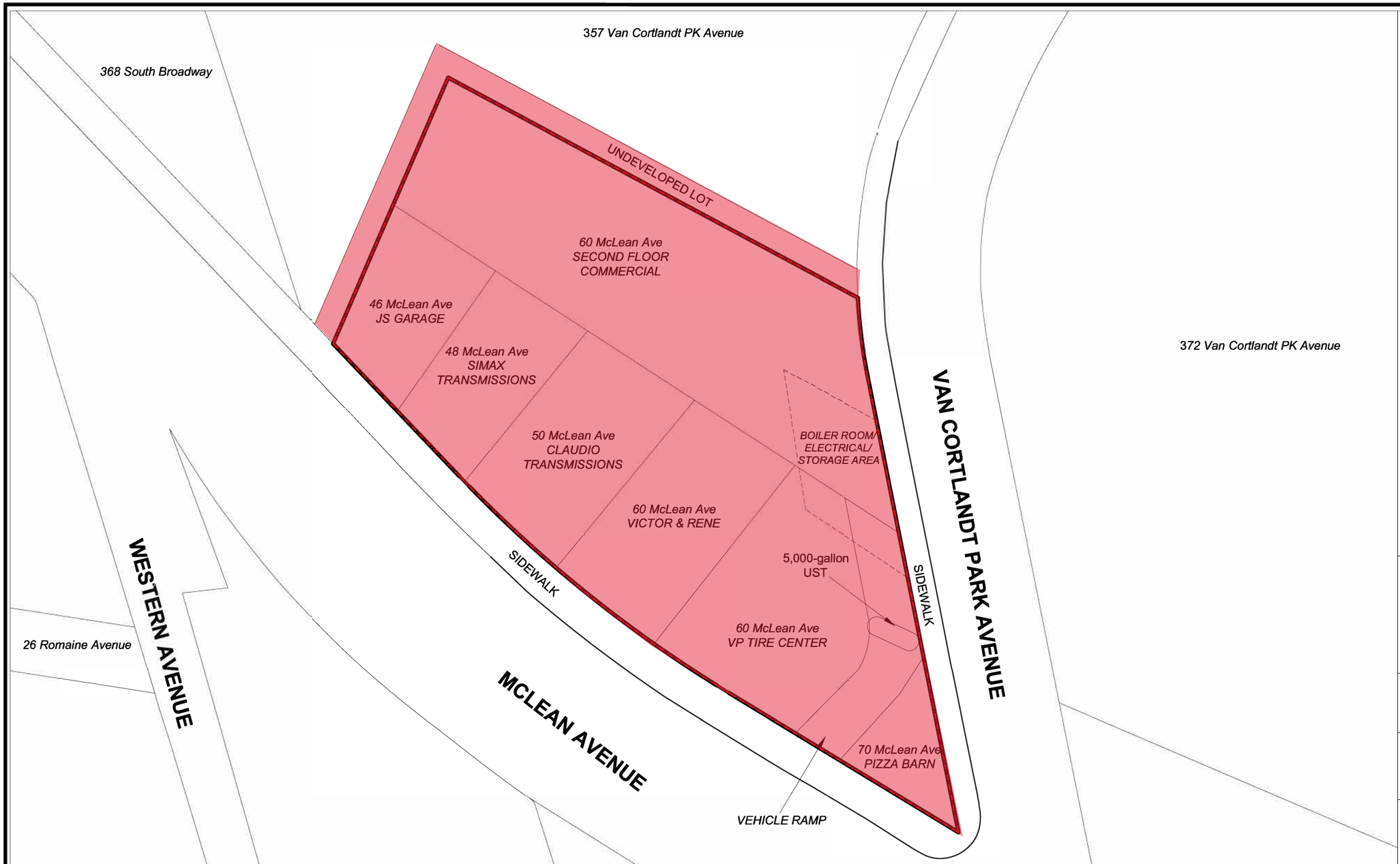
Figure No. 13

PROJECT NO.	15514-01
DESIGNED BY:	LR
DRAWN BY:	AK
CHECKED BY:	CC
DATE:	05/11/2022
SCALE:	SEE ABOVE

REVISIONS

IMPACT ENVIRONMENTAL CLOSURES, INC.

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800
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LEGEND

PROPERTY LINE

PROJECT NORTH

0' 10' 20' 50'

NOTES:

INSTITUTIONAL CONTROL BOUNDARY

60 McLean Avenue
Yonkers, New York

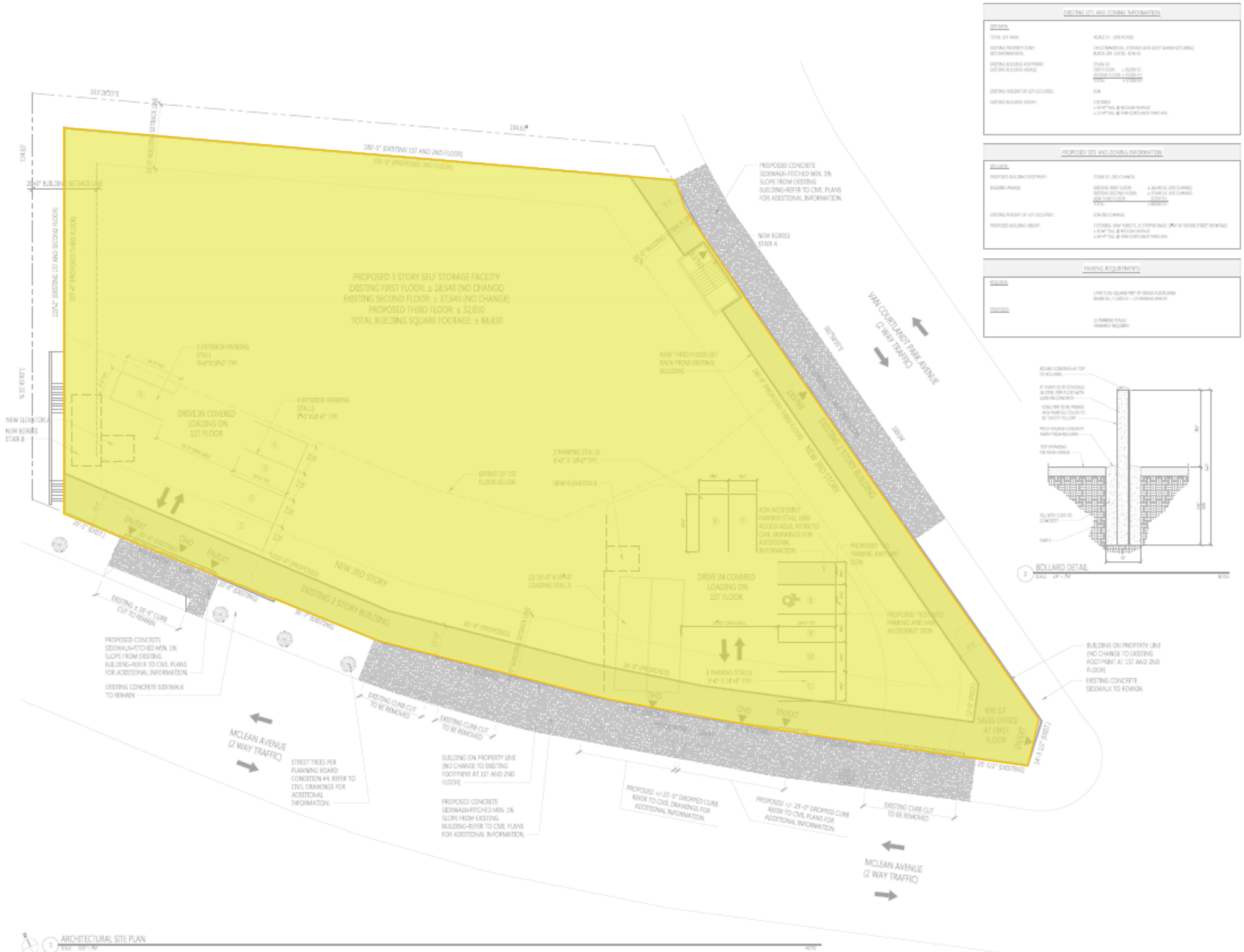
FIGURE No: 14

PROJECT NO.	15514-01
DESIGNED BY:	LR
DRAWN BY:	LR
CHECKED BY:	CC
DATE:	12/11/2020
SCALE:	SEE ABOVE

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TEL (631) 269-8800
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EXISTING SITE AND ZONING INFORMATION

SITE DATA

TOTAL LOT AREA:	43,812 S.F. (1.006 ACRES)
EXISTING PROPERTY ZONE/ SITE INFORMATION:	C4-1/COMMERCIAL, STORAGE AND LIGHT MANUFACTURING/ BLOCK 203 LOT(S): 10 & 11
EXISTING BUILDING FOOTPRINT/ EXISTING BUILDING AREA(S):	17,436 S.F. FIRST FLOOR: ± 18,000 S.F. SECOND FLOOR: ± 33,000 S.F. TOTAL: ± 51,000 S.F.
EXISTING PERCENT OF LOT OCCUPIED:	41%
EXISTING BUILDING HEIGHT:	2 STORIES ± 33'-4" TALL @ MCLEAN AVENUE ± 22'-4" TALL @ VAN CORTLANDT PARK AVE.

PROPOSED SITE AND ZONING INFORMATION

SITE DATA

PROPOSED BUILDING FOOTPRINT:	17,436 S.F. (NO CHANGE)
BUILDING AREA(S):	EXISTING FIRST FLOOR: ± 18,540 S.F. (NO CHANGE) EXISTING SECOND FLOOR: ± 37,640 S.F. (NO CHANGE) NEW THIRD FLOOR: ± 32,650 TOTAL: ± 88,830 S.F.
EXISTING PERCENT OF LOT OCCUPIED:	41% (NO CHANGE)
PROPOSED BUILDING HEIGHT:	3 STORIES- NEW THIRD FL. IS STEPPED BACK 29'-0" AT ENTIRE STREET FRONTAGE ± 45'-0" TALL @ MCLEAN AVENUE ± 34'-4" TALL @ VAN CORTLANDT PARK AVE.

PARKING REQUIREMENTS

REQUIRED:	1 PER 7,500 SQUARE FEET OF GROSS FLOOR AREA 88,830 S.F. / 7,500 S.F. = 12 PARKING SPACES
PROVIDED:	11 PARKING STALLS VARIANCE REQUIRED

Legend

STEGO WRAP 20-MIL VAPOR BARRIER

VAPOR BARRIER LOCATION MAP

46-70 McLean Avenue, Yonkers, NY

BCP#360211

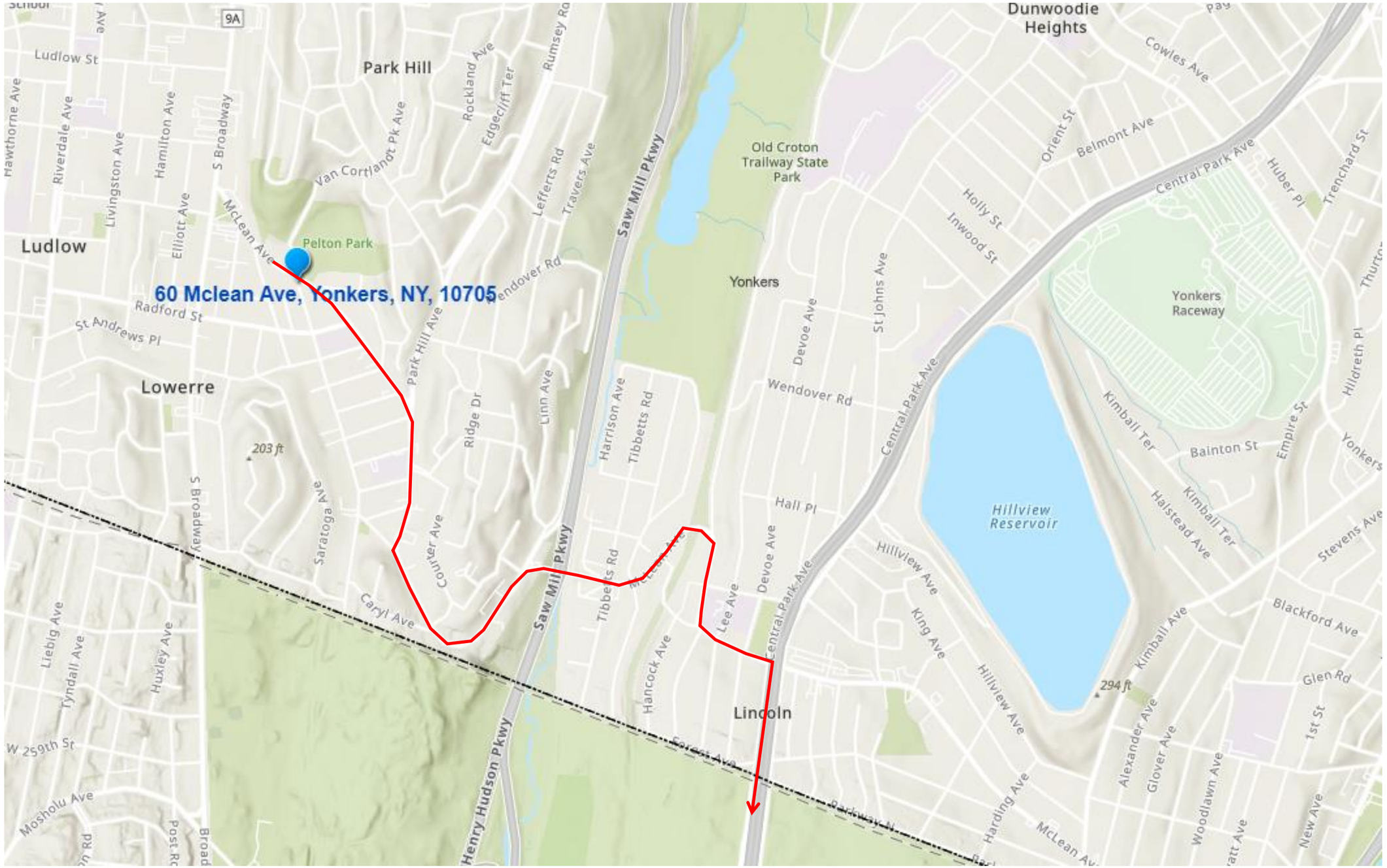
Figure 15

Project #:	15514
Drawn By:	CJC
Checked By:	GMC
Date:	7/28/23
Revisions	

Not To Scale

IMPACT ENVIRONMENTAL CLOSURES, INC.

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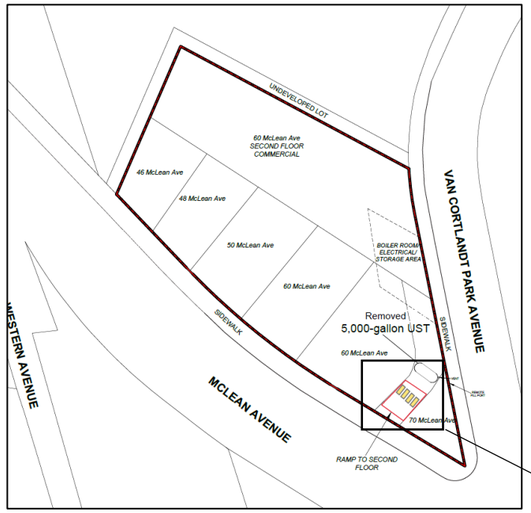
Legend

TRUCKING ROUTE

46-70 McLean Avenue, Yonkers, NY	**Figure 16**
BCP#360211	Project #: 15514
	Drawn By: CJC
	Checked By: GMC
Not To Scale	Date: 7/28/23
	Revisions

IMPACT ENVIRONMENTAL CLOSURES, INC.

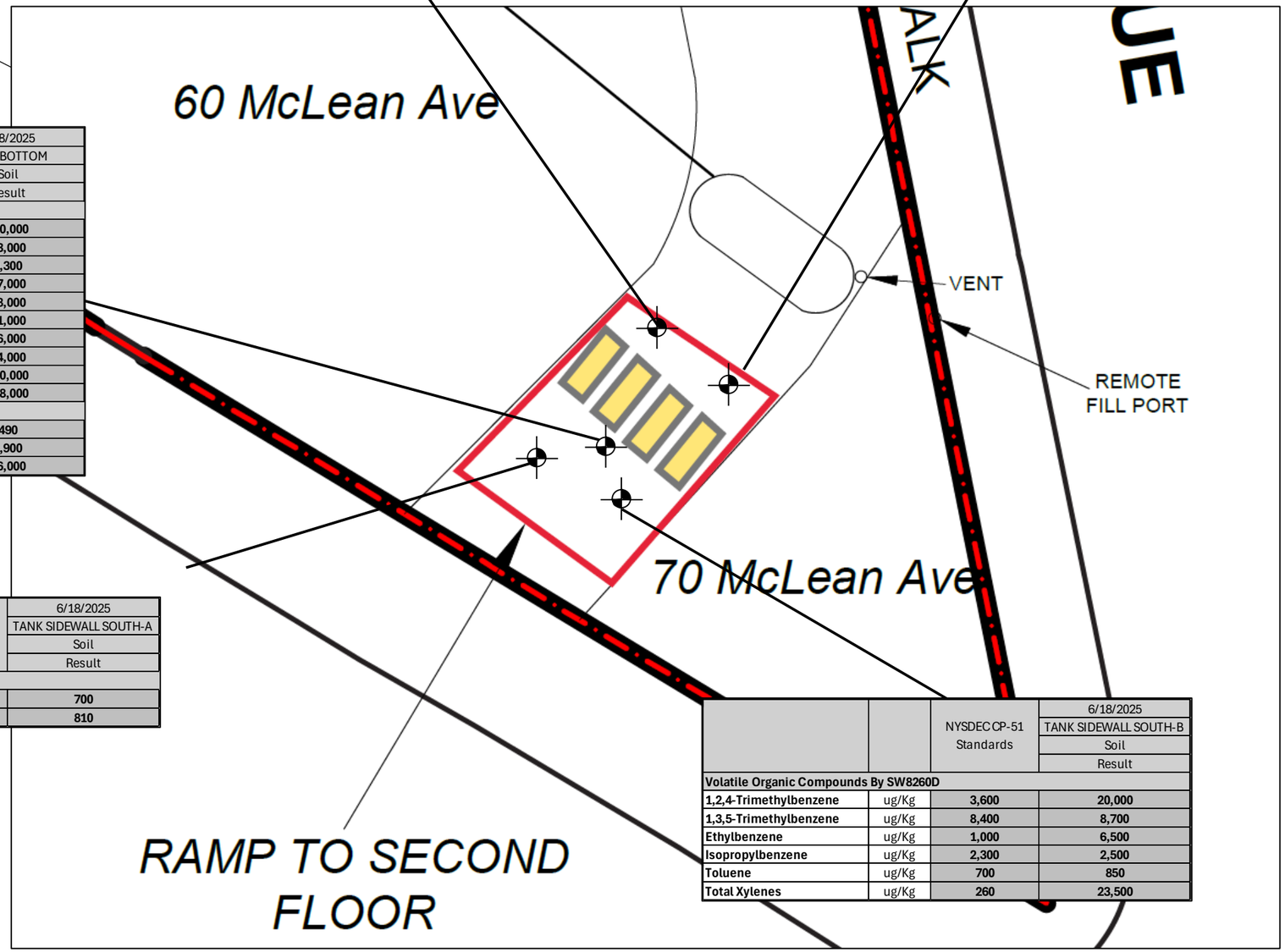
170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800
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		NYSDEC CP-51 Standards	6/18/2025 TANK SIDEWALL NORTH-A Soil Result
Volatile Organic Compounds By SW8260D			
1,2,4-Trimethylbenzene	ug/Kg	**3,600**	**11,000**
Benzene	ug/Kg	**60**	**4,600**
Ethylbenzene	ug/Kg	**1,000**	**8,900**
Toluene	ug/Kg	**700**	**16,000**
Total Xylenes	ug/Kg	**260**	**28,000**

		NYSDEC CP-51 Standards	6/18/2025 TANK SIDEWALL NORTH-B Soil Result
Volatile Organic Compounds By SW8260D			
1,2,4-Trimethylbenzene	ug/Kg	**3,600**	**19,000**
Ethylbenzene	ug/Kg	**1,000**	**3,600**
Total Xylenes	ug/Kg	**260**	**12,100**

		NYSDEC CP-51 Standards	6/18/2025 TANK BOTTOM Soil Result
Volatile Organic Compounds By SW8260D			
1,2,4-Trimethylbenzene	ug/Kg	**3,600**	**130,000**
1,3,5-Trimethylbenzene	ug/Kg	**8,400**	**53,000**
Benzene	ug/Kg	**60**	**9,300**
Ethylbenzene	ug/Kg	**1,000**	**77,000**
Isopropylbenzene	ug/Kg	**2,300**	**18,000**
Naphthalene	ug/Kg	**12,000**	**31,000**
n-Propylbenzene	ug/Kg	**3,900**	**26,000**
p-Isopropyltoluene	ug/Kg	**10,000**	**14,000**
Toluene	ug/Kg	**700**	**110,000**
Total Xylenes	ug/Kg	**260**	**298,000**
Semivolatiles By SW8270E			
Dibenz(a,h)anthracene	ug/Kg	**330**	**490**
Indeno(1,2,3-cd)pyrene	ug/Kg	**500**	**1,900**
Naphthalene	ug/Kg	**12,000**	**16,000**



		NYSDEC CP-51 Standards	6/18/2025 TANK SIDEWALL SOUTH-A Soil Result
Volatile Organic Compounds By SW8260D			
Benzene	ug/Kg	**60**	**700**
Total Xylenes	ug/Kg	**260**	**810**

		NYSDEC CP-51 Standards	6/18/2025 TANK SIDEWALL SOUTH-B Soil Result
Volatile Organic Compounds By SW8260D			
1,2,4-Trimethylbenzene	ug/Kg	**3,600**	**20,000**
1,3,5-Trimethylbenzene	ug/Kg	**8,400**	**8,700**
Ethylbenzene	ug/Kg	**1,000**	**6,500**
Isopropylbenzene	ug/Kg	**2,300**	**2,500**
Toluene	ug/Kg	**700**	**850**
Total Xylenes	ug/Kg	**260**	**23,500**

Legend

UST EXCAVATION ENDPOINT SAMPLE

UST EXCAVATION

REMOVED 550-GALLON USTS

POST GASOLINE UST REMOVAL ENDPOINT SAMPLE ANALYTICAL MAP

46-70 McLean Avenue, Yonkers, NY

BCP#360211

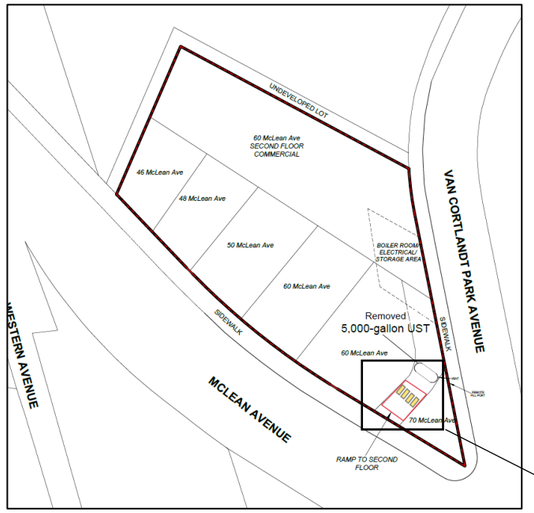
Plate 17

Project #:	15514
Drawn By:	CJC
Checked By:	GMC
Date:	6/26/23
Revisions	

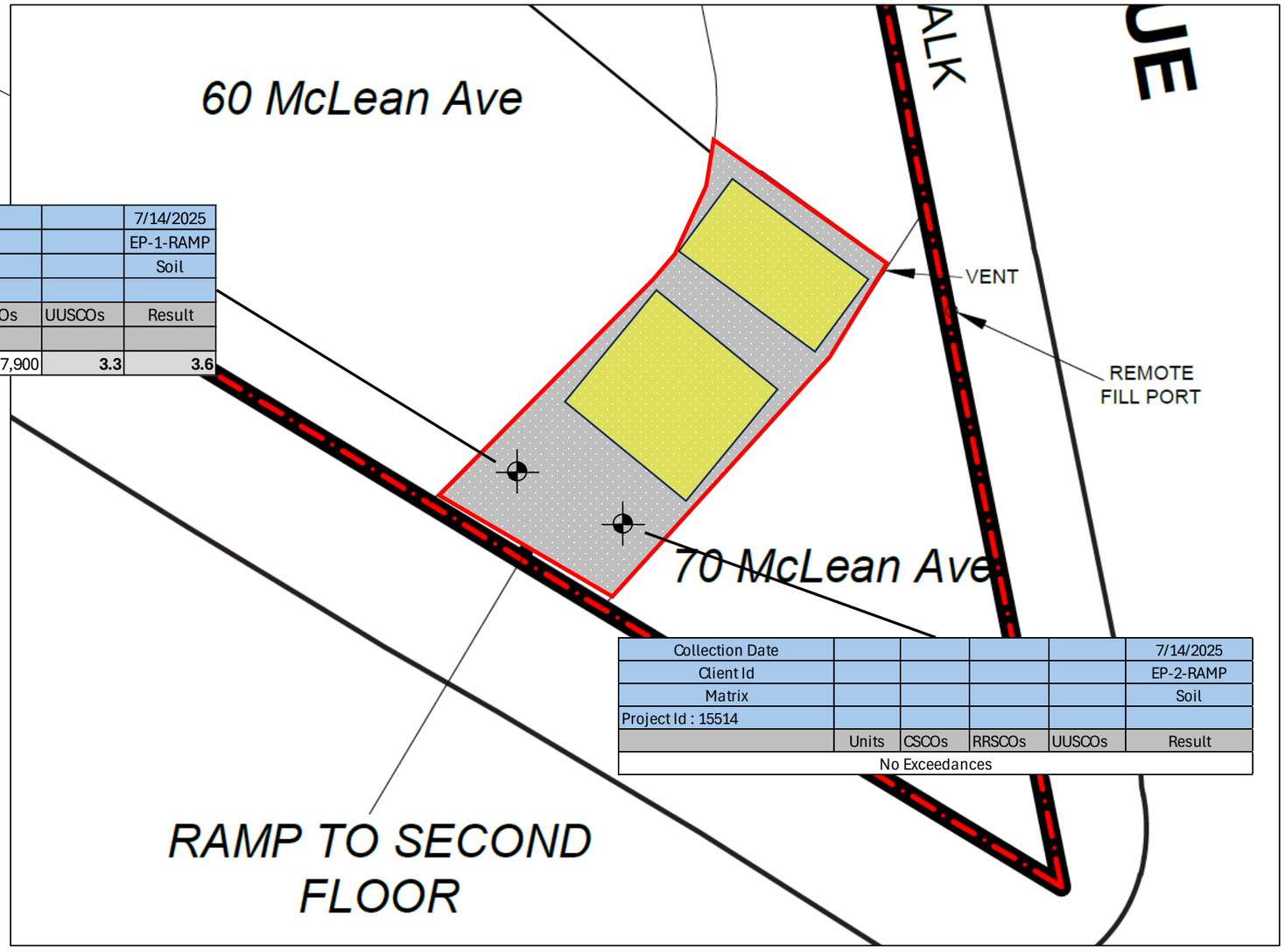
Not To Scale

IMPACT ENVIRONMENTAL CLOSURES, INC.

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800
FAX (631) 269-1599



Collection Date					7/14/2025
Client Id					EP-1-RAMP
Matrix					Soil
Project Id : 15514					
	Units	CSCOs	RRSCOs	UUSCOs	Result
Pesticides - Soil By SW8081B					
4,4' -DDT	ug/Kg	47,000	7,900	**3.3**	**3.6**



Collection Date					7/14/2025
Client Id					EP-2-RAMP
Matrix					Soil
Project Id : 15514					
	Units	CSCOs	RRSCOs	UUSCOs	Result
No Exceedances					

Legend

- POST EXCAVATION ENDPOINT SAMPLE
- FINAL RAMP EXCAVATION
- FORMER 550 AND 5,000-GALLON UST EXCAVATION LOCATIONS (EP SAMPLED)

POST RAMP EXCAVATION ENDPOINT SAMPLE ANALYTICAL MAP

46-70 McLean Avenue, Yonkers, NY

BCP#360211

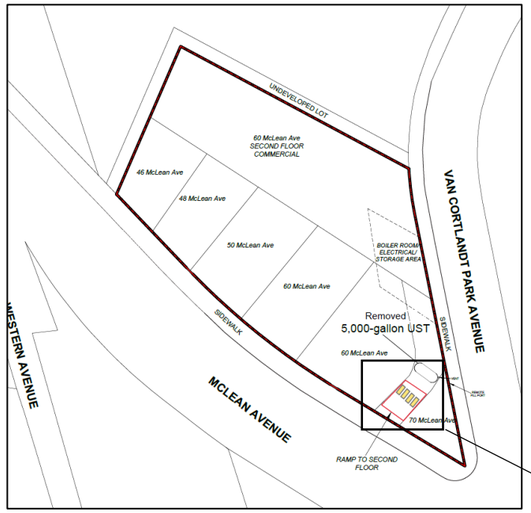
Plate 18

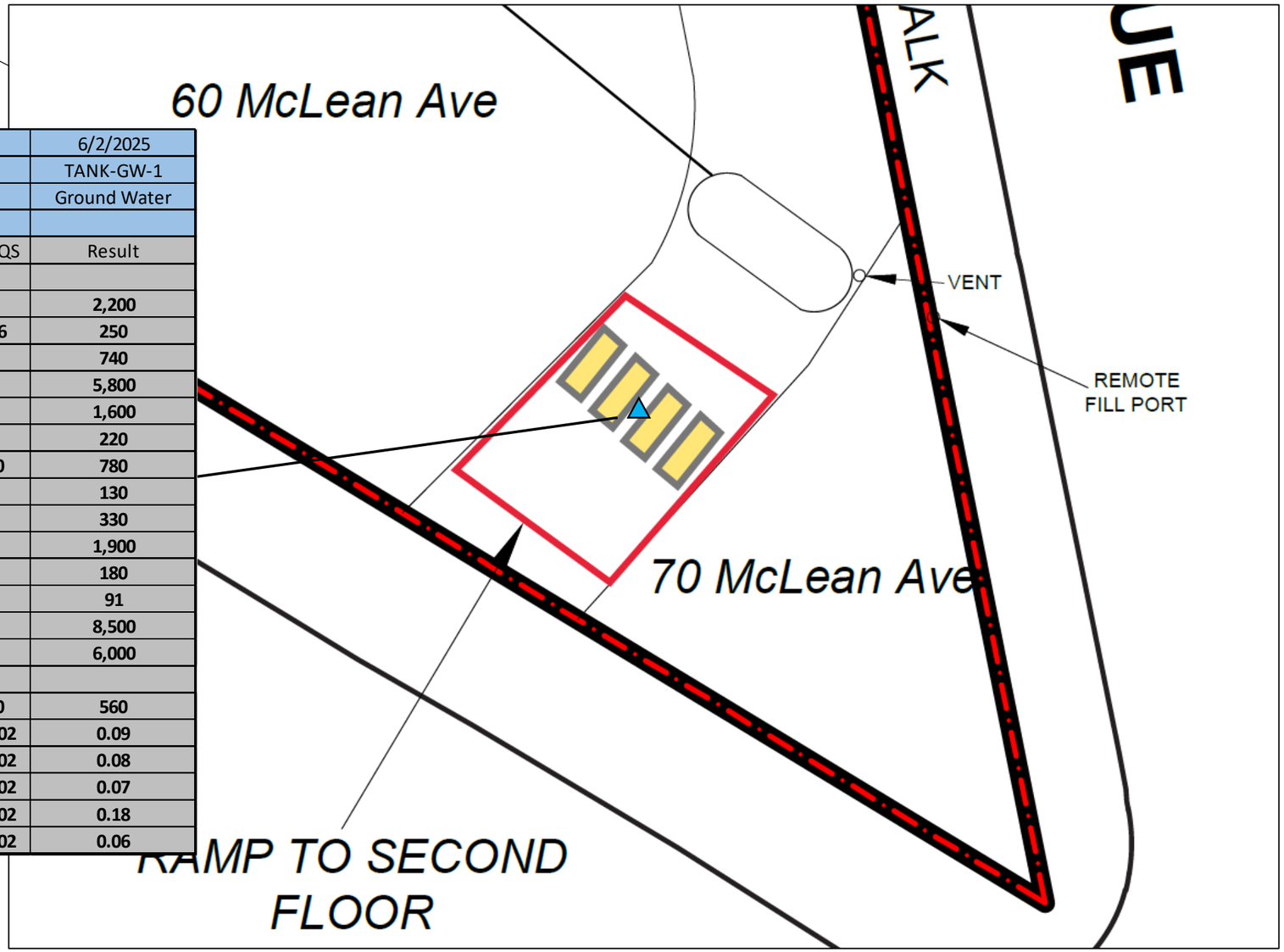
Project #:	15514
Drawn By:	CJC
Checked By:	GMC
Date:	6/26/23
Revisions	

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IMPACT ENVIRONMENTAL CLOSURES, INC.

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BOHEMIA, NEW YORK 11716
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Collection Date			6/2/2025
Client Id			TANK-GW-1
Matrix			Ground Water
Project Id : 60 MCLEAN AVE YONKERS			
	Units	AWQS	Result
Volatiles By SW8260D			
1,2,4-Trimethylbenzene	ug/L	**5**	**2,200**
1,2-Dichloroethane	ug/L	**0.6**	**250**
1,3,5-Trimethylbenzene	ug/L	**5**	**740**
Benzene	ug/L	**1**	**5,800**
Ethylbenzene	ug/L	**5**	**1,600**
Isopropylbenzene	ug/L	**5**	**220**
Naphthalene	ug/L	**10**	**780**
n-Butylbenzene	ug/L	**5**	**130**
n-Propylbenzene	ug/L	**5**	**330**
o-Xylene	ug/L	**5**	**1,900**
p-Isopropyltoluene	ug/L	**5**	**180**
sec-Butylbenzene	ug/L	**5**	**91**
Toluene	ug/L	**5**	**8,500**
Total Xylenes	ug/L	**5**	**6,000**
Semivolatiles By SW8270E			
Naphthalene	ug/L	**10**	**560**
Benz(a)anthracene	ug/L	**0.002**	**0.09**
Benzo(b)fluoranthene	ug/L	**0.002**	**0.08**
Benzo(k)fluoranthene	ug/L	**0.002**	**0.07**
Chrysene	ug/L	**0.002**	**0.18**
Indeno(1,2,3-cd)pyrene	ug/L	**0.002**	**0.06**

Legend

- UST EXCAVATION STANDING GROUNDWATER SAMPLE
- UST EXCAVATION
- REMOVED 550-GALLON USTS

POST GASOLINE UST REMOVAL STANDING GROUNDWATER SAMPLE ANALYTICAL MAP

46-70 McLean Avenue, Yonkers, NY

BCP#360211

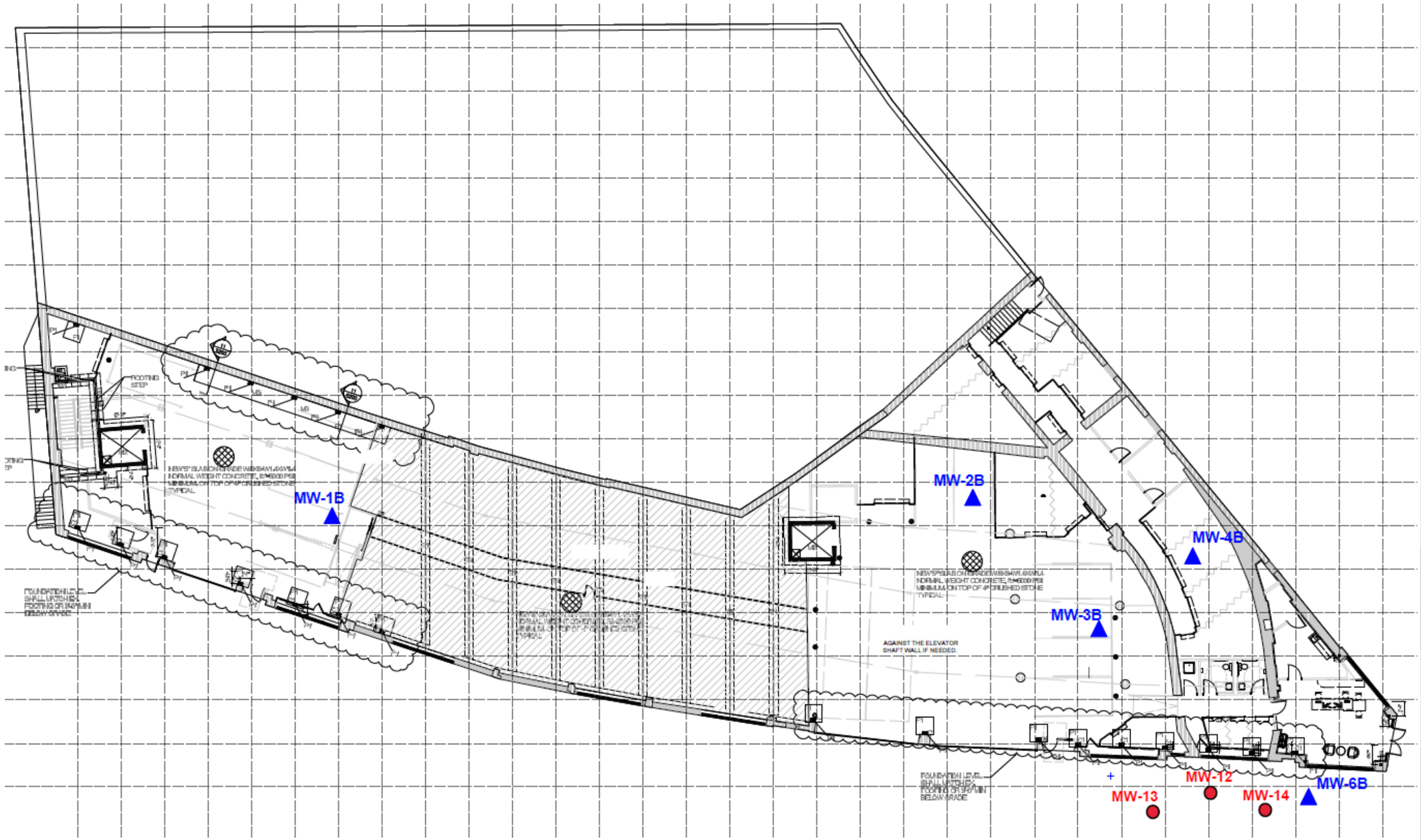
Plate 19

Project #:	15514
Drawn By:	CJC
Checked By:	GMC
Date:	6/26/23
Revisions	

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IMPACT ENVIRONMENTAL CLOSURES, INC.

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Legend

- NEW MONITORING WELL LOCATIONS
- PRE-EXISTING MONITORING WELLS

POST REMEDIAL GROUNDWATER MONITORING WELL LOCATIONS

46-70 McLean Avenue, Yonkers, NY

BCP#360211

Plate 20

Project #:	15514
Drawn By:	CJC
Checked By:	GMC
Date:	6/26/23
Revisions	

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IMPACT ENVIRONMENTAL CLOSURES, INC.

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800
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Collection Date				12/22/2022
Client Id				HS-1-SWS
Matrix				SOIL
Project: 60 MCLEAN AVE YONKERS NY	Units	RRSCOs	UUSCOs	Result
Metals Total				
Copper	mg/kg	270	**50**	**54.1**
Nickel	mg/Kg	310	**30**	**59.8**
Trivalent Chromium	mg/kg	180	**30**	**94**

Collection Date				2/20/2023	2/20/2023	2/20/2023	2/20/2023
Client Id				HS-3-N	HS-3-S	HS-3-W	HS-3-E
Matrix				Soil	Soil	Soil	Soil
Project: 60 MCLEAN AVE Y	Units	RRSCOs	UUSCOs	Result	Result	Result	Result
Metals, Total							
Mercury	mg/Kg	0.81	**0.18**	**0.23**	**0.53**	**0.62**	**0.34**
Nickel	mg/Kg	310	**30**	**37.3**	**40.5**	**30.1**	**35.1**
Trivalent Chromium	mg/kg	180	**30**	**27.5**	**47.7**	**22.7**	**26.9**

Collection Date				5/10/2023
Client Id				SB-23
Matrix				Soil
	Units	UUSCOs	RRSCOs	Result
Metals, Total				
Lead	mg/Kg	**63**	**400**	**69.3**
Trivalent Chromium	mg/kg	**30**	180	**33.4**
Pesticides - Soil By SW8081B				
4,4'-DDD	ug/Kg	**3.3**	13,000	**150**
4,4'-DDE	ug/Kg	**3.3**	8,900	**990**
4,4'-DDT	ug/Kg	**3.3**	7,900	**2,500**
a-Chlordane	ug/Kg	**94**	4,200	**1,200**

Collection Date				5/10/2023
Client Id				FT-1
Matrix				Soil
Metals, Total	UNITS	UUSCOs	RRSCOs	RESULT
Copper	mg/kg	**50**	270	**50.8**
Zinc	mg/Kg	**109**	10,000	**238**

Collection Date			06/18/2025
Client Id			TANK SIDEWALL NORTH-A
Matrix			SOIL
	Units	UUSCOs	Result
Volatile Organic Compounds - SW8260D			
1,2,4-Trimethylbenzene	ug/Kg	**3600**	**11000**
Benzene	ug/Kg	**60**	**4600**
Ethylbenzene	ug/Kg	**1000**	**8900**
Toluene	ug/Kg	**700**	**16000**
Total Xylenes	ug/Kg	**260**	**28000**

Collection Date			06/18/2025
Client Id			TANK SIDEWALL NORTH-B
Matrix			SOIL
	Units	UUSCOs	Result
Volatile Organic Compounds - SW8260D			
1,2,4-Trimethylbenzene	ug/Kg	**3600**	**19000**
Ethylbenzene	ug/Kg	**1000**	**3600**
Total Xylenes	ug/Kg	**260**	**12100**

Collection Date			06/18/2025
Client Id			TANK BOTTOM
Matrix			SOIL
	Units	UUSCOs	Result
Semivolatiles - SW8270E			
Dibenz(a,h)anthracene	ug/Kg	**330**	**490**
Indeno(1,2,3-cd)pyrene	ug/Kg	**500**	**1900**
Naphthalene	ug/Kg	**12000**	**16000**
Volatile Organic Compounds - SW8260D			
1,2,4-Trimethylbenzene	ug/Kg	**3600**	**130000**
1,3,5-Trimethylbenzene	ug/Kg	**8400**	**53000**
Benzene	ug/Kg	**60**	**9300**
Ethylbenzene	ug/Kg	**1000**	**77000**
n-Propylbenzene	ug/Kg	**3900**	**26000**
Naphthalene	ug/Kg	**12000**	**31000**
Toluene	ug/Kg	**700**	**110000**
Total Xylenes	ug/Kg	**260**	**298000**

Collection Date				5/10/2023	5/10/2023
Client Id				HS-10A-N	HS-10A-E
Matrix				Soil	Soil
Metals, Total	**UNITS**	RRSCOs	UUSCOs	RESULT	RESULT
Barium	mg/Kg	**350**	**400**	**821**	**318**
Cadmium	mg/Kg	**2.5**	4.3	**2.98**	**2.27**
Copper	mg/kg	**50**	270	**88.7**	**61.2**
Lead	mg/Kg	**63**	**400**	**572**	**78.4**
Mercury	mg/Kg	**0.18**	0.81	**0.64**	**0.75**
Nickel	mg/Kg	**30**	310	**49.5**	**42.6**
Trivalent Chromium	mg/kg	**30**	180	**50.2**	**41**
Zinc	mg/Kg	**109**	10,000	**314**	**268**

Collection Date			06/18/2025
Client Id			TANK SIDEWALL SOUTH-A
Matrix			SOIL
	Units	UUSCOs	Result
Volatile Organic Compounds - SW8260D			
Benzene	ug/Kg	**60**	**700**
Total Xylenes	ug/Kg	**260**	**810**

Collection Date					7/14/2025
Client Id					EP-1-RAMP
Matrix					Soil
Project Id : 15514					
	Units	CSCOs	RRSCOs	UUSCOs	Result
Pesticides - Soil By SW8081B					
4,4'-DDT	ug/Kg	47,000	7,900	**3.3**	**3.6**

Collection Date			06/18/2025
Client Id			TANK SIDEWALL SOUTH-B
Matrix			SOIL
	Units	UUSCOs	Result
Volatile Organic Compounds - SW8260D			
1,2,4-Trimethylbenzene	ug/Kg	**3600**	**20000**
1,3,5-Trimethylbenzene	ug/Kg	**8400**	**8700**
Ethylbenzene	ug/Kg	**1000**	**6500**
Toluene	ug/Kg	**700**	**850**
Total Xylenes	ug/Kg	**260**	**23500**

Hot Spot #1

Hot Spot #3

Hot Spot #10

Legend

SOIL SAMPLE LOCATIONS

POST REMEDIAL UNRESTRICTED USE SCO EXCEEDANCE MAP

46-70 McLean Avenue, Yonkers, NY

BCP#360211

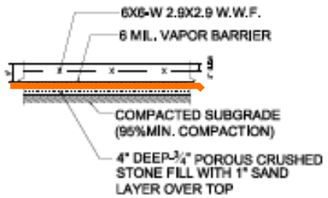
Plate 21

Project #:	15514
Drawn By:	CJC
Checked By:	GMC
Date:	6/26/23
Revisions	

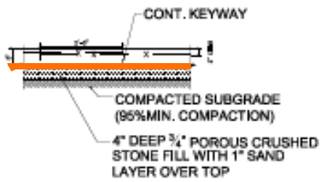
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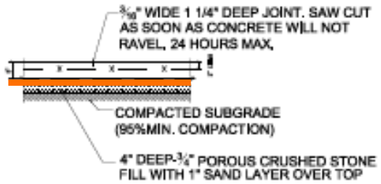
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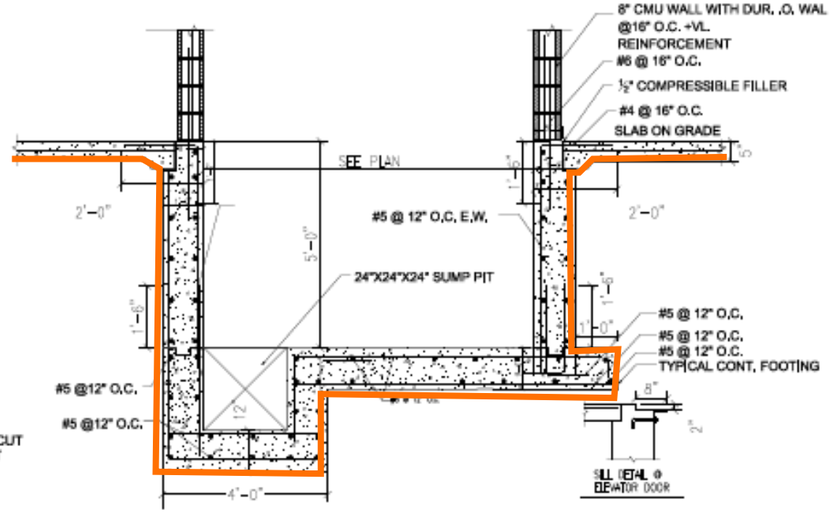
① TYPICAL SLAB ON GRADE
3/4" = 1'-0"



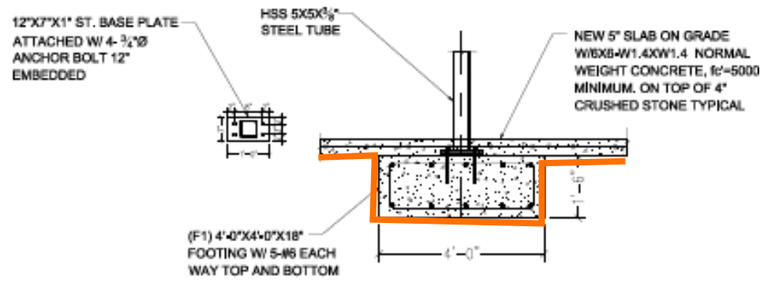
② SLAB CONSTRUCTION JOINT
3/4" = 1'-0"



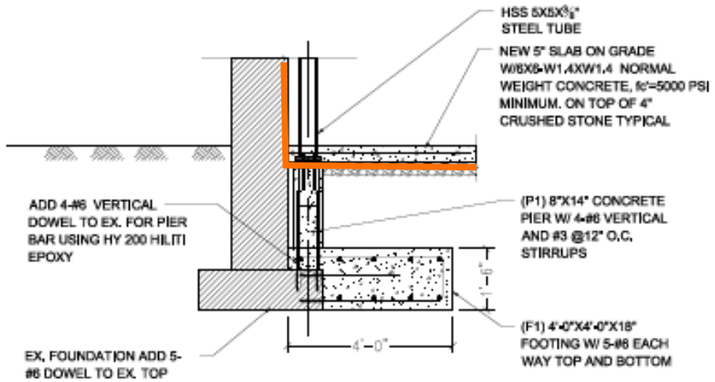
③ SLAB CONTROL JOINT
3/4" = 1'-0"



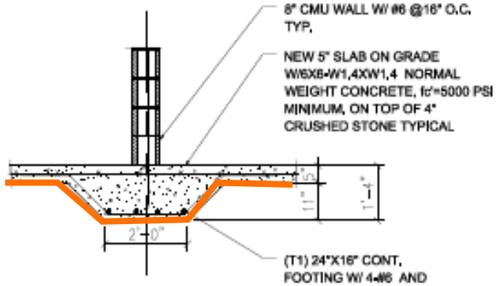
④ ELEVATOR SHAFT SECTION
3/4" = 1'-0"



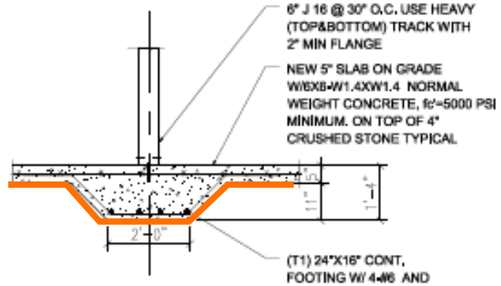
⑤ NEW FOOTING DETAIL
3/4" = 1'-0"



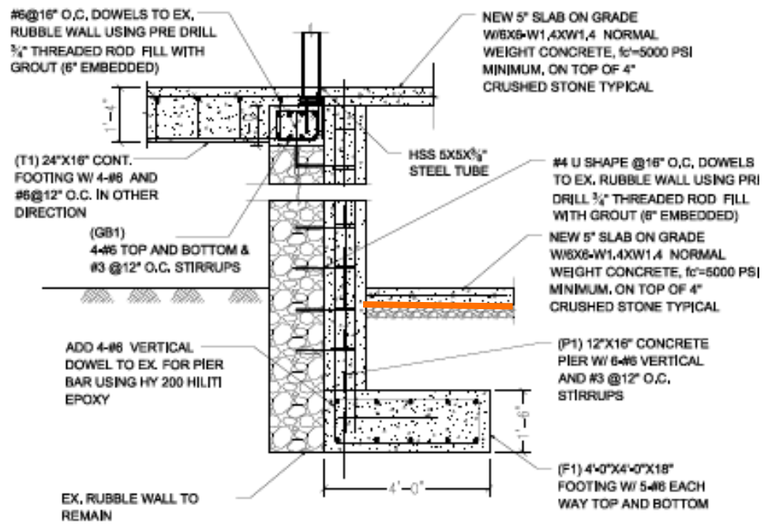
⑧ NEW FOUNDATION @ EX. FOUNDATION DETAIL
3/4" = 1'-0"



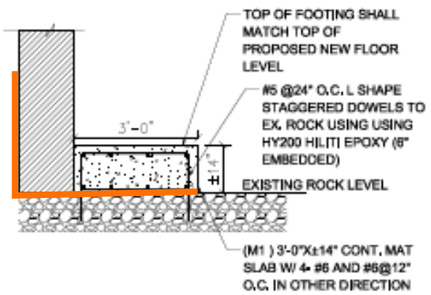
⑥ NEW C.M.U. WALL FOUNDATION DETAIL
3/4" = 1'-0"



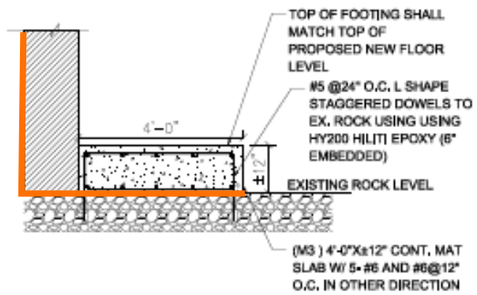
⑦ NEW STUD. WALL FOUNDATION DETAIL
3/4" = 1'-0"



⑨ NEW FOUNDATION @ EX. RUBBLE WALL DETAIL
3/4" = 1'-0"



⑩ PROPOSED FOUNDATION @2ND FLOOR LEVEL ACCORDING TO EX. ROCK LEVEL
3/4" = 1'-0"



⑪ PROPOSED FOUNDATION @1ST FLOOR LEVEL ACCORDING TO EX. ROCK LEVEL
3/4" = 1'-0"

Legend

20-mil Stego Wrap Vapor Barrier

AS-BUILT SOIL COVER AND CAP SYSTEM CROSS SECTIONS

46-70 McLean Avenue, Yonkers, NY

BCP#360211

Plate 22

Project #:	15514
Drawn By:	CJC
Checked By:	GMC
Date:	6/26/23
Revisions	

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Legend

6-INCHES OF ¾” VIRGIN QUARRY BLUESTONE, 20-MIL STEGO WRAP VAPOR BARRIER, AND 4- TO 6-INCH CONCRETE BUILDING SLAB

AS-BUILT SOIL COVER AND CAP SYSTEM LAYOUT

46-70 McLean Avenue, Yonkers, NY

BCP#360211

Plate 23

Project #:	15514
Drawn By:	CJC
Checked By:	GMC
Date:	6/26/23
Revisions	

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TABLES

46-70 McLean Avenue, Yonkers, NY

Site Management Plan
NYSDEC BCP #C360211

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
TEL: (631) 268-8800
FAX: (631) 269-1599

Table 1

Groundwater Gauging Data

60 McLean Avenue, Yonkers, NY

Well Name	TOC Elevation	Depth to Water (ft)	Groundwater elevation
MW-4A	79.41	1.44	77.97
MW-5A	79.21	1.29	77.92
MW-7A	81.74	N/A	N/A
MW-9A	79.52	10.57	68.95
WP-11	79.33	10.3	69.03
WP-12	78.26	9.45	68.81
WP-13	78.37	9.51	68.86
WP-14	78.11	9.21	68.9
WP-15	N/A	10.51	N/A

MW - IEEG 2022 Monitoring Well
WP - Well point installed by others
TOC - Top of casing
ft - feet
N/A - not applicable

Table 2 - UST Endpoint Sample Results
60 McLean Avenue, Yonkers, NY
BCP #C360211

Lab Sample Id				CM71101		CM71102		CM71103	
Collection Date				10/25/2022		10/25/2022		10/25/2022	
Client Id				TANK BOTTOM EAST		TANK BOTTOM WEST		TANK SIDEWALL SOUTH	
Matrix				Soil		Soil		Soil	
Project: 60 MCLEAN AVE YONKERS NY	CAS	Units	CP-51 Soil - Gas/Fuel Oil	Result	RL	Result	RL	Result	RL
Miscellaneous/Inorganics									
Percent Solid	PHNX - PCTSOLID	%		**83**		**86**		**86**	
Volatile Organic Compounds By SW8260C									
1,2,4-Trimethylbenzene	95-63-6	ug/Kg	**3,600**	< 0.92	0.92	< 1.0	1.0	< 0.95	0.95
1,3,5-Trimethylbenzene	108-67-8	ug/Kg	**8,400**	< 0.92	0.92	< 1.0	1.0	< 0.95	0.95
Benzene	71-43-2	ug/Kg	**60**	< 1.8	1.8	< 2.1	2.1	< 1.9	1.9
Ethylbenzene	100-41-4	ug/Kg	**1,000**	< 1.8	1.8	< 2.1	2.1	< 1.9	1.9
Isopropylbenzene	98-82-8	ug/Kg	**2,300**	< 0.92	0.92	< 1.0	1.0	< 0.95	0.95
m&p-Xylene	179601-23-1	ug/Kg		< 1.8	1.8	< 2.1	2.1	< 1.9	1.9
Methyl t-Butyl Ether (MTBE)	1634-04-4	ug/Kg	**930**	< 1.8	1.8	< 2.1	2.1	< 1.9	1.9
Naphthalene	91-20-3	ug/Kg	**12,000**	< 1.8	1.8	< 2.1	2.1	< 1.9	1.9
n-Butylbenzene	104-51-8	ug/Kg	**12,000**	**3.4**	0.92	< 1.0	1.0	< 0.95	0.95
n-Propylbenzene	103-65-1	ug/Kg	**3,900**	< 0.92	0.92	< 1.0	1.0	< 0.95	0.95
o-Xylene	95-47-6	ug/Kg		< 1.8	1.8	< 2.1	2.1	< 1.9	1.9
p-Isopropyltoluene	99-87-6	ug/Kg	**10,000**	< 0.92	0.92	< 1.0	1.0	< 0.95	0.95
sec-Butylbenzene	135-98-8	ug/Kg	**11,000**	< 0.92	0.92	< 1.0	1.0	< 0.95	0.95
tert-Butylbenzene	98-06-6	ug/Kg	**5,900**	< 0.92	0.92	< 1.0	1.0	< 0.95	0.95
Toluene	108-88-3	ug/Kg	**700**	< 1.8	1.8	< 2.1	2.1	< 1.9	1.9
Total Xylenes	1330-20-7	ug/Kg	**260**	< 1.8	1.8	< 2.1	2.1	< 1.9	1.9
Semivolatiles By SW8270D									
Acenaphthene	83-32-9	ug/Kg	**20,000**	< 280	280	< 270	270	< 270	270
Acenaphthylene	208-96-8	ug/Kg	**100,000**	< 280	280	< 270	270	< 270	270
Anthracene	120-12-7	ug/Kg	**100,000**	< 280	280	< 270	270	< 270	270
Benz(a)anthracene	56-55-3	ug/Kg	**1,000**	< 280	280	< 270	270	< 270	270
Benzo(a)pyrene	50-32-8	ug/Kg	**1,000**	< 200	200	< 200	200	< 200	200
Benzo(b)fluoranthene	205-99-2	ug/Kg	**1,000**	< 280	280	< 270	270	< 270	270
Benzo(ghi)perylene	191-24-2	ug/Kg	**100,000**	< 280	280	< 270	270	< 270	270
Benzo(k)fluoranthene	207-08-9	ug/Kg	**800**	< 280	280	< 270	270	< 270	270
Chrysene	218-01-9	ug/Kg	**1,000**	**140**	280	< 270	270	< 270	270
Dibenz(a,h)anthracene	53-70-3	ug/Kg	**330**	< 280	280	< 270	270	< 270	270
Fluoranthene	206-44-0	ug/Kg	**100,000**	< 280	280	< 270	270	< 270	270
Fluorene	86-73-7	ug/Kg	**30,000**	< 280	280	< 270	270	< 270	270
Indeno(1,2,3-cd)pyrene	193-39-5	ug/Kg	**500**	< 280	280	< 270	270	< 270	270
Naphthalene	91-20-3	ug/Kg	**12,000**	< 280	280	< 270	270	< 270	270
Phenanthrene	85-01-8	ug/Kg	**100,000**	**270**	280	< 270	270	< 270	270
Pyrene	129-00-0	ug/Kg	**100,000**	**210**	280	< 270	270	< 270	270

Result Detected	**BOLD**
RL Exceeds Criteria	*ITALIC*
Result Exceeds Criteria	**BOLD**
ug/kg	micrograms per kilogram
RL	Reporting Limit

Table 3 - Hydraulic Lift Piston Endpoint Sample Results
60 McLean Avenue, Yonkers, NY
BCP #C360211

Lab Sample Id				CM97006		CM97007		CM97008		CM97009	
Collection Date				11/30/2022		12/02/2022		12/02/2022		12/02/2022	
Client Id				HL-1		HL-2		HL-3		HL-4	
Matrix				SOIL		SOIL		SOIL		SOIL	
Project: 60 MCLEAN AVE YONKERS NY	CAS	Units	NY CP-51 Soil - Gas/Fuel Oil	Result	RL	Result	RL	Result	RL	Result	RL
Miscellaneous/Inorganics											
Percent Solid	PHNX - PCTSOLID	%		**79**	-	**85**	-	**85**		**91**	-
Polychlorinated Biphenyls - SW8082A											
PCB-1016	12674-11-2	ug/Kg	**1000**	< 84	84	< 76	76	< 78	78	< 71	71
PCB-1221	11104-28-2	ug/Kg	**1000**	< 84	84	< 76	76	< 78	78	< 71	71
PCB-1232	11141-16-5	ug/Kg	**1000**	< 84	84	< 76	76	< 78	78	< 71	71
PCB-1242	53469-21-9	ug/Kg	**1000**	< 84	84	< 76	76	< 78	78	< 71	71
PCB-1248	12672-29-6	ug/Kg	**1000**	< 84	84	< 76	76	< 78	78	< 71	71
PCB-1254	11097-69-1	ug/Kg	**1000**	< 84	84	< 76	76	< 78	78	< 71	71
PCB-1260	11096-82-5	ug/Kg	**1000**	**140**	84	**180**	76	< 78	78	**130**	71
PCB-1262	37324-23-5	ug/Kg	**-**	< 84	84	< 76	76	< 78	78	< 71	71
PCB-1268	11100-14-4	ug/Kg	**-**	< 84	84	< 76	76	< 78	78	< 71	71
Semivolatiles - SW8270D											
Acenaphthene	83-32-9	ug/Kg	**20000**	< 290	290	< 270	270	< 270	270	< 250	250
Acenaphthylene	208-96-8	ug/Kg	**100000**	< 290	290	< 270	270	< 270	270	< 250	250
Anthracene	120-12-7	ug/Kg	**100000**	< 290	290	< 270	270	< 270	270	< 250	250
Benz(a)anthracene	56-55-3	ug/Kg	**1000**	< 290	290	< 270	270	< 270	270	**180**	250
Benzo(a)pyrene	50-32-8	ug/Kg	**1000**	< 200	200	< 200	200	< 200	200	**170**	200
Benzo(b)fluoranthene	205-99-2	ug/Kg	**1000**	< 290	290	**140**	270	< 270	270	**200**	250
Benzo(ghi)perylene	191-24-2	ug/Kg	**100000**	< 290	290	< 270	270	< 270	270	**120**	250
Benzo(k)fluoranthene	207-08-9	ug/Kg	**800**	< 290	290	< 270	270	< 270	270	< 250	250
Chrysene	218-01-9	ug/Kg	**1000**	< 290	290	**130**	270	< 270	270	**210**	250
Dibenz(a,h)anthracene	53-70-3	ug/Kg	**330**	< 290	290	< 270	270	< 270	270	< 250	250
Fluoranthene	206-44-0	ug/Kg	**100000**	< 290	290	**220**	270	< 270	270	**410**	250
Fluorene	86-73-7	ug/Kg	**30000**	< 290	290	< 270	270	< 270	270	< 250	250
Indeno(1,2,3-cd)pyrene	193-39-5	ug/Kg	**500**	< 290	290	< 270	270	< 270	270	< 250	250
Naphthalene	91-20-3	ug/Kg	**12000**	< 290	290	< 270	270	< 270	270	< 250	250
Phenanthrene	85-01-8	ug/Kg	**100000**	< 290	290	**180**	270	**120**	270	**290**	250
Pyrene	129-00-0	ug/Kg	**100000**	< 290	290	**200**	270	< 270	270	**490**	250
Volatile Organic Compounds - SW8260C											
1,2,4-Trimethylbenzene	95-63-6	ug/Kg	**3600**	< 1.2	1.2	< 0.95	0.95	**5.2**	1.3	**4.6**	1.2
1,3,5-Trimethylbenzene	108-67-8	ug/Kg	**8400**	< 1.2	1.2	< 0.95	0.95	**2.4**	1.3	**3.3**	1.2
Benzene	71-43-2	ug/Kg	**60**	< 2.3	2.3	< 1.9	1.9	< 2.5	2.5	< 2.4	2.4
Ethylbenzene	100-41-4	ug/Kg	**1000**	< 2.3	2.3	< 1.9	1.9	< 2.5	2.5	< 2.4	2.4
Isopropylbenzene	98-82-8	ug/Kg	**2300**	< 1.2	1.2	< 0.95	0.95	< 1.3	1.3	< 1.2	1.2
m&p-Xylene	179601-23-1	ug/Kg	**-**	< 2.3	2.3	< 1.9	1.9	< 2.5	2.5	< 2.4	2.4
Methyl t-Butyl Ether (MTBE)	1634-04-4	ug/Kg	**930**	< 2.3	2.3	< 1.9	1.9	< 2.5	2.5	< 2.4	2.4
n-Butylbenzene	104-51-8	ug/Kg	**12000**	< 1.2	1.2	< 0.95	0.95	**2.4**	1.3	**1.2**	1.2
n-Propylbenzene	103-65-1	ug/Kg	**3900**	< 1.2	1.2	< 0.95	0.95	< 1.3	1.3	< 1.2	1.2
Naphthalene	91-20-3	ug/Kg	**12000**	< 2.3	2.3	< 1.9	1.9	**2**	2.5	< 2.4	2.4
o-Xylene	95-47-6	ug/Kg	**-**	< 2.3	2.3	< 1.9	1.9	< 2.5	2.5	< 2.4	2.4
p-Isopropyltoluene	99-87-6	ug/Kg	**10000**	< 1.2	1.2	< 0.95	0.95	**0.91**	1.3	**1**	1.2
sec-Butylbenzene	135-98-8	ug/Kg	**11000**	< 1.2	1.2	< 0.95	0.95	**1.3**	1.3	**1.1**	1.2
tert-Butylbenzene	98-06-6	ug/Kg	**5900**	< 1.2	1.2	< 0.95	0.95	< 1.3	1.3	< 1.2	1.2
Toluene	108-88-3	ug/Kg	**700**	< 2.3	2.3	< 1.9	1.9	< 2.5	2.5	< 2.4	2.4
Total Xylenes	1330-20-7	ug/Kg	**260**	< 2.3	2.3	< 1.9	1.9	< 2.5	2.5	< 2.4	2.4

Result Detected	**BOLD**
RL Exceeds Criteria	*ITALIC*
Result Exceeds Criteria	**BOLD**
ug/kg	micrograms per kilogram
RL	Reporting Limit

Table 4a - Hotspot #1 Endpoint Sample Results
60 McLean Avenue, Yonkers, NY
BCP #C360211

Lab Sample Id					CN12674	
Collection Date					12/22/2022	
Client Id					HS-1-SWS	
Matrix					SOIL	
Project: 60 MCLEAN AVE YONKERS NY	CAS	Units	NY 375 Res Restricted	NY 375 UnRestricted SCO	Result	RL
Miscellaneous/Inorganics						
Chromium, Hex. (SW3060A digestion)	18540-29-9	mg/Kg	110	**1**	< 0.42	0.42
Percent Solid	PHNX - PCTSOLID	%			**89**	
pH at 25C - Soil	PHNX - PH	pH Units			**7.07**	1
Redox Potential	PHNX - REDOX	mV			**211**	
Total Cyanide (SW9010C Distill.)	57-12-5	mg/Kg	27	**27**	< 0.56	0.56
Metals Total						
Aluminum	7429-90-5	mg/Kg			**11600**	340
Antimony	7440-36-0	mg/Kg			< 3.4	3.4
Arsenic	7440-38-2	mg/Kg	16	**13**	**1.45**	0.69
Barium	7440-39-3	mg/Kg	400	**350**	**131**	0.7
Beryllium	7440-41-7	mg/Kg	72	**7.2**	**0.68**	0.27
Cadmium	7440-43-9	mg/Kg	4.3	**2.5**	**1.68**	0.34
Calcium	7440-70-2	mg/Kg			**2010**	3.4
Chromium	7440-47-3	mg/Kg			**94**	0.34
Cobalt	7440-48-4	mg/Kg			**28.1**	0.34
Copper	7440-50-8	mg/kg	270	**50**	**54.1**	0.7
Iron	7439-89-6	mg/Kg			**34100**	34
Lead	7439-92-1	mg/Kg	400	**63**	**16.6**	0.7
Magnesium	7439-95-4	mg/Kg			**10700**	34
Manganese	7439-96-5	mg/Kg	2000	**1600**	**634**	3.4
Mercury	7439-97-6	mg/Kg	0.81	**0.18**	**0.12**	0.03
Nickel	7440-02-0	mg/Kg	310	**30**	**59.8**	0.34
Potassium	7440-09-7	mg/Kg			**5450**	69
Selenium	7782-49-2	mg/Kg	180	**3.9**	< 1.4	1.4
Silver	7440-22-4	mg/Kg	180	**2**	< 0.34	0.34
Sodium	7440-23-5	mg/Kg			**326**	7
Thallium	7440-28-0	mg/Kg			< 1.4	1.4
Trivalent Chromium	16065-83-1	mg/kg	180	**30**	**94**	0.34
Vanadium	7440-62-2	mg/Kg			**58.6**	0.34
Zinc	7440-66-6	mg/Kg	10000	**109**	**64.3**	0.7

Result Detected	**BOLD**
RL Exceeds Criteria	*ITALIC*
Result Exceeds USCO Criteria	**BOLD**
Result Exceeds RRSCO Criteria	underlined
mg/kg	milligrams per kilogram
RL	Reporting Limit

Table 4b - Hotspot #3 Endpoint Sample Analytical Summary
46-70 McLean Avenue, Yonkers, NY
BCP #C360211

Lab Sample Id					CN48415		CN48416		CN48417		CN48418	
Collection Date					2/20/2023		2/20/2023		2/20/2023		2/20/2023	
Client Id					HS-3-N		HS-3-S		HS-3-W		HS-3-E	
Matrix					Soil		Soil		Soil		Soil	
Project: 60 MCLEAN AVE YONKERS NY	CAS	Units	NY-ResRestrict	NY-UnRestricted SCO	Result	RL	Result	RL	Result	RL	Result	RL
Miscellaneous/Inorganics												
Percent Solid	PHNX - PCTSOLID	%			**88**		**86**		**88**		**84**	
Chromium, Hex. (SW3060A digestion)	18540-29-9	mg/Kg	110	**1**	< 0.40	0.40	< 0.43	0.43	< 0.39	0.39	< 0.47	0.47
pH at 25C - Soil	PHNX - PH	pH Units			**9.23**	1.00	**9.8**	1.00	**10.4**	1.00	**9.51**	1.00
Redox Potential	PHNX - REDOX	mV			**181**		**164**		**130**		**170**	
Total Cyanide (SW9010C Distill.)	57-12-5	mg/Kg	27	**27**	< 0.57	0.57	< 0.58	0.58	< 0.57	0.57	< 0.60	0.60
Metals, Total												
Arsenic	7440-38-2	mg/Kg	16	**13**	**0.89**	0.71	**1.63**	0.81	**4.08**	0.70	**1.63**	0.74
Barium	7440-39-3	mg/Kg	400	**350**	**333**	0.36	**168**	0.40	**242**	0.35	**221**	0.37
Beryllium	7440-41-7	mg/Kg	72	**7.2**	**0.43**	0.28	**0.36**	0.32	**0.35**	0.28	**0.39**	0.30
Cadmium	7440-43-9	mg/Kg	4.3	**2.5**	**1.37**	0.36	**1.36**	0.40	**1.15**	0.35	**1.26**	0.37
Chromium	7440-47-3	mg/Kg			**27.5**	0.36	**47.7**	0.40	**22.7**	0.35	**26.9**	0.37
Copper	7440-50-8	mg/kg	270	**50**	**15**	0.7	**30.1**	0.8	**20.4**	0.7	**28.8**	0.7
Lead	7439-92-1	mg/Kg	400	**63**	**19.7**	0.36	**60.2**	0.40	**34.6**	0.35	**28.9**	0.37
Manganese	7439-96-5	mg/Kg	2,000	**1,600**	165	3.6	**230**	4.0	**141**	0.35	**228**	3.7
Mercury	7439-97-6	mg/Kg	0.81	**0.18**	**0.23**	0.03	**0.53**	0.03	**0.62**	0.03	**0.34**	0.03
Nickel	7440-02-0	mg/Kg	310	**30**	**37.3**	0.36	**40.5**	0.40	**30.1**	0.35	**35.1**	0.37
Selenium	7782-49-2	mg/Kg	180	**3.9**	< 1.4	1.4	< 1.6	1.6	< 1.4	1.4	< 1.5	1.5
Silver	7440-22-4	mg/Kg	180	**2**	< 0.36	0.36	< 0.40	0.40	< 0.35	0.35	< 0.37	0.37
Trivalent Chromium	16065-83-1	mg/kg	180	**30**	**27.5**	0.36	**47.7**	0.40	**22.7**	0.35	**26.9**	0.37
Zinc	7440-66-6	mg/Kg	10,000	**109**	**32**	0.7	**65.7**	0.8	**35.8**	0.7	**40.6**	0.7

Result Detected	**BOLD**
RL Exceeds Criteria	*ITALIC*
Result Exceeds USCO Criteria	**BOLD**
Result Exceeds RRSCO Criteria	underlined
mg/kg	milligrams per kilogram
RL	Reporting Limit

Table 4c - Hotspot #10A (Initial) Endpoint Sample Results
60 McLean Avenue, Yonkers, NY
BCP #C360211

Lab Sample Id					CN77792		CN77793		CN77794	
Collection Date					04/05/2023		04/05/2023		04/05/2023	
Client Id					HS-10A-N		HS-10A-W		HS-10A-E	
Matrix					SOIL		SOIL		SOIL	
SDG: GCN77792				NY						
Project: 15514 MCLEAN AVE	CAS	Units		375 Res Restricted	Result	RL	Result	RL	Result	RL
Miscellaneous/Inorganics										
Chromium, Hex. (SW3060A digestion)	18540-29-9	mg/Kg		110	< 0.42	0.42	< 0.43	0.43	< 0.42	0.42
Percent Solid	PHNX - PCTSOLID	%			91		89		86	
pH at 25C - Soil	PHNX - PH	pH Units			9.75	1	9.02	1	7.96	1
Redox Potential	PHNX - REDOX	mV			-80.2		-38.5		-125	
Total Cyanide (SW9010C Distill.)	57-12-5	mg/Kg		27	< 0.55	0.55	< 0.56	0.56	< 0.58	0.58
Metals Total										
Arsenic	7440-38-2	mg/Kg		16	**0.9**	0.7	**2.1**	0.68	**1.92**	0.76
Barium	7440-39-3	mg/Kg		400	**41.1**	0.35	**53.8**	0.34	419	0.38
Beryllium	7440-41-7	mg/Kg		72	**0.21**	0.28	**0.32**	0.27	**0.48**	0.31
Cadmium	7440-43-9	mg/Kg		4.3	**0.64**	0.35	**0.8**	0.34	**2.7**	0.38
Chromium	7440-47-3	mg/Kg			**21.7**	0.35	**23.8**	0.34	**65.5**	0.38
Copper	7440-50-8	mg/kg		270	**31.1**	0.7	**30.8**	0.7	**91.1**	0.8
Lead	7439-92-1	mg/Kg		400	**6.1**	0.35	**20.9**	0.34	475	3.8
Manganese	7439-96-5	mg/Kg		2000	**213**	3.5	**307**	3.4	**328**	3.8
Mercury	7439-97-6	mg/Kg		0.81	0.97	0.03	**0.18**	0.03	**0.8**	0.03
Nickel	7440-02-0	mg/Kg		310	**20.2**	0.35	**18.2**	0.34	**47.5**	0.38
Selenium	7782-49-2	mg/Kg		180	< 1.4	1.4	< 1.4	1.4	< 1.5	1.5
Silver	7440-22-4	mg/Kg		180	< 0.35	0.35	< 0.34	0.34	< 0.38	0.38
Trivalent Chromium	16065-83-1	mg/kg		180	**21.7**	0.35	**23.8**	0.34	**65.5**	0.38
Zinc	7440-66-6	mg/Kg		10000	**27.4**	0.7	**43.7**	0.7	**620**	7.6

Result Detected	**BOLD**
RL Exceeds Criteria	*ITALIC*
Result Exceeds USCO Criteria	**BOLD**
Result Exceeds RRSCO Criteria	underlined
mg/kg	milligrams per kilogram
RL	Reporting Limit

Table 4d - Hotspot #10A (Secondary) Endpoint Sample Results
60 McLean Avenue, Yonkers, NY
BCP #C360211

Project : 60 MCLEAN AVE YONKERS NY	Lab Sample Id		NY-UnRestricted SCO	NY-ResRestrict	CO03992		CO03993	
	Collection Date				5/10/2023		5/10/2023	
	Client Id				HS-10A-N		HS-10A-E	
	Matrix				Soil		Soil	
	CAS	Units			Result	RL	Result	RL
Miscellaneous/Inorganics								
Percent Solid	PHNX - PCTSOLID	%			**84**		**92**	
Chromium, Hex. (SW3060A digestion)	18540-29-9	mg/Kg	1	110	< 0.45	0.45	< 0.41	0.41
pH at 25C - Soil	PHNX - PH	pH Units			**7.23**	1.00	**7.85**	1.00
Redox Potential	PHNX - REDOX	mV			**239**		**226**	
Total Cyanide (SW9010C Distill.)	57-12-5	mg/Kg	27	27	**1.64**	0.60	**0.3**	0.54
Metals, Total								
Arsenic	7440-38-2	mg/Kg	13	16	**2.19**	0.78	**1.26**	0.70
Barium	7440-39-3	mg/Kg	**350**	**400**	**821**	0.39	**318**	0.35
Beryllium	7440-41-7	mg/Kg	7.2	72	**0.43**	0.31	**0.39**	0.28
Cadmium	7440-43-9	mg/Kg	**2.5**	4.3	**2.98**	0.39	**2.27**	0.35
Chromium	7440-47-3	mg/Kg			**50.2**	0.39	**41**	0.35
Copper	7440-50-8	mg/kg	**50**	270	**88.7**	0.8	**61.2**	0.7
Lead	7439-92-1	mg/Kg	**63**	**400**	**572**	3.9	**78.4**	0.35
Manganese	7439-96-5	mg/Kg	1,600	2,000	**221**	3.9	**168**	3.5
Mercury	7439-97-6	mg/Kg	**0.18**	0.81	**0.64**	0.03	**0.75**	0.03
Nickel	7440-02-0	mg/Kg	**30**	310	**49.5**	0.39	**42.6**	0.35
Selenium	7782-49-2	mg/Kg	3.9	180	< 1.6	1.6	< 1.4	1.4
Silver	7440-22-4	mg/Kg	2	180	< 0.39	0.39	< 0.35	0.35
Trivalent Chromium	16065-83-1	mg/kg	**30**	180	**50.2**	0.39	**41**	0.35
Zinc	7440-66-6	mg/Kg	**109**	10,000	**314**	7.8	**268**	7.0

Notes/Qualifiers
U = The compound was analyzed for but not detected at or above the MDL
N = The conecntration is based on the response of the nearest internal. This flag is used on the TIC form for all compounds indentified
J = The value is estimated.
BOLD = Result Detected
GREY CELL = Result Exceeds NY-UnRestricted SCO Criteria
GREY CELL and UNDERLINED = Results exceed NY-ResRestrict

Table 5 - Groundwater Sample Results
60 McLean Avenue, Yonkers, NY
BCP #C360211

Lab Sample Id				CN10401		CN10402		CN10403		CN10404		CN10572	
Collection Date				12/20/2022		12/20/2022		12/20/2022		12/20/2022		12/20/2022	
Client Id				WP-11		WP-12		WP-13		WP-14		TB	
Matrix				GROUND WATER		GROUND WATER		GROUND WATER		GROUND WATER		GROUND WATER	
Project: 60 MCLEAN AVE YONKERS NY	CAS	Units	TOGS 1.1.1 WQ/GA Table 1	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Semivolatiles (SIM) - SW8270D (SIM)													
2-Methylnaphthalene	91-57-6	ug/L		**8.1**	0.47	**5.8**	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Acenaphthene	83-32-9	ug/L	**20**	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Acenaphthylene	208-96-8	ug/L		< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Anthracene	120-12-7	ug/L	**50**	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Benz(a)anthracene	56-55-3	ug/L	**0.002**	**0.02**	0.02	< 0.02	*0.02*	< 0.02	*0.02*	< 0.02	*0.02*	-	-
Benzo(a)pyrene	50-32-8	ug/L		**0.02**	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	-	-
Benzo(b)fluoranthene	205-99-2	ug/L	**0.002**	**0.02**	0.02	< 0.02	*0.02*	< 0.02	*0.02*	< 0.02	*0.02*	-	-
Benzo(ghi)perylene	191-24-2	ug/L		< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Benzo(k)fluoranthene	207-08-9	ug/L	**0.002**	< 0.02	*0.02*	< 0.02	*0.02*	< 0.02	*0.02*	< 0.02	*0.02*	-	-
Chrysene	218-01-9	ug/L	**0.002**	**0.02**	0.02	< 0.02	*0.02*	< 0.02	*0.02*	< 0.02	*0.02*	-	-
Dibenz(a,h)anthracene	53-70-3	ug/L		< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Fluoranthene	206-44-0	ug/L	**50**	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Fluorene	86-73-7	ug/L	**50**	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Hexachlorobenzene	118-74-1	ug/L	**0.04**	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04	< 0.04	0.04	-	-
Hexachlorobutadiene	87-68-3	ug/L	**0.5**	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Hexachlorocyclopentadiene	77-47-4	ug/L	**5**	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	**0.002**	< 0.02	*0.02*	< 0.02	*0.02*	< 0.02	*0.02*	< 0.02	*0.02*	-	-
N-Nitrosodimethylamine	62-75-9	ug/L		< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Naphthalene	91-20-3	ug/L	**10**	-	-	**7.9**	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Nitrobenzene	98-95-3	ug/L	**0.4**	< 0.38	0.38	< 0.38	0.38	< 0.38	0.38	< 0.38	0.38	-	-
Pentachlorophenol	87-86-5	ug/L	**1**	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Phenanthrene	85-01-8	ug/L	**50**	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Pyrene	129-00-0	ug/L	**50**	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Pyridine	110-86-1	ug/L	**50**	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	< 0.47	0.47	-	-
Semivolatiles - SW8270D													
1,2,4,5-Tetrachlorobenzene	95-94-3	ug/L		< 3.3	3.3	< 3.3	3.3	< 3.3	3.3	< 3.3	3.3	-	-
1,2,4-Trichlorobenzene	120-82-1	ug/L		< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
1,2-Dichlorobenzene	95-50-1	ug/L		< 2.4	2.4	< 2.4	2.4	< 2.4	2.4	< 2.4	2.4	-	-
1,2-Diphenylhydrazine	122-66-7	ug/L		< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
1,3-Dichlorobenzene	541-73-1	ug/L	**3**	< 2.4	2.4	< 2.4	2.4	< 2.4	2.4	< 2.4	2.4	-	-
1,4-Dichlorobenzene	106-46-7	ug/L		< 2.4	2.4	< 2.4	2.4	< 2.4	2.4	< 2.4	2.4	-	-
2,2'-Oxybis(1-Chloropropane)	108-60-1	ug/L	**5**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
2,4,5-Trichlorophenol	95-95-4	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
2,4,6-Trichlorophenol	88-06-2	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
2,4-Dichlorophenol	120-83-2	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
2,4-Dimethylphenol	105-67-9	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
2,4-Dinitrophenol	51-28-5	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
2,4-Dinitrotoluene	121-14-2	ug/L	**5**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
2,6-Dinitrotoluene	606-20-2	ug/L	**5**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
2-Chloronaphthalene	91-58-7	ug/L	**10**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
2-Chlorophenol	95-57-8	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
2-Methylphenol (o-cresol)	95-48-7	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
2-Nitroaniline	88-74-4	ug/L	**5**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
2-Nitrophenol	88-75-5	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
3&4-Methylphenol (m&p-cresol)	PHNX - M&P CRESOL	ug/L		< 9.4	9.4	< 9.4	9.4	< 9.4	9.4	< 9.4	9.4	-	-
3,3'-Dichlorobenzidine	91-94-1	ug/L	**5**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
3-Nitroaniline	99-09-2	ug/L	**5**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
4,6-Dinitro-2-methylphenol	534-52-1	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
4-Bromophenyl phenyl ether	101-55-3	ug/L		< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
4-Chloro-3-methylphenol	59-50-7	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
4-Chloroaniline	106-47-8	ug/L	**5**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
4-Chlorophenyl phenyl ether	7005-72-3	ug/L		< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
4-Nitroaniline	100-01-6	ug/L	**5**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
4-Nitrophenol	100-02-7	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
Acetophenone	98-86-2	ug/L		< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Aniline	62-53-3	ug/L	**5**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Benzidine	92-87-5	ug/L	**5**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Benzoic acid	65-85-0	ug/L		< 47	47	< 47	47	< 47	47	< 47	47	-	-
Benzyl butyl phthalate	85-68-7	ug/L	**50**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Bis(2-chloroethoxy)methane	111-91-1	ug/L	**5**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Bis(2-chloroethyl)ether	111-44-4	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
Bis(2-ethylhexyl)phthalate	117-81-7	ug/L	**5**	**28**	0.94	**12**	0.94	**35**	0.94	< 2.4	2.4	-	-
Carbazole	86-74-8	ug/L		< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Di-n-butylphthalate	84-74-2	ug/L	**50**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Di-n-octylphthalate	117-84-0	ug/L	**50**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Dibenzofuran	132-64-9	ug/L		< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Diethyl phthalate	84-66-2	ug/L	**50**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Dimethylphthalate	131-11-3	ug/L	**50**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Hexachloroethane	67-72-1	ug/L	**5**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-
Isophorone	78-59-1	ug/L	**50**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
N-Nitrosodi-n-propylamine	621-64-7	ug/L		< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
N-Nitrosodiphenylamine	86-30-6	ug/L	**50**	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	< 4.7	4.7	-	-
Naphthalene	91-20-3	ug/L	**10**	**34**	4.7	-	-	-	-	-	-	-	-
Pentachloronitrobenzene	82-68-8	ug/L		< 2.4	2.4	< 2.4	2.4	< 2.4	2.4	< 2.4	2.4	-	-
Phenol	108-95-2	ug/L	**1**	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	< 0.94	0.94	-	-

Table 5 - Groundwater Sample Results
60 McLean Avenue, Yonkers, NY
BCP #C360211

Lab Sample Id				CN10401		CN10402		CN10403		CN10404		CN10572	
Collection Date				12/20/2022		12/20/2022		12/20/2022		12/20/2022		12/20/2022	
Client Id				WP-11		WP-12		WP-13		WP-14		TB	
Matrix				GROUND WATER		GROUND WATER		GROUND WATER		GROUND WATER		GROUND WATER	
Project: 60 MCLEAN AVE YONKERS NY	CAS	Units	TOGS 1.1.1 WQ/GA Table 1	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Volatiles - SW8260C													
1,1,1,2-Tetrachloroethane	630-20-6	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
1,1,1-Trichloroethane	71-55-6	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
1,1,2,2-Tetrachloroethane	79-34-5	ug/L	**5**	< 1.0	1	< 2.5	2.5	< 0.50	0.5	< 0.50	0.5	< 0.50	0.5
1,1,2-Trichloroethane	79-00-5	ug/L	**1**	< 1.0	1	< 1.3	*1.3*	< 1.0	1	< 1.0	1	< 1.0	1
1,1-Dichloroethane	75-34-3	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
1,1-Dichloroethene	75-35-4	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
1,1-Dichloropropene	563-58-6	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
1,2,3-Trichlorobenzene	87-61-6	ug/L		< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
1,2,3-Trichloropropane	96-18-4	ug/L	**0.04**	< 0.50	*0.5*	< 1.3	*1.3*	< 0.25	*0.25*	< 0.25	*0.25*	< 1.0	*1*
1,2,4-Trichlorobenzene	120-82-1	ug/L		< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
1,2,4-Trimethylbenzene	95-63-6	ug/L	**5**	**98**	2	**270**	5	**3.7**	1	**9.8**	1	< 1.0	1
1,2-Dibromo-3-chloropropane	96-12-8	ug/L	**0.04**	< 1.0	*1*	< 2.5	*2.5*	< 0.50	*0.5*	< 0.50	*0.5*	< 1.0	*1*
1,2-Dibromoethane	106-93-4	ug/L	**0.0006**	< 0.50	*0.5*	< 1.3	*1.3*	< 0.25	*0.25*	< 0.25	*0.25*	< 1.0	*1*
1,2-Dichlorobenzene	95-50-1	ug/L		< 2.0	2	< 4.7	4.7	< 1.0	1	< 1.0	1	< 1.0	1
1,2-Dichloroethane	107-06-2	ug/L	**0.6**	< 0.60	0.6	< 1.3	*1.3*	< 0.60	0.6	< 0.60	0.6	< 0.60	0.6
1,2-Dichloropropane	78-87-5	ug/L	**1**	< 1.0	1	< 1.3	*1.3*	< 1.0	1	< 1.0	1	< 1.0	1
1,3,5-Trimethylbenzene	108-67-8	ug/L	**5**	**37**	2	**110**	5	**1.5**	1	**2.2**	1	< 1.0	1
1,3-Dichlorobenzene	541-73-1	ug/L	**3**	< 2.0	2	< 3.0	3	< 1.0	1	< 1.0	1	< 1.0	1
1,3-Dichloropropane	142-28-9	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
1,4-Dichlorobenzene	106-46-7	ug/L		< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
2,2-Dichloropropane	594-20-7	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
2-Chlorotoluene	95-49-8	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
2-Hexanone	591-78-6	ug/L	**50**	< 10	10	< 25	25	< 5.0	5	< 5.0	5	< 5.0	5
2-Isopropyltoluene	527-84-4	ug/L	**5**	**1.5**	2	**5**	5	< 1.0	1	**0.47**	1	< 1.0	1
4-Chlorotoluene	106-43-4	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
4-Methyl-2-pentanone	108-10-1	ug/L		< 10	10	< 25	25	< 5.0	5	< 5.0	5	< 5.0	5
Acetone	67-64-1	ug/L	**50**	**6.9**	50	**25**	50	**3.5**	25	< 25	25	< 25	25
Acrylonitrile	107-13-1	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Benzene	71-43-2	ug/L	**1**	< 0.70	0.7	**2.2**	1.3	< 0.70	0.7	< 0.70	0.7	< 0.70	0.7
Bromobenzene	108-86-1	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Bromochloromethane	74-97-5	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Bromodichloromethane	75-27-4	ug/L	**50**	< 1.0	1	< 2.5	2.5	< 0.50	0.5	< 0.50	0.5	< 0.50	0.5
Bromoform	75-25-2	ug/L	**50**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Bromomethane	74-83-9	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Carbon Disulfide	75-15-0	ug/L		< 10	10	< 25	25	< 5.0	5	< 5.0	5	< 5.0	5
Carbon tetrachloride	56-23-5	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Chlorobenzene	108-90-7	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Chloroethane	75-00-3	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Chloroform	67-66-3	ug/L	**7**	< 2.0	2	< 5.0	5	< 1.0	1	**0.27**	1	< 1.0	1
Chloromethane	74-87-3	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
cis-1,2-Dichloroethene	156-59-2	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
cis-1,3-Dichloropropene	10061-01-5	ug/L	**0.4**	< 0.50	*0.5*	< 1.3	*1.3*	< 0.40	0.4	< 0.40	0.4	< 0.40	0.4
Dibromochloromethane	124-48-1	ug/L	**50**	< 1.0	1	< 2.5	2.5	< 0.50	0.5	< 0.50	0.5	< 0.50	0.5
Dibromomethane	74-95-3	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Dichlorodifluoromethane	75-71-8	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Ethylbenzene	100-41-4	ug/L	**5**	**21**	2	**28**	5	**0.27**	1	**0.65**	1	< 1.0	1
Hexachlorobutadiene	87-68-3	ug/L	**0.5**	< 0.50	0.5	< 1.3	*1.3*	< 0.40	0.4	< 0.40	0.4	< 0.40	0.4
Isopropylbenzene	98-82-8	ug/L	**5**	**12**	2	**42**	5	**0.3**	1	**1.6**	1	< 1.0	1
m&p-Xylene	179601-23-1	ug/L		**81**	2	**140**	5	**1.2**	1	**7**	1	< 1.0	1
Methyl ethyl ketone	78-93-3	ug/L	**50**	< 10	10	< 25	25	< 5.0	5	< 5.0	5	< 5.0	5
Methyl t-butyl ether (MTBE)	1634-04-4	ug/L		< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Methylene chloride	75-09-2	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
n-Butylbenzene	104-51-8	ug/L	**5**	**3.7**	2	**12**	5	< 1.0	1	**0.73**	1	< 1.0	1
n-Propylbenzene	103-65-1	ug/L	**5**	**16**	2	**52**	5	**0.46**	1	**1.6**	1	< 1.0	1
Naphthalene	91-20-3	ug/L	**10**	**24**	2	**38**	5	< 1.0	1	**2.2**	1	< 1.0	1
o-Xylene	95-47-6	ug/L	**5**	**31**	2	**33**	5	**0.45**	1	**2.9**	1	< 1.0	1
p-Isopropyltoluene	99-87-6	ug/L	**5**	**5.7**	2	**20**	5	**0.73**	1	**1.7**	1	< 1.0	1
sec-Butylbenzene	135-98-8	ug/L	**5**	**3.4**	2	**13**	5	**0.34**	1	**0.98**	1	< 1.0	1
Styrene	100-42-5	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
tert-Butylbenzene	98-06-6	ug/L	**5**	**0.58**	2	**2.1**	5	< 1.0	1	**0.33**	1	< 1.0	1
Tetrachloroethene	127-18-4	ug/L	**5**	**0.54**	2	**2.6**	5	**0.4**	1	**0.27**	1	< 1.0	1
Tetrahydrofuran (THF)	109-99-9	ug/L	**50**	< 5.0	5	< 13	13	< 2.5	2.5	< 2.5	2.5	< 2.5	2.5
Toluene	108-88-3	ug/L	**5**	**3.4**	2	**2.6**	5	< 1.0	1	**0.74**	1	< 1.0	1
Total Xylenes	1330-20-7	ug/L	**5**	**112**	2	**173**	5	**1.7**	1	**9.9**	1	< 1.0	1
trans-1,2-Dichloroethene	156-60-5	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
trans-1,3-Dichloropropene	10061-02-6	ug/L	**0.4**	< 0.50	*0.5*	< 1.3	*1.3*	< 0.40	0.4	< 0.40	0.4	< 0.40	0.4
trans-1,4-dichloro-2-butene	110-57-6	ug/L	**5**	< 5.0	5	< 13	*13*	< 5.0	5	< 5.0	5	< 5.0	5
Trichloroethene	79-01-6	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Trichlorofluoromethane	75-69-4	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Trichlorotrifluoroethane	76-13-1	ug/L	**5**	< 2.0	2	< 5.0	5	< 1.0	1	< 1.0	1	< 1.0	1
Vinyl chloride	75-01-4	ug/L	**2**	< 2.0	2	< 2.0	2	< 1.0	1	< 1.0	1	< 1.0	1
TOTAL BTEX		ug/L		**245**		**376.2**		**3.62**		**11.29**			
TOTAL VOCs		ug/L		**457.72**		**970.5**		**14.55**		**43.34**			

Result Detected	**BOLD**
RL Exceeds Criteria	*ITALIC*
Result Exceeds Criteria	**BOLD**
ug/L	micrograms per liter
RL	Reporting Limit

Table 6 - Hydraulic Lift Piston Groundwater Samples
60 McLean Avenue, Yonkers, NY
BCP #C360211

Lab Sample Id					CN02725		CN02726	
Collection Date					12/09/2022		12/09/2022	
Client Id					HL1-GW		HL4-GW	
Matrix					GROUND WATER		GROUND WATER	
Project: 60 MCLEAN AVE YONKERS, NY	CAS	Units		TOGS 1.1.1 WQ/GA Table 1	Result	RL	Result	RL
1,4-dioxane - SW8260C								
1,4-dioxane	123-91-1	ug/l			< 100	100	< 100	100
Polychlorinated Biphenyls - SW8082A								
PCB-1016	12674-11-2	ug/L		**0.09**	< 0.50	*0.5*	< 0.52	*0.52*
PCB-1221	11104-28-2	ug/L		**0.09**	< 0.50	*0.5*	< 0.52	*0.52*
PCB-1232	11141-16-5	ug/L		**0.09**	< 0.50	*0.5*	< 0.52	*0.52*
PCB-1242	53469-21-9	ug/L		**0.09**	< 0.50	*0.5*	< 0.52	*0.52*
PCB-1248	12672-29-6	ug/L		**0.09**	< 0.50	*0.5*	< 0.52	*0.52*
PCB-1254	11097-69-1	ug/L		**0.09**	< 0.50	*0.5*	< 0.52	*0.52*
PCB-1260	11096-82-5	ug/L		**0.09**	< 0.50	*0.5*	< 0.52	*0.52*
PCB-1262	37324-23-5	ug/L			< 0.50	0.5	< 0.52	0.52
PCB-1268	11100-14-4	ug/L			< 0.50	0.5	< 0.52	0.52
Semivolatiles - SW8270D								
1,1-Biphenyl	92-52-4	ug/L		**5**	< 12	*12*	< 12	*12*
1,2,4,5-Tetrachlorobenzene	95-94-3	ug/L			< 12	12	< 12	12
2,2'-Oxybis(1-Chloropropane)	108-60-1	ug/L		**5**	< 17	*17*	< 17	*17*
2,3,4,6-tetrachlorophenol	58-90-2	ug/L		**1**	< 17	*17*	< 17	*17*
2,4,5-Trichlorophenol	95-95-4	ug/L		**1**	< 17	*17*	< 17	*17*
2,4,6-Trichlorophenol	88-06-2	ug/L		**1**	< 17	*17*	< 17	*17*
2,4-Dichlorophenol	120-83-2	ug/L		**1**	< 17	*17*	< 17	*17*
2,4-Dimethylphenol	105-67-9	ug/L		**1**	< 17	*17*	< 17	*17*
2,4-Dinitrophenol	51-28-5	ug/L		**1**	< 17	*17*	< 17	*17*
2,4-Dinitrotoluene	121-14-2	ug/L		**5**	< 17	*17*	< 17	*17*
2,6-Dinitrotoluene	606-20-2	ug/L		**5**	< 17	*17*	< 17	*17*
2-Chloronaphthalene	91-58-7	ug/L		**10**	< 17	*17*	< 17	*17*
2-Chlorophenol	95-57-8	ug/L		**1**	< 17	*17*	< 17	*17*
2-Methylnaphthalene	91-57-6	ug/L			< 17	17	< 17	17
2-Methylphenol (o-cresol)	95-48-7	ug/L		**1**	< 17	*17*	< 17	*17*
2-Nitroaniline	88-74-4	ug/L		**5**	< 17	*17*	< 17	*17*
2-Nitrophenol	88-75-5	ug/L		**1**	< 17	*17*	< 17	*17*
3&4-Methylphenol (m&p-cresol)	PHNX - M&P CRESOL	ug/L			< 17	17	< 17	17
3,3'-Dichlorobenzidine	91-94-1	ug/L		**5**	< 17	*17*	< 17	*17*
3-Nitroaniline	99-09-2	ug/L		**5**	< 17	*17*	< 17	*17*
4,6-Dinitro-2-methylphenol	534-52-1	ug/L		**1**	< 17	*17*	< 17	*17*
4-Bromophenyl phenyl ether	101-55-3	ug/L			< 17	17	< 17	17
4-Chloro-3-methylphenol	59-50-7	ug/L		**1**	< 17	*17*	< 17	*17*
4-Chloroaniline	106-47-8	ug/L		**5**	< 17	*17*	< 17	*17*
4-Chlorophenyl phenyl ether	7005-72-3	ug/L			< 17	17	< 17	17
4-Nitroaniline	100-01-6	ug/L		**5**	< 17	*17*	< 17	*17*
4-Nitrophenol	100-02-7	ug/L		**1**	< 17	*17*	< 17	*17*
Acenaphthene	83-32-9	ug/L		**20**	< 17	17	< 17	17
Acetophenone	98-86-2	ug/L			< 17	17	< 17	17
Atrazine	1912-24-9	ug/L		**7.5**	< 3.3	3.3	< 3.3	3.3
Benzaldehyde	100-52-7	ug/L			< 17	17	< 17	17
Benzyl butyl phthalate	85-68-7	ug/L		**50**	< 17	17	< 17	17
Bis(2-chloroethoxy)methane	111-91-1	ug/L		**5**	< 17	*17*	< 17	*17*
Bis(2-ethylhexyl)phthalate	117-81-7	ug/L		**5**	< 3.3	3.3	< 3.3	3.3
Caprolactam	105-60-2	ug/L			< 17	17	< 17	17
Carbazole	86-74-8	ug/L			< 17	17	< 17	17
Di-n-butylphthalate	84-74-2	ug/L		**50**	< 17	17	< 17	17
Di-n-octylphthalate	117-84-0	ug/L		**50**	< 17	17	< 17	17
Dibenzofuran	132-64-9	ug/L			< 17	17	< 17	17
Diethyl phthalate	84-66-2	ug/L		**50**	< 17	17	< 17	17
Dimethylphthalate	131-11-3	ug/L		**50**	< 17	17	< 17	17
Hexachlorocyclopentadiene	77-47-4	ug/L		**5**	< 17	*17*	< 17	*17*
Hexachloroethane	67-72-1	ug/L		**5**	< 3.3	3.3	< 3.3	3.3
Isophorone	78-59-1	ug/L		**50**	< 17	17	< 17	17
N-Nitrosodi-n-propylamine	621-64-7	ug/L			< 17	17	< 17	17
N-Nitrosodiphenylamine	86-30-6	ug/L		**50**	< 17	17	< 17	17
Naphthalene	91-20-3	ug/L		**10**	< 17	*17*	< 17	*17*
Phenol	108-95-2	ug/L		**1**	< 17	*17*	< 17	*17*

Table 6 - Hydraulic Lift Piston Groundwater Samples
60 McLean Avenue, Yonkers, NY
BCP #C360211

Lab Sample Id					CN02725		CN02726	
Collection Date					12/09/2022		12/09/2022	
Client Id					HL1-GW		HL4-GW	
Matrix					GROUND WATER		GROUND WATER	
Project: 60 MCLEAN AVE YONKERS, NY	CAS	Units		TOGS 1.1.1 WQ/GA Table 1	Result	RL	Result	RL
Semivolatiles - SW8270D (SIM)								
Acenaphthylene	208-96-8	ug/L			< 1.7	1.7	< 1.7	1.7
Anthracene	120-12-7	ug/L		**50**	< 1.7	1.7	< 1.7	1.7
Benz(a)anthracene	56-55-3	ug/L		**0.002**	< 0.07	*0.07*	< 0.07	*0.07*
Benzo(a)pyrene	50-32-8	ug/L			< 0.07	0.07	< 0.07	0.07
Benzo(b)fluoranthene	205-99-2	ug/L		**0.002**	< 0.07	*0.07*	< 0.07	*0.07*
Benzo(ghi)perylene	191-24-2	ug/L			< 0.87	0.87	< 1.7	1.7
Benzo(k)fluoranthene	207-08-9	ug/L		**0.002**	< 0.07	*0.07*	< 0.07	*0.07*
Bis(2-chloroethyl)ether	111-44-4	ug/L		**1**	< 1.7	*1.7*	< 1.7	*1.7*
Chrysene	218-01-9	ug/L		**0.002**	< 0.07	*0.07*	< 0.07	*0.07*
Dibenz(a,h)anthracene	53-70-3	ug/L			< 0.10	0.1	< 1.0	1
Fluoranthene	206-44-0	ug/L		**50**	< 1.7	1.7	< 1.7	1.7
Fluorene	86-73-7	ug/L		**50**	< 1.7	1.7	< 1.7	1.7
Hexachlorobenzene	118-74-1	ug/L		**0.04**	< 0.07	*0.07*	< 0.07	*0.07*
Hexachlorobutadiene	87-68-3	ug/L		**0.5**	< 1.7	*1.7*	< 1.7	*1.7*
Hexachlorocyclopentadiene	77-47-4	ug/L		**5**	< 1.7	1.7	< 1.7	1.7
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L		**0.002**	< 0.07	*0.07*	< 0.07	*0.07*
N-Nitrosodimethylamine	62-75-9	ug/L			< 0.67	0.67	< 0.67	0.67
Nitrobenzene	98-95-3	ug/L		**0.4**	< 1.3	*1.3*	< 1.3	*1.3*
Pentachlorophenol	87-86-5	ug/L		**1**	< 1.0	1	< 1.0	1
Phenanthrene	85-01-8	ug/L		**50**	< 1.0	1	< 1.0	1
Pyrene	129-00-0	ug/L		**50**	< 1.7	1.7	< 1.7	1.7

Table 6 - Hydraulic Lift Piston Groundwater Samples
60 McLean Avenue, Yonkers, NY
BCP #C360211

Lab Sample Id					CN02725		CN02726	
Collection Date					12/09/2022		12/09/2022	
Client Id					HL1-GW		HL4-GW	
Matrix					GROUND WATER		GROUND WATER	
Project: 60 MCLEAN AVE YONKERS, NY	CAS	Units		TOGS 1.1.1 WQ/GA Table 1	Result	RL	Result	RL
Volatiles - SW8260C								
1,1,1-Trichloroethane	71-55-6	ug/L		**5**	< 2.0	2	< 2.0	2
1,1,2,2-Tetrachloroethane	79-34-5	ug/L		**5**	< 1.0	1	< 1.0	1
1,1,2-Trichloroethane	79-00-5	ug/L		**1**	< 2.0	*2*	< 2.0	*2*
1,1-Dichloroethane	75-34-3	ug/L		**5**	< 2.0	2	< 2.0	2
1,1-Dichloroethene	75-35-4	ug/L		**5**	< 1.0	1	< 1.0	1
1,2,3-Trichlorobenzene	87-61-6	ug/L			< 1.0	1	< 1.0	1
1,2,4-Trichlorobenzene	120-82-1	ug/L			< 1.0	1	< 1.0	1
1,2-Dibromo-3-chloropropane	96-12-8	ug/L		**0.04**	< 1.0	*1*	< 1.0	*1*
1,2-Dibromoethane	106-93-4	ug/L		**0.0006**	< 1.0	*1*	< 1.0	*1*
1,2-Dichlorobenzene	95-50-1	ug/L			< 2.0	2	< 2.0	2
1,2-Dichloroethane	107-06-2	ug/L		**0.6**	< 1.0	*1*	< 1.0	*1*
1,2-Dichloropropane	78-87-5	ug/L		**1**	< 1.0	1	< 1.0	1
1,3-Dichlorobenzene	541-73-1	ug/L		**3**	< 2.0	2	< 2.0	2
1,4-Dichlorobenzene	106-46-7	ug/L			< 2.0	2	< 2.0	2
2-Hexanone	591-78-6	ug/L		**50**	< 2.5	2.5	< 2.5	2.5
4-Methyl-2-pentanone	108-10-1	ug/L			< 2.5	2.5	< 2.5	2.5
Acetone	67-64-1	ug/L		**50**	< 5.0	5	**6.1**	5
Benzene	71-43-2	ug/L		**1**	< 0.70	0.7	< 0.70	0.7
Bromochloromethane	74-97-5	ug/L		**5**	< 1.0	1	< 1.0	1
Bromodichloromethane	75-27-4	ug/L		**50**	< 1.0	1	< 1.0	1
Bromoform	75-25-2	ug/L		**50**	< 1.0	1	< 1.0	1
Bromomethane	74-83-9	ug/L		**5**	< 2.0	2	< 2.0	2
Carbon Disulfide	75-15-0	ug/L			< 1.0	1	< 1.0	1
Carbon tetrachloride	56-23-5	ug/L		**5**	< 1.0	1	< 1.0	1
Chlorobenzene	108-90-7	ug/L		**5**	< 2.0	2	< 2.0	2
Chloroethane	75-00-3	ug/L		**5**	< 2.0	2	< 2.0	2
Chloroform	67-66-3	ug/L		**7**	< 2.0	2	< 2.0	2
Chloromethane	74-87-3	ug/L		**5**	< 2.0	2	< 2.0	2
cis-1,2-Dichloroethene	156-59-2	ug/L		**5**	< 1.0	1	< 1.0	1
cis-1,3-Dichloropropene	10061-01-5	ug/L		**0.4**	< 0.40	0.4	< 0.40	0.4
Cyclohexane	110-82-7	ug/L			< 5.0	5	< 5.0	5
Dibromochloromethane	124-48-1	ug/L		**50**	< 1.0	1	< 1.0	1
Dichlorodifluoromethane	75-71-8	ug/L		**5**	< 1.0	1	< 1.0	1
Ethylbenzene	100-41-4	ug/L		**5**	< 1.0	1	< 1.0	1
Isopropylbenzene	98-82-8	ug/L		**5**	< 1.0	1	< 1.0	1
m&p-Xylene	179601-23-1	ug/L			< 1.0	1	< 1.0	1
Methyl ethyl ketone	78-93-3	ug/L		**50**	< 5.0	5	< 5.0	5
Methyl t-butyl ether (MTBE)	1634-04-4	ug/L			< 1.0	1	< 1.0	1
Methylacetate	79-20-9	ug/L			< 2.5	2.5	< 2.5	2.5
Methylcyclohexane	108-87-2	ug/L			< 2.0	2	< 2.0	2
Methylene chloride	75-09-2	ug/L		**5**	< 3.0	3	< 3.0	3
o-Xylene	95-47-6	ug/L		**5**	< 1.0	1	< 1.0	1
Styrene	100-42-5	ug/L		**5**	< 1.0	1	< 1.0	1
Tetrachloroethene	127-18-4	ug/L		**5**	< 1.0	1	< 1.0	1
Toluene	108-88-3	ug/L		**5**	< 2.0	2	< 2.0	2
Total Xylenes	1330-20-7	ug/L		**5**	< 1.0	1	< 1.0	1
trans-1,2-Dichloroethene	156-60-5	ug/L		**5**	< 2.0	2	< 2.0	2
trans-1,3-Dichloropropene	10061-02-6	ug/L		**0.4**	< 0.40	0.4	< 0.40	0.4
Trichloroethene	79-01-6	ug/L		**5**	< 1.0	1	< 1.0	1
Trichlorofluoromethane	75-69-4	ug/L		**5**	< 1.0	1	< 1.0	1
Trichlorotrifluoroethane	76-13-1	ug/L		**5**	< 1.0	1	< 1.0	1
Vinyl chloride	75-01-4	ug/L		**2**	< 1.0	1	< 1.0	1

Result Detected	**BOLD**
RL Exceeds Criteria	*ITALIC*
Result Exceeds Criteria	**BOLD**
ug/L	micrograms per liter
RL	Reporting Limit

Table 7
Soil Vapor and Indoor/Outdoor Air Sample Analytical Data Summary
60 McLean Avenue, Yonkers, NY

LOCATION							SV-2A		SV-3A		SV-4A		SV-5A		SV-6A		SV-7A		SV-8A		SV-9A		SV-10A		IA-1A		IA-2A		IA-3A		IA-4A		OA-1A		OA-2A		SV-DUP	
SAMPLING DATE	NY-IAC-A	NY-IAC-B	NY-IAC-C	NY-SSC-A	NY-SSC-B	NY-SSC-C	5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022		5/4/2022	
LAB SAMPLE ID							L2224094-01		L2224094-02		L2224094-15		L2224094-03		L2224094-05		L2224094-06		L2224094-07		L2224094-10		L2224094-11		L2224094-14		L2224094-04		L2224094-13		L2224094-12		L2224094-08		L2224094-17		L2224094-09	
SAMPLE TYPE							SOIL_VAPOR		SOIL_VAPOR		SOIL_VAPOR		SOIL_VAPOR		SOIL_VAPOR		SOIL_VAPOR		SOIL_VAPOR		SOIL_VAPOR		SOIL_VAPOR		AIR		AIR		AIR		AIR		AIR		SOIL_VAPOR	
							Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
Volatile Organics in Air																																						
Dichlorodifluoromethane	~	~	~	~	~	~	3.04		2.43		ND		2.49		2.8		2.5		2.79		2.49		2.61		3.01		2.85		2.75		2.97		2.76		2.87		2.34	
Chloromethane	~	~	~	~	~	~	ND		ND		ND		0.661		0.774		0.502		ND		0.434		ND		1.64		1.64		1.52		1.57		1.39		1.51		ND	
Freon-114	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		1.4	U	ND		ND		ND	
Vinyl chloride	~	~	0.2	~	~	**6**	ND		ND		ND		ND		ND		ND		ND		ND		ND		-	-	-	-	-	-	-	-	-	-	-	-	ND	
1,3-Butadiene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		0.743		ND		ND		ND		ND		ND		ND	
Bromomethane	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroethane	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethanol	~	~	~	~	~	~	22		159		ND		51.3		213		62.4		25.2		53.1		39		53.3		67.5		19.8		11		16.1		13.8		90.8	
Vinyl bromide	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Acetone	~	~	~	~	~	~	52		76.7		16.8		33.3		318		150		117		87.7		75.3		23.5		12		257		9.17		123		ND		132	
Trichlorofluoromethane	~	~	~	~	~	~	1.38		1.19		ND		ND		1.3		1.46		1.18		ND		1.16		1.33		1.28		1.26		1.24		1.21		1.25		ND	
Isopropanol	~	~	~	~	~	~	3.37		5.16		ND		1.72		27.8		7.03		3.79		63.4		4.45		8.33		1.95		9.76		1.67		7.79		1.57		10.6	
1,1-Dichloroethene	0.2	~	~	**6**	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		-	-	-	-	-	-	-	-	-	-	-	-	ND	
Tertiary butyl Alcohol	~	~	~	~	~	~	ND		2.75		ND		ND		11.8		7.09		2.62		4.4		2.09		ND		ND		ND		ND		ND		ND		4.27	
Methylene chloride	~	3	~	~	**100**	~	ND		ND		ND		ND		ND		ND		ND		ND		**3.93**		ND		ND		ND		ND		ND		**5.04**		ND	
3-Chloropropene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon disulfide	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		2.38		ND		1.17		ND		ND		ND		ND		ND		ND		ND	
Freon-113	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
trans-1,2-Dichloroethene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethane	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Methyl tert butyl ether	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Butanone	~	~	~	~	~	~	4.63		6.34		ND		4.22		16.3		11.7		7.11		6.55		12.7		ND		2.29		2.49		3.89		1.65		ND		6.4	
cis-1,2-Dichloroethene	0.2	~	~	**6**	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		-	-	-	-	-	-	-	-	-	-	-	-	ND	
Ethyl Acetate	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		2.34		ND		ND		ND	
Chloroform	~	~	~	~	~	~	ND		1.03		ND		6.06		ND		38.6		1.05		ND		18.1		ND		ND		ND		ND		ND		ND		ND	
Tetrahydrofuran	~	~	~	~	~	~	1.7		ND		ND		ND		ND		ND		ND		2.6		ND		ND		ND		ND		2.02		ND		ND		ND	
1,2-Dichloroethane	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
n-Hexane	~	~	~	~	~	~	ND		ND		4.72		1.1		1.01		1.07		0.754		4.76		165		11.5		24.1		90.2		16.9		47.2		6.13		2.28	
1,1,1-Trichloroethane	~	3	~	~	**100**	~	ND		ND		ND		ND		2.65		ND		2.4		ND		ND		-	-	-	-	-	-	-	-	-	-	-	-	ND	
Benzene	~	~	~	~	~	~	0.696		ND		ND		0.709		0.872		ND		1.75		1.51		36.1		3.39		6.71		2.42		2.55		2.36		0.901		ND	
Carbon tetrachloride	0.2	~	~	**6**	~	~	ND		ND		ND		2.23		ND		1.32		ND		ND		ND		-	-	-	-	-	-	-	-	-	-	-	-	ND	
Cyclohexane	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		78.8		1.92		5.27		6.71		7.13		4.06		0.747		ND	
1,2-Dichloropropane	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromodichloromethane	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,4-Dioxane	~	~	~	~	~	~	ND		ND		ND		ND		0.818		1.66		ND		0.948		ND		ND		ND		ND		ND		ND		ND		ND	
Trichloroethene	0.2	~	~	**6**	~	~	ND		ND		ND		ND		3.14		1.11		ND		ND		ND		-	-	-	-	-	-	-	-	-	-	-	-	ND	
2,2,4-Trimethylpentane	~	~	~	~	~	~	ND		ND		ND		ND		1.41		ND		1.01		ND		ND		2.56		20		3.15		2.78		2.7		1.08		ND	
Heptane	~	~	~	~	~	~	ND		ND		1320		ND		1.09		0.959		0.906		2.95		58.6		2.5		8.03		2.23		24		2.75		0.844		1.97	
cis-1,3-Dichloropropene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
4-Methyl-2-pentanone	~	~	~	~	~	~	ND		ND		44.3		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
trans-1,3-Dichloropropene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2-Trichloroethane	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Toluene	~	~	~	~	~	~	4.33		3.64		ND		3.71		6.14		5.5		6.48		8.93		19.5		7.61		35.4		6.33		4.97		5.05		2.4		9.12	
2-Hexanone	~	~	~	~	~	~	ND		ND		ND		ND		1.76		1.06		ND		0.832		ND		ND		ND		ND		ND		ND		ND		ND	
Dibromochloromethane	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dibromoethane	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Tetrachloroethene	~	3	~	~	**100**	~	44.1		32.9		28		**368**		96.3		79.3		**296**		21.2		41.2		-	-	-	-	-	-	-	-	-	-	-	-	15.9	
Chlorobenzene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethylbenzene	~	~	~	~	~	~	ND		ND		ND		2.36		4.82		ND		0.947		1.01		ND		1.96		8.21		2.05		3.17		1.62		ND		ND	
p/m-Xylene	~	~	~	~	~	~	2.47		1.84		ND		7.08		13.5		2.57		3.11		3.12		2.85		5.82		28.7		6.73		5.47		5.26		ND		2.77	
Bromoform	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		2.07	U	ND		ND	
Styrene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		0.852	U	ND		ND	
1,1,2,2-Tetrachloroethane	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		1.37	U	ND		ND	
o-Xylene	~	~	~	~	~	~	0.921		ND		ND		2.04		3.4		0.899		1.23		1.19		1.35		2.43		11.6		3.14		1.46		2.39		ND		1.26	
4-Ethyltoluene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		2.5		1.01		1.56		0.983	U	ND		ND	
1,3,5-Trimethylbenzene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		1.31		2.85		1.07		ND		0.983	U	ND		ND	
1,2,4-Trimethylbenzene	~	~	~	~	~	~	1.46		1.05		ND		ND		1.8		1.06		1.83		1.87		2.35		4.92		11.4		4.65		5.8		3.65		ND		2.35	
Benzyl chloride	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		1.04	U	ND		ND	
1,3-Dichlorobenzene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		1.2	U	ND		ND	
1,4-Dichlorobenzene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		1.2	U	ND		ND	
1,2-Dichlorobenzene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		1.2	U	ND		ND	
1,2,4-Trichlorobenzene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		1.48	U	ND		ND	
Hexachlorobutadiene	~	~	~	~	~	~	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		2.13	U	ND		ND	
Volatile Organics in Air by SIM																																						
Vinyl chloride	~	~	0.2	~	~	**6**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND		ND		ND		ND		ND		ND		-	-
1,1-Dichloroethene	0.2	~	~	**6**	~	~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND		ND		ND		ND		ND		ND		-	-
cis-1,2-Dichloroethene	0.2	~	~	**6**	~	~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND		ND		ND		ND		ND		ND		-	-
1,1,1-Trichloroethane	~	3	~	~	**100**	~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND		ND		ND		ND		ND		ND		-	-
Carbon tetrachloride	0.2	~	~	**6**	~	~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.61		0.547		0.579		0.642		0.566		0.566		-	-
Trichloroethene	0.2	~	~	**6**	~	~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND		ND		ND		ND		ND		ND		-	-
Tetrachloroethene	~	3	~	~	**100**	~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.231		0.264		0.264		1.28		0.237		0.156		-	-
Total BTEX							8.417		5.48		0		15.899		28.732		8.969		13.517		15.76		59.8		21.21		90.62		20.67		17.62		16.68		3.301		13.15	
Total VOCS							142.097		294.03		1413.82		486.98		730.484		377.79		479.537		272.924		562.33		138.614		255.091		425.113		114.982		246.251		38.864		282.06	

* Comparison is not performed on parameters with non-numeric criteria.
ug/m3 - micrograms per cubic meter
U - compound not detected
J - lab estimated value
NY-IAC-A: New York DOH Matrix A Indoor Air Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.
NY-IAC-B: New York DOH Matrix B Indoor Air Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.
NY-IAC-C: New York DOH Matrix C Indoor Air Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.
NY-SSC-A: New York DOH Matrix A Sub-slab Vapor Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.
NY-SSC-B: New York DOH Matrix B Sub-slab Vapor Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.
NY-SSC-C: New York DOH Matrix C Sub-slab Vapor Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.

Table 8: 6 NYCRR Part 375 Soil Cleanup Objectives

Unrestricted Use, Restricted-Residential and Protection of Groundwater

CAS Number	Parameter Name	Parameter ID	NYCRR 375 Unrestricted Use	NYCRR 375 Restricted-Residential	NYCRR 375 Protection of Groundwater
630-20-6	1,1,1,2-Tetrachloroethane	VOC	NA	NA	NA
71-55-6	1,1,1-Trichloroethane	VOC	680	100,000a	680
79-34-5	1,1,2,2-Tetrachloroethane	VOC	NA	NA	600
79-00-5	1,1,2-Trichloroethane	VOC	NA	NA	NA
76-13-1	1,1,2 Trichloro-1,2,2 Trifluoroethane	VOC	NA	NA	NA
75-34-3	1,1-Dichloroethane	VOC	270	26000	270
75-35-4	1,1-Dichloroethene	VOC	330	100,000a	330
96-18-4	1,2,3-Trichloropropane	VOC	NA	NA	340
120-82-1	1,2,4-Trichlorobenzene	VOC	NA	NA	3400
95-63-6	1,2,4-Trimethylbenzene	VOC	3,600	52000	3600
96-12-8	1,2-Dibromo-3-Chloropropane	VOC	NA	NA	NA
106-93-4	1,2-Dibromoethane	VOC	NA	NA	NA
95-50-1	1,2-Dichlorobenzene	VOC	1,100	100,000a	1100
107-06-2	1,2-Dichloroethane	VOC	20c	3100	20f
78-87-5	1,2-Dichloropropane	VOC	NA	NA	NA
108-67-8	1,3,5-Trimethylbenzene	VOC	8,400	52000	8400
541-73-1	1,3-Dichlorobenzene	VOC	2,400	49000	2400
142-28-9	1,3-Dichloropropane	VOC	NA	NA	300
542-75-6	1,3-Dichloropropene(cis and trans)	VOC	NA	NA	NA
106-46-7	1,4-Dichlorobenzene	VOC	1,800	13000	1800
123-91-1	1,4-Dioxane	VOC	100b	13000	100e
78-93-3	2-Butanone	VOC	120	100,000a	120
95-49-8	2-Chlorotoluene	VOC	NA	NA	NA
108-10-1	4-Methyl-2-Pentanone	VOC	NA	NA	1000
67-64-1	Acetone	VOC	50	100,000b	50
107-02-8	Acrolein	VOC	NA	NA	NA
107-13-1	Acrylonitrile	VOC	NA	NA	NA
71-43-2	Benzene	VOC	60	4800	60
74-97-5	Bromochloromethane	VOC	NA	NA	NA
75-27-4	Bromodichloromethane	VOC	NA	NA	NA
75-25-2	Bromoform	VOC	NA	NA	NA
74-83-9	Bromomethane	VOC	NA	NA	NA
75-15-0	Carbon Disulfide	VOC	NA	NA	2700
56-23-5	Carbon Tetrachloride	VOC	760	2400	760
108-90-7	Chlorobenzene	VOC	1,100	100,000a	1100
124-48-1	Chlorodibromomethane	VOC	NA	NA	NA
75-00-3	Chloroethane	VOC	NA	NA	1900
67-66-3	Chloroform	VOC	370	49000	370
74-87-3	Chloromethane	VOC	NA	NA	NA
156-59-2	cis-1,2-Dichloroethene	VOC	250	100,000a	250
74-95-3	Dibromomethane	VOC	NA	NA	NA
75-71-8	Dichlorodifluoromethane	VOC	NA	NA	NA
100-41-4	Ethylbenzene	VOC	1,000	41000	1000
98-82-8	Isopropylbenzene	VOC	NA	NA	2300
79-20-9	Methyl Acetate	VOC	NA	NA	NA
75-09-2	Methylene Chloride	VOC	50	100,000a	50
1634-04-4	Methyl Tert-Butyl Ether	VOC	930	100,000a	930
104-51-8	n-Butylbenzene	VOC	12,000	100,000a	12000
103-65-1	n-Propylbenzene	VOC	3,900	100,000a	3900
99-87-6	p-Isoproplytoluene	VOC	NA	NA	10000
135-98-8	sec-Butylbenzene	VOC	11,000	100,000a	11000
100-42-5	Styrene	VOC	NA	NA	NA
98-06-6	tert-Butylbenzene	VOC	5,900	100,000a	5900
75-65-0	Tertiary Butyl Alcohol	VOC	NA	NA	NA
127-18-4	Tetrachloroethene	VOC	1,300	19000	1300
108-88-3	Toluene	VOC	700	100,000a	700
1330-20-7	Total Xylenes	VOC	260	100,000a	1600
156-60-5	trans-1,2-Dichloroethene	VOC	190	100,000a	190
79-01-6	Trichloroethene	VOC	470	21000	470
75-69-4	Trichlorofluoromethane	VOC	NA	NA	NA
108-05-4	Vinyl Acetate	VOC	NA	NA	NA
75-01-4	Vinyl Chloride	VOC	20	900	20

Table 8: 6 NYCRR Part 375 Soil Cleanup Objectives

Unrestricted Use, Restricted-Residential and Protection of Groundwater

CAS Number	Parameter Name	Parameter ID	NYCRR 375 Unrestricted Use	NYCRR 375 Restricted-Residential	NYCRR 375 Protection of Groundwater
87-68-3	Hexachlorobutadiene	SVOC	NA	NA	NA
92-52-4	1-1- Biphenyl	SVOC	NA	NA	NA
122-66-7	1,2- Diphenylhydrazine	SVOC	NA	NA	NA
95-94-3	1,2,4,5-Tetrachlorobenzene	SVOC		NA	NA
58-90-2	2,3,4,6-Tetrachlorophenol	SVOC		NA	NA
95-95-4	2,4,5-Trichlorophenol	SVOC	NA	NA	100
88-06-2	2,4,6-Trichlorophenol	SVOC	NA	NA	NA
120-83-2	2,4-Dichlorophenol	SVOC	NA	NA	400
105-67-9	2,4-Dimethylphenol	SVOC	NA	NA	NA
51-28-5	2,4-Dinitrophenol	SVOC	NA	NA	200
121-14-2	2,4-Dinitrotoluene	SVOC	NA	NA	NA
606-20-2	2,6-Dinitrotoluene	SVOC	NA	NA	170
91-58-7	2-Chloronaphthalene	SVOC	NA	NA	NA
95-57-8	2-Chlorophenol	SVOC	NA	NA	NA
91-57-6	2-Methylnaphthalene	SVOC	NA	NA	NA
95-48-7	2-Methylphenol	SVOC	330b	100,000a	330e
88-74-4	2-Nitroaniline	SVOC	NA	NA	400
88-75-5	2-Nitrophenol	SVOC	NA	NA	300
91-94-1	3,3-Dichlorobenzidine	SVOC	NA	NA	NA
108-39-4	m-Cresol(s)	SVOC	330b	100,000a	330e
99-09-2	3-Nitroaniline	SVOC	NA	NA	500
534-52-1	4,6-Dinitro-2-methylphenol	SVOC	NA	NA	NA
59-50-7	4-Chloro-3-methylphenol	SVOC	NA	NA	NA
106-47-8	4-Chloroaniline	SVOC	NA	NA	220
106-44-5	4-Methylphenol	SVOC	330b	100,000a	330e
15831-10-4	3+4 Methylphenol	SVOC		100,000a	330e
100-01-6	4-Nitroaniline	SVOC	NA	NA	NA
100-02-7	4-Nitrophenol	SVOC	NA	NA	100
83-32-9	Acenaphthene	SVOC	20,000	100,000a	98000
208-96-8	Acenaphthylene	SVOC	100,000a	100,000a	107000
98-86-2	Acetophenone	SVOC	NA	NA	NA
62-53-3	Aniline	SVOC	NA	100000	330
120-12-7	Anthracene	SVOC	100,000a	100,000a	1,000,000c
1912-24-9	Atrazine	SVOC	NA	NA	NA
100-52-7	Benzaldehyde	SVOC	NA	NA	NA
92-87-5	Benzidine	SVOC	NA	NA	NA
56-55-3	Benzo-a-Anthracene	SVOC	1,000c	1,000f	1,000f
50-32-8	Benzo-a-Pyrene	SVOC	1,000c	1,000f	22000
205-99-2	Benzo-b-Fluoranthene	SVOC	1,000c	1,000f	1700
207-08-9	Benzo-k-Fluoranthene	SVOC	800c	3900	1700
191-24-2	Benzo-g,h,i-Perylene	SVOC	100,000	100,000a	1,000,000c
65-85-0	Benzoic Acid	SVOC	NA	NA	100000
100-51-6	Benzyl Alcohol	SVOC	NA	NA	NA
111-44-4	Bis(2-Chloroethyl)ether	SVOC	NA	NA	NA
108-60-1	Bis(2-Chloroisopropyl)ether	SVOC	NA	NA	NA
117-81-7	Bis(2-Ethylhexyl)Phthalate	SVOC	NA	NA	435000
85-68-7	Butylbenzylphthalate	SVOC	NA	NA	122000
105-60-2	Caprolactam	SVOC	NA	NA	NA
86-74-8	Carbazole	SVOC	NA	NA	NA
218-01-9	Chrysene	SVOC	1,000c	3900	1,000f
75-99-0	Dalapon	SVOC		NA	NA
132-64-9	Dibenzofuran	SVOC	7,000	59000	6200
53-70-3	Dibenzo-a,h-Anthracene	SVOC	330b	330e	1,000,000c
84-66-2	Diethyl Phthalate	SVOC	NA	NA	7100
131-11-3	Dimethyl Phthalate	SVOC	NA	NA	27000
84-74-2	Di-n-Butyl Phthalate	SVOC	NA	NA	8100
25321-14-6	Dinitrotoluene(2,4-/2,6-)	SVOC	NA	NA	NA
117-84-0	Di-n-Octyl Phthalate	SVOC	NA	NA	120000
206-44-0	Fluoranthene	SVOC	100,000	100,000a	1,000,000c
86-73-7	Fluorene	SVOC	30,000	100,000a	386000
118-74-1	Hexachlorobenzene	SVOC	330	1200	3200
77-47-4	Hexachlorocyclopentadiene	SVOC	NA	NA	NA
67-72-1	Hexachloroethane	SVOC	NA	NA	NA
193-39-5	Indeno(1,2,3-cd)Pyrene	SVOC	500c	500f	8200
78-59-1	Isophorone	SVOC	NA	NA	4400
91-20-3	Naphthalene	SVOC	12,000	100,000a	12000
98-95-3	Nitrobenzene	SVOC	NA	15000	170
62-75-9	N-Nitrosodimethylamine	SVOC	NA	NA	NA
621-64-7	N-Nitroso-di-n-Propylamine	SVOC	NA	NA	NA
86-30-6	N-Nitrosodiphenylamine	SVOC	NA	NA	NA
87-86-5	Pentachlorophenol	SVOC	800b	6700	800e
85-01-8	Phenanthrene	SVOC	100,000	100,000a	1,000,000c
108-95-2	Phenol	SVOC	330b	100,000a	330e
129-00-0	Pyrene	SVOC	100000	100,000a	1,000,000c

Table 8: 6 NYCRR Part 375 Soil Cleanup Objectives

Unrestricted Use, Restricted-Residential and Protection of Groundwater

CAS Number	Parameter Name	Parameter ID	NYCRR 375 Unrestricted Use	NYCRR 375 Restricted-Residential	NYCRR 375 Protection of Groundwater
93-76-5	2,4,5-T	HERBICIDE	NA	NA	1900
93-72-1	2,4,5-TP Acid	PESTICIDE	3,800	100,000a	3800
94-75-7	2,4-D	HERBICIDE	NA	NA	500
72-54-8	4,4-DDD	PESTICIDE	3.3b	13000	14000
72-55-9	4,4-DDE	PESTICIDE	3.3b	8900	17000
50-29-3	4,4-DDT	PESTICIDE	3.3b	7900	136000
309-00-2	Aldrin	PESTICIDE	5c	97	190
319-84-6	alpha-BHC	PESTICIDE	20	480	20
5103-71-9	Alpha Chlordane	PESTICIDE	94	4200	2900
12674-11-2	Aroclor 1016	PCB	NA	NA	NA
11104-28-2	Aroclor 1221	PCB	NA	NA	NA
11141-16-5	Aroclor 1232	PCB	NA	NA	NA
53469-21-9	Aroclor 1242	PCB	NA	NA	NA
12672-29-6	Aroclor 1248	PCB	NA	NA	NA
11097-69-1	Aroclor 1254	PCB	NA	NA	NA
11096-82-5	Aroclor 1260	PCB	NA	NA	NA
37324-23-5	Aroclor 1262	PCB		NA	NA
11100-14-4	Aroclor 1268	PCB		NA	NA
319-85-7	beta-BHC	PESTICIDE	36	360	90
57-74-9	Chlordane	PESTICIDE	94	4200	2900
319-86-8	delta-BHC	PESTICIDE	40	100,000a	250
1918-00-9	Dicamba	HERBICIDE	NA	NA	NA
60-57-1	Dieldrin	PESTICIDE	5	200	100
115-29-7	Endosulfan	PESTICIDE	2400	NA	NA
959-98-8	Endosulfan I	PESTICIDE	2,400	24,000i	102000
33213-65-9	Endosulfan II	PESTICIDE	2,400	24,000i	102000
1031-07-8	Endosulfan Sulfate	PESTICIDE	2,400	24,000i	1,000,000c
72-20-8	Endrin	PESTICIDE	14	11000	60
58-89-9	gamma-BHC	PESTICIDE	100	1300	100
5103-74-2	Gamma Chlordane	PESTICIDE	NA	NA	14000
76-44-8	Heptachlor	PESTICIDE	42	2100	380
1024-57-3	Heptachlor Epoxide	PESTICIDE	NA	NA	20
72-43-5	Methoxychlor	PESTICIDE	NA	NA	900000
56-38-2	Parathion	PESTICIDE	NA	NA	1200
1336-36-3	Polychlorinated Biphenyls	PCBs	100	1000	3200
8001-35-2	Toxaphene	PESTICIDE	NA	NA	NA
	Unit		*mg/kg*	*mg/kg*	*mg/kg*
7429-90-5	Aluminum, Al	METAL	NA	NA	NA
7440-36-0	Antimony, Sb	METAL	NA	NA	NA
7440-38-2	Arsenic, As	METAL	13c	16f	16f
7440-39-3	Barium, Ba	METAL	350c	400	820
7440-41-7	Beryllium, Be	METAL	7.2	72	47
7440-42-8	Boron, B	METAL		NA	NA
7440-43-9	Cadmium, Cd	METAL	2.5c	4.3	7.5
7440-47-3	Chromium, Cr	METAL	NA	110	NA
18540-29-9	Chromium, hexavalent	METAL	1b	110	19
16065-83-1	Chromium, trivalent	METAL	30c	180	NA
7440-48-4	Cobalt, Co	METAL	NA	NA	NA
7440-50-8	Copper, Cu	METAL	50	270	1720
57-12-5	Cyanide	METAL	27	27	40
7439-89-6	Iron, Fe	METAL	NA	NA	NA
7439-92-1	Lead, Pb	METAL	63c	400	450
7439-96-5	Manganese, Mn	METAL	1,600c	2,000f	2,000f
7439-97-6	Mercury, Hg	METAL	.18c	.81j	0.73
7440-02-0	Nickel, Ni	METAL	30	310	130
7782-49-2	Selenium, Se	METAL	3.9c	180	4f
7440-22-4	Silver, Ag	METAL	2	180	8.3
7440-31-5	Tin, Sn	METAL		NA	NA
7440-28-0	Thallium, Tl	METAL	NA	NA	NA
7440-62-2	Vanadium, V	METAL	NA	NA	NA
7440-66-6	Zinc, Zn	METAL	109c	10,000d	2480
pH	pH	pH		NA	NA

Table 8
Post Remedial Groundwater Analytical Results
46-70 McLean Avenue, Yonkers, NY - BCP #C360211

LOCATION				MW-4B		MW-6B		MW-14		MW-12		MW-2B		MW-DUP		FIELD BLANK	
SAMPLING DATE				9/19/2025		9/19/2025		9/19/2025		9/19/2025		9/19/2025		9/19/2025		9/19/2025	
LAB SAMPLE ID				L2559574-01		L2559574-02		L2559574-03		L2559574-04		L2559574-05		L2559574-06		L2559574-07	
SAMPLE TYPE				WATER		WATER		WATER		WATER		WATER		WATER		WATER	
SAMPLE DEPTH (ft.)																	
	CasNum	NY-AWQS	Units	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
Semivolatile Organics by GC/MS																	
1,2,4-Trichlorobenzene	120-82-1	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Bis(2-chloroethyl)ether	111-44-4	1	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
1,2-Dichlorobenzene	95-50-1	3	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
1,3-Dichlorobenzene	541-73-1	3	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
1,4-Dichlorobenzene	106-46-7	3	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
3,3'-Dichlorobenzidine	91-94-1	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2,4-Dinitrotoluene	121-14-2	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2,6-Dinitrotoluene	606-20-2	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
4-Chlorophenyl phenyl ether	7005-72-3		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
4-Bromophenyl phenyl ether	101-55-3		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
Bis(2-chloroisopropyl)ether	108-60-1	5	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
Bis(2-chloroethoxy)methane	111-91-1	5	ug/l	5	U	2.5	J	0.96	J	5	U	5	U	5	U	-	-
Hexachlorocyclopentadiene	77-47-4	5	ug/l	20	U	20	U	20	U	20	U	20	U	20	U	-	-
Isophorone	78-59-1	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Nitrobenzene	98-95-3	0.4	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
NDPA/DPA	86-30-6	50	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
n-Nitrosodi-n-propylamine	621-64-7		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Bis(2-ethylhexyl)phthalate	117-81-7	5	ug/l	3	U	3	U	3	U	38		3	U	3	U	-	-
Butyl benzyl phthalate	85-68-7	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Di-n-butylphthalate	84-74-2	50	ug/l	5	U	5	U	1	J	1.2	J	1.4	J	1.3	J	-	-
Di-n-octylphthalate	117-84-0	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Diethyl phthalate	84-66-2	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Dimethyl phthalate	131-11-3	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Biphenyl	92-52-4		ug/l	2	U	0.49	J	2	U	0.27	J	2	U	2	U	-	-
4-Chloroaniline	106-47-8	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2-Nitroaniline	88-74-4	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
3-Nitroaniline	99-09-2	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
4-Nitroaniline	100-01-6	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Dibenzofuran	132-64-9		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
1,2,4,5-Tetrachlorobenzene	95-94-3	5	ug/l	10	U	10	U	10	U	10	U	10	U	10	U	-	-
Acetophenone	98-86-2		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2,4,6-Trichlorophenol	88-06-2		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
p-Chloro-m-cresol	59-50-7		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
2-Chlorophenol	95-57-8		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
2,4-Dichlorophenol	120-83-2	1	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2,4-Dimethylphenol	105-67-9	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2-Nitrophenol	88-75-5		ug/l	10	U	10	U	10	U	10	U	10	U	10	U	-	-
4-Nitrophenol	100-02-7		ug/l	10	U	10	U	10	U	10	U	10	U	10	U	-	-
2,4-Dinitrophenol	51-28-5	10	ug/l	20	U	20	U	20	U	20	U	20	U	20	U	-	-
4,6-Dinitro-o-cresol	534-52-1		ug/l	10	U	10	U	10	U	10	U	10	U	10	U	-	-
Phenol	108-95-2	1	ug/l	5	U	2.3	J	6.1		5	U	1.3	J	2.9	J	-	-
2-Methylphenol	95-48-7		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
3-Methylphenol/4-Methylphenol	108-39-4/106-44-5		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2,4,5-Trichlorophenol	95-95-4		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Benzoic Acid	65-85-0		ug/l	50	U	50	U	50	U	50	U	50	U	50	U	-	-
Benzyl Alcohol	100-51-6		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
Carbazole	86-74-8		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
Semivolatile Organics by GC/MS-SIM																	
Acenaphthene	83-32-9	20	ug/l	0.1	U	0.09	J	0.06	J	0.05	J	0.1	U	0.08	J	0.1	U
2-Chloronaphthalene	91-58-7	10	ug/l	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Fluoranthene	206-44-0	50	ug/l	0.1	U	0.06	J	0.04	J	0.03	J	0.1	U	0.05	J	0.1	U
Hexachlorobutadiene	87-68-3	0.5	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Naphthalene	91-20-3	10	ug/l	0.07	J	31		13		15		3		20		0.04	J
Benzo(a)anthracene	56-55-3	0.002	ug/l	0.1	U	0.04	J	0.1	U	0.04	J	0.03	J	0.1	U	0.1	U
Benzo(a)pyrene	50-32-8	0	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(b)fluoranthene	205-99-2	0.002	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(k)fluoranthene	207-08-9	0.002	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Chrysene	218-01-9	0.002	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Acenaphthylene	208-96-8		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Anthracene	120-12-7	50	ug/l	0.1	U	0.04	J	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Benzo(ghi)perylene	191-24-2		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U

Table 8
Post Remedial Groundwater Analytical Results
46-70 McLean Avenue, Yonkers, NY - BCP #C360211

LOCATION				MW-4B		MW-6B		MW-14		MW-12		MW-2B		MW-DUP		FIELD BLANK	
SAMPLING DATE				9/19/2025		9/19/2025		9/19/2025		9/19/2025		9/19/2025		9/19/2025		9/19/2025	
LAB SAMPLE ID				L2559574-01		L2559574-02		L2559574-03		L2559574-04		L2559574-05		L2559574-06		L2559574-07	
SAMPLE TYPE				WATER		WATER		WATER		WATER		WATER		WATER		WATER	
SAMPLE DEPTH (ft.)																	
	CasNum	NY-AWQS	Units	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
Fluorene	86-73-7	50	ug/l	0.1	U	0.08	J	0.05	J	0.05	J	0.1	U	0.07	J	0.1	U
Phenanthrene	85-01-8	50	ug/l	0.1	U	0.06	J	0.1	U	0.05	J	0.06	J	0.05	J	0.06	J
Dibenzo(a,h)anthracene	53-70-3		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Indeno(1,2,3-cd)pyrene	193-39-5	0.002	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Pyrene	129-00-0	50	ug/l	0.1	U	0.05	J	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
2-Methylnaphthalene	91-57-6		ug/l	0.05	J	10		5.8		6		3.2		9.8		0.1	U
Pentachlorophenol	87-86-5	1	ug/l	0.8	U	0.14	J	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U
Hexachlorobenzene	118-74-1	0.04	ug/l	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U
Hexachloroethane	67-72-1	5	ug/l	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U
Volatile Organics by GC/MS																	
Methylene chloride	75-09-2	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
1,1-Dichloroethane	75-34-3	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Chloroform	67-66-3	7	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Carbon tetrachloride	56-23-5	5	ug/l	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U
1,2-Dichloropropane	78-87-5	1	ug/l	1	U	2.5	U	1	U	2.5	U	1	U	2.5	U	1	U
Dibromochloromethane	124-48-1	50	ug/l	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U
1,1,2-Trichloroethane	79-00-5	1	ug/l	1.5	U	3.8	U	1.5	U	3.8	U	1.5	U	3.8	U	1.5	U
Tetrachloroethene	127-18-4	5	ug/l	0.5	U	1.2	U	0.18	J	1.2	U	0.5	U	1.2	U	0.5	U
Chlorobenzene	108-90-7	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Trichlorofluoromethane	75-69-4	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
1,2-Dichloroethane	107-06-2	0.6	ug/l	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U	4.3		0.5	U
1,1,1-Trichloroethane	71-55-6	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Bromodichloromethane	75-27-4	50	ug/l	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U
trans-1,3-Dichloropropene	10061-02-6	0.4	ug/l	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U
cis-1,3-Dichloropropene	10061-01-5	0.4	ug/l	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U
1,3-Dichloropropene, Total	542-75-6		ug/l	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U
1,1-Dichloropropene	563-58-6	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Bromoform	75-25-2	50	ug/l	2	U	5	U	2	U	5	U	2	U	5	U	2	U
1,1,2,2-Tetrachloroethane	79-34-5	5	ug/l	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U
Benzene	71-43-2	1	ug/l	1.8		230		0.5	U	5.9		2.6		280		0.5	U
Toluene	108-88-3	5	ug/l	2.5		36		2.5	U	8.8		1.4	J	26		2.5	U
Ethylbenzene	100-41-4	5	ug/l	15		99		2.5	U	21		8.8		74		2.5	U
Chloromethane	74-87-3		ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Bromomethane	74-83-9	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Vinyl chloride	75-01-4	2	ug/l	1	U	2.5	U	1	U	2.5	U	1	U	2.5	U	1	U
Chloroethane	75-00-3	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
1,1-Dichloroethene	75-35-4	5	ug/l	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U
trans-1,2-Dichloroethene	156-60-5	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Trichloroethene	79-01-6	5	ug/l	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U	1.2	U	0.5	U
1,2-Dichlorobenzene	95-50-1	3	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
1,3-Dichlorobenzene	541-73-1	3	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
1,4-Dichlorobenzene	106-46-7	3	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Methyl tert butyl ether	1634-04-4	10	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
p/m-Xylene	179601-23-1	5	ug/l	45		120		2.5	U	65		24		100		2.5	U
o-Xylene	95-47-6	5	ug/l	11		27		1.4	J	37		4.8		26		2.5	U
Xylenes, Total	1330-20-7		ug/l	56		150		1.4	J	100		29		130		2.5	U
cis-1,2-Dichloroethene	156-59-2	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
1,2-Dichloroethene, Total	540-59-0		ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Dibromomethane	74-95-3	5	ug/l	5	U	12	U	5	U	12	U	5	U	12	U	5	U
1,2,3-Trichloropropane	96-18-4	0.04	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Acrylonitrile	107-13-1	5	ug/l	5	U	12	U	5	U	12	U	5	U	12	U	5	U
Styrene	100-42-5	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Dichlorodifluoromethane	75-71-8	5	ug/l	5	U	12	U	5	U	12	U	5	U	12	U	5	U
Acetone	67-64-1	50	ug/l	5	U	12	U	2.2	J	12	U	3.4	J	12	U	2.5	J
Carbon disulfide	75-15-0	60	ug/l	5	U	12	U	5	U	12	U	5	U	12	U	5	U
2-Butanone	78-93-3	50	ug/l	5	U	12	U	5	U	12	U	5	U	12	U	5	U
Vinyl acetate	108-05-4		ug/l	5	U	12	U	5	U	12	U	5	U	12	U	5	U
4-Methyl-2-pentanone	108-10-1		ug/l	5	U	26		5	U	12		5	U	33		5	U
2-Hexanone	591-78-6	50	ug/l	5	U	12	U	5	U	12	U	5	U	12	U	5	U
Bromochloromethane	74-97-5	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
2,2-Dichloropropane	594-20-7	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
1,2-Dibromoethane	106-93-4	0.0006	ug/l	2	U	5	U	2	U	5	U	2	U	5	U	2	U

Table 8
Post Remedial Groundwater Analytical Results
46-70 McLean Avenue, Yonkers, NY - BCP #C360211

LOCATION				MW-4B		MW-6B		MW-14		MW-12		MW-2B		MW-DUP		FIELD BLANK	
SAMPLING DATE				9/19/2025		9/19/2025		9/19/2025		9/19/2025		9/19/2025		9/19/2025		9/19/2025	
LAB SAMPLE ID				L2559574-01		L2559574-02		L2559574-03		L2559574-04		L2559574-05		L2559574-06		L2559574-07	
SAMPLE TYPE				WATER		WATER		WATER		WATER		WATER		WATER		WATER	
SAMPLE DEPTH (ft.)																	
	CasNum	NY-AWQS	Units	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
1,3-Dichloropropane	142-28-9	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
1,1,1,2-Tetrachloroethane	630-20-6	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Bromobenzene	108-86-1	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
n-Butylbenzene	104-51-8	5	ug/l	0.88	J	8.5		2.5	U	5.4	J	2.5	U	7.2		2.5	U
sec-Butylbenzene	135-98-8	5	ug/l	0.93	J	11		2.5	U	8.5		2.5	U	10		2.5	U
tert-Butylbenzene	98-06-6	5	ug/l	2.5	U	3.1	J	2.5	U	1.8	J	2.5	U	2.9	J	2.5	U
o-Chlorotoluene	95-49-8	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
p-Chlorotoluene	106-43-4	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
1,2-Dibromo-3-chloropropane	96-12-8	0.04	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Hexachlorobutadiene	87-68-3	0.5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
Isopropylbenzene	98-82-8	5	ug/l	3.6		73		2.5	U	40		1.4	J	65		2.5	U
p-Isopropyltoluene	99-87-6	5	ug/l	1.5	J	14		2.5	U	13		2.5	U	11		2.5	U
Naphthalene	91-20-3	10	ug/l	4.1		56		2.5	U	42		1.6	J	35		2.5	U
n-Propylbenzene	103-65-1	5	ug/l	4		80		2.5	U	40		1.5	J	74		2.5	U
1,2,3-Trichlorobenzene	87-61-6	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
1,2,4-Trichlorobenzene	120-82-1	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
1,3,5-Trimethylbenzene	108-67-8	5	ug/l	8		27		2.5	U	68		2.4	J	25		2.5	U
1,2,4-Trimethylbenzene	95-63-6	5	ug/l	22		120		2.5	U	210		7.4		82		2.5	U
1,4-Dioxane	123-91-1	0.35	ug/l	250	U	620	U	250	U	620	U	250	U	620	U	250	U
p-Diethylbenzene	105-05-5		ug/l	5.7		13		2	U	7.1		2	U	12		2	U
p-Ethyltoluene	622-96-8		ug/l	21		50		1.6	J	86		9		42		2	U
1,2,4,5-Tetramethylbenzene	95-93-2	5	ug/l	1.2	J	23		2	U	13		2	U	20		2	U
Ethyl ether	60-29-7		ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U
trans-1,4-Dichloro-2-butene	110-57-6	5	ug/l	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U	6.2	U	2.5	U

* Comparison is not performed on parameters with non-numeric criteria.
U = Non Detect
AWQS = NYSDEC Ambient Water Quality Standards
ug/L = micrograms per liter
NY-AWQS: New York TOGS 111 Ambient Water Quality Standards & Guidance Values Criteria per Standards & Guidance Values including all addenda through February 2023.

Table 5

Post Gasoline UST Removal Endpoint Analytical Summary

46-70 McLean Avenue, Yonkers, NY (BCP #C360211)

		NYSDEC CP-51 Standards	6/18/2025	6/18/2025	6/18/2025	6/18/2025	6/18/2025
			TANK BOTTOM	TANK SIDEWALL NORTH-A	TANK SIDEWALL NORTH-B	TANK SIDEWALL SOUTH-A	TANK SIDEWALL SOUTH-B
			Soil	Soil	Soil	Soil	Soil
			Result	Result	Result	Result	Result
Miscellaneous/Inorganics							
Percent Solid	%		85	79	87	86	85
Volatile Organic Compounds By SW8260D							
1,2,4-Trimethylbenzene	ug/Kg	**3,600**	**130,000**	**11,000**	**19,000**	830	**20,000**
1,3,5-Trimethylbenzene	ug/Kg	**8,400**	**53,000**	4,000	7,300	310	**8,700**
Benzene	ug/Kg	**60**	**9,300**	**4,600**	ND	**700**	ND
Ethylbenzene	ug/Kg	**1,000**	**77,000**	**8,900**	**3,600**	310	**6,500**
Isopropylbenzene	ug/Kg	**2,300**	**18,000**	1,700	2,000	93	**2,500**
m&p-Xylene	ug/Kg		230,000	20,000	9,600	660	19,000
Methyl t-Butyl Ether (MTBE)	ug/Kg	**930**	ND	ND	ND	ND	ND
Naphthalene	ug/Kg	**12,000**	**31,000**	2,200	3,200	210	3,300
n-Butylbenzene	ug/Kg	**12,000**	10,000	1,000	2,500	ND	2,100
n-Propylbenzene	ug/Kg	**3,900**	**26,000**	2,600	3,700	140	3,800
o-Xylene	ug/Kg		68,000	8,000	2,500	150	4,500
p-Isopropyltoluene	ug/Kg	**10,000**	**14,000**	1,100	3,000	72	2,700
sec-Butylbenzene	ug/Kg	**11,000**	8,200	740	1,900	ND	1,700
tert-Butylbenzene	ug/Kg	**5,900**	800	ND	ND	ND	150
Toluene	ug/Kg	**700**	**110,000**	**16,000**	660	450	**850**
Total Xylenes	ug/Kg	**260**	**298,000**	**28,000**	**12,100**	**810**	**23,500**
Semivolatiles By SW8270E							
Acenaphthene	ug/Kg	**20,000**	ND	ND	ND	ND	ND
Acenaphthylene	ug/Kg	**100,000**	ND	ND	ND	ND	ND
Anthracene	ug/Kg	**100,000**	ND	ND	ND	ND	ND
Benz(a)anthracene	ug/Kg	**1,000**	ND	ND	ND	ND	ND
Benzo(a)pyrene	ug/Kg	**1,000**	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	ug/Kg	**1,000**	ND	ND	ND	ND	ND
Benzo(ghi)perylene	ug/Kg	**100,000**	2,300	ND	ND	ND	ND
Benzo(k)fluoranthene	ug/Kg	**800**	ND	ND	ND	ND	ND
Chrysene	ug/Kg	**1,000**	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	ug/Kg	**330**	**490**	ND	ND	ND	ND
Fluoranthene	ug/Kg	**100,000**	ND	ND	ND	ND	ND
Fluorene	ug/Kg	**30,000**	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ug/Kg	**500**	**1,900**	ND	ND	ND	ND
Naphthalene	ug/Kg	**12,000**	**16,000**	2,800	1,300	3,900	600
Phenanthrene	ug/Kg	**100,000**	ND	ND	ND	ND	ND
Pyrene	ug/Kg	**100,000**	ND	ND	ND	ND	ND

ND = Not Detected

Bold value indicated exceedance to SCO

ug/kg - micrograms per kilogram

Table 5
Post Gasoline UST Removal Endpoint Analytical Summary
46-70 McLean Avenue, Yonkers, NY (BCP #C360211)

Table 6

Post Ramp Excavation Endpoint Sample Analytical Summary

46-70 McLean Avenue, Yonkers, NY (BCP #C360211)

	Lab Sample Id					CT76711				CT76712			
	Collection Date					7/14/2025				7/14/2025			
	Client Id					EP-1-RAMP				EP-2-RAMP			
	Matrix					Soil				Soil			
Project Id : 15514													
	CAS	Units	NY-Com.	NY-ResRestrict	NY-UnRestricted SCO	Result	RL	Qual	MDL	Result	RL	Qual	MDL
Miscellaneous/Inorganics													
Percent Solid	PHNX - PCTSOLID	%				89				88			
Chromium, Hex. (SW3060A digestion)	18540-29-9	mg/Kg	400	110	1	< 0.54	0.54	U	0.54	< 0.41	0.41	U	0.41
pH at 22C - Soil	PHNX - PH	pH Units				7.88	1.00		1.00	7.91	1.00		1.00
Redox Potential	PHNX - REDOX	mV				188				182			
Total Cyanide (SW9010C Distill.)	57-12-5	mg/Kg	27	27	27	< 0.56	0.56	U	0.281	< 0.57	0.57	U	0.284
Metals, Total													
Arsenic	7440-38-2	mg/Kg	16	16	13	2.51	0.75		0.75	2.61	0.77		0.77
Barium	7440-39-3	mg/Kg	400	400	350	94.7	0.37		0.37	93.6	0.38		0.38
Beryllium	7440-41-7	mg/Kg	590	72	7.2	0.41	0.30		0.15	0.42	0.31		0.15
Cadmium	7440-43-9	mg/Kg	9.3	4.3	2.5	< 0.37	0.37	U	0.37	< 0.38	0.38	U	0.38
Chromium	7440-47-3	mg/Kg				25.3	0.37		0.37	27.2	0.38		0.38
Copper	7440-50-8	mg/kg	270	270	50	23.3	0.7		0.37	23.9	0.8		0.38
Lead	7439-92-1	mg/Kg	1,000	400	63	39.6	0.37		0.37	45.2	0.38		0.38
Manganese	7439-96-5	mg/Kg	10,000	2,000	1,600	223	0.37		0.37	227	0.38		0.38
Mercury	7439-97-6	mg/Kg	2.8	0.81	0.18	0.07	0.03		0.02	0.1	0.03		0.02
Nickel	7440-02-0	mg/Kg	310	310	30	17.2	0.37		0.37	17.6	0.38		0.38
Selenium	7782-49-2	mg/Kg	1,500	180	3.9	< 1.5	1.5	U	1.3	< 1.5	1.5	U	1.3
Silver	7440-22-4	mg/Kg	1,500	180	2	< 0.37	0.37	U	0.37	< 0.38	0.38	U	0.38
Trivalent Chromium	16065-83-1	mg/kg	1,500	180	30	25.3	0.37		0.37	27.2	0.38		0.38
Zinc	7440-66-6	mg/Kg	10,000	10,000	109	61.5	0.7		0.37	64.3	0.8		0.38
PCBs By SW8082A													
PCB-1016	12674-11-2	ug/Kg	1,000		100	< 74	74	U	74	< 75	75	U	75
PCB-1221	11104-28-2	ug/Kg	1,000		100	< 74	74	U	74	< 75	75	U	75
PCB-1232	11141-16-5	ug/Kg	1,000		100	< 74	74	U	74	< 75	75	U	75
PCB-1242	53469-21-9	ug/Kg	1,000		100	< 74	74	U	74	< 75	75	U	75
PCB-1248	12672-29-6	ug/Kg	1,000		100	< 74	74	U	74	< 75	75	U	75
PCB-1254	11097-69-1	ug/Kg	1,000		100	< 74	74	U	74	< 75	75	U	75
PCB-1260	11096-82-5	ug/Kg	1,000		100	< 74	74	U	74	< 75	75	U	75
PCB-1262	37324-23-5	ug/Kg			100	< 74	74	U	74	< 75	75	U	75
PCB-1268	11100-14-4	ug/Kg			100	< 74	74	U	74	< 75	75	U	75
Volatiles By SW8260D													
1,1,1,2-Tetrachloroethane	630-20-6	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
1,1,1-Trichloroethane	71-55-6	ug/Kg	500,000	100,000	680	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
1,1,2,2-Tetrachloroethane	79-34-5	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
1,1,2-Trichloroethane	79-00-5	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
1,1-Dichloroethane	75-34-3	ug/Kg	240,000	26,000	270	< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
1,1-Dichloroethene	75-35-4	ug/Kg	500,000	100,000	330	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
1,1-Dichloropropene	563-58-6	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
1,2,3-Trichlorobenzene	87-61-6	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
1,2,3-Trichloropropane	96-18-4	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
1,2,4-Trichlorobenzene	120-82-1	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
1,2,4-Trimethylbenzene	95-63-6	ug/Kg	190,000	52,000	3,600	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
1,2-Dibromo-3-chloropropane	96-12-8	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
1,2-Dibromoethane	106-93-4	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
1,2-Dichlorobenzene	95-50-1	ug/Kg	500,000	100,000	1,100	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
1,2-Dichloroethane	107-06-2	ug/Kg	30,000	3,100	20	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
1,2-Dichloropropane	78-87-5	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
1,3,5-Trimethylbenzene	108-67-8	ug/Kg	190,000	52,000	8,400	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
1,3-Dichlorobenzene	541-73-1	ug/Kg	280,000	49,000	2,400	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
1,3-Dichloropropane	142-28-9	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
1,4-Dichlorobenzene	106-46-7	ug/Kg	130,000	13,000	1,800	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
2,2-Dichloropropane	594-20-7	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
2-Chlorotoluene	95-49-8	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
2-Hexanone	591-78-6	ug/Kg				< 28	28	U	5.5	< 32	32	U	6.4
2-Isopropyltoluene	527-84-4	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
4-Chlorotoluene	106-43-4	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
4-Methyl-2-pentanone	108-10-1	ug/Kg				< 28	28	U	5.5	< 32	32	U	6.4
Acetone	67-64-1	ug/Kg	500,000	100,000	50	< 28	28	U	5.5	< 32	32	U	6.4
Acrylonitrile	107-13-1	ug/Kg				< 11	11	U	0.55	< 13	13	U	0.64
Benzene	71-43-2	ug/Kg	44,000	4,800	60	46	60	J	33	< 6.4	6.4	U	0.64
Bromobenzene	108-86-1	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Bromochloromethane	74-97-5	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Bromodichloromethane	75-27-4	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
Bromoform	75-25-2	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
Bromomethane	74-83-9	ug/Kg				< 5.5	5.5	U	2.2	< 6.4	6.4	U	2.6
Carbon Disulfide	75-15-0	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
Carbon tetrachloride	56-23-5	ug/Kg	22,000	2,400	760	< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
Chlorobenzene	108-90-7	ug/Kg	500,000	100,000	1,100	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Chloroethane	75-00-3	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Chloroform	67-66-3	ug/Kg	350,000	49,000	370	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Chloromethane	74-87-3	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
cis-1,2-Dichloroethene	156-59-2	ug/Kg	500,000	100,000	250	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
cis-1,3-Dichloropropene	10061-01-5	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Dibromochloromethane	124-48-1	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
Dibromomethane	74-95-3	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3

Table 6

Post Ramp Excavation Endpoint Sample Analytical Summary

46-70 McLean Avenue, Yonkers, NY (BCP #C360211)

	Lab Sample Id					CT76711				CT76712			
	Collection Date					7/14/2025				7/14/2025			
	Client Id					EP-1-RAMP				EP-2-RAMP			
	Matrix					Soil				Soil			
Project Id : 15514													
	CAS	Units	NY-Com.	NY-ResRestrict	NY-UnRestricted SCO	Result	RL	Qual	MDL	Result	RL	Qual	MDL
Dichlorodifluoromethane	75-71-8	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Ethylbenzene	100-41-4	ug/Kg	390,000	41,000	1,000	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Hexachlorobutadiene	87-68-3	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Isopropylbenzene	98-82-8	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
m&p-Xylene	179601-23-1	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
Methyl Ethyl Ketone	78-93-3	ug/Kg	500,000	100,000	120	< 28	28	U	5.5	< 32	32	U	6.4
Methyl t-butyl ether (MTBE)	1634-04-4	ug/Kg	500,000	100,000	930	< 11	11	U	1.1	< 13	13	U	1.3
Methylene chloride	75-09-2	ug/Kg	500,000	100,000	50	< 11	11	U	5.5	< 13	13	U	6.4
Naphthalene	91-20-3	ug/Kg	500,000	100,000	12,000	< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
n-Butylbenzene	104-51-8	ug/Kg	500,000	100,000	12,000	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
n-Propylbenzene	103-65-1	ug/Kg	500,000	100,000	3,900	< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
o-Xylene	95-47-6	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
p-Isopropyltoluene	99-87-6	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
sec-Butylbenzene	135-98-8	ug/Kg	500,000	100,000	11,000	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Styrene	100-42-5	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
tert-Butylbenzene	98-06-6	ug/Kg	500,000	100,000	5,900	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Tetrachloroethene	127-18-4	ug/Kg	150,000	19,000	1,300	< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
Tetrahydrofuran (THF)	109-99-9	ug/Kg				< 11	11	U	2.8	< 13	13	U	3.2
Toluene	108-88-3	ug/Kg	500,000	100,000	700	40	330	J	33	< 6.4	6.4	U	0.64
Total Xylenes	1330-20-7	ug/Kg		100,000	260	< 5.5	5.5	U	5.5	< 6.4	6.4	U	6.4
trans-1,2-Dichloroethene	156-60-5	ug/Kg	500,000	100,000	190	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
trans-1,3-Dichloropropene	10061-02-6	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
trans-1,4-dichloro-2-butene	110-57-6	ug/Kg				< 11	11	U	2.8	< 13	13	U	3.2
Trichloroethene	79-01-6	ug/Kg	200,000	21,000	470	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Trichlorofluoromethane	75-69-4	ug/Kg				< 5.5	5.5	U	1.1	< 6.4	6.4	U	1.3
Trichlorotrifluoroethane	76-13-1	ug/Kg				< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Vinyl chloride	75-01-4	ug/Kg	13,000	900	20	< 5.5	5.5	U	0.55	< 6.4	6.4	U	0.64
Semivolatiles By SW8270E													
1,2,4,5-Tetrachlorobenzene	95-94-3	ug/Kg				< 260	260	U	87	< 260	260	U	89
1,2,4-Trichlorobenzene	120-82-1	ug/Kg				< 260	260	U	110	< 260	260	U	110
1,2-Dichlorobenzene	95-50-1	ug/Kg	500,000	100,000	1,100	< 260	260	U	100	< 260	260	U	100
1,2-Diphenylhydrazine	122-66-7	ug/Kg				< 360	360	U	150	< 370	370	U	150
1,3-Dichlorobenzene	541-73-1	ug/Kg	280,000	49,000	2,400	< 260	260	U	110	< 260	260	U	110
1,4-Dichlorobenzene	106-46-7	ug/Kg	130,000	13,000	1,800	< 260	260	U	110	< 260	260	U	110
2,2'-Oxybis(1-Chloropropane)	108-60-1	ug/Kg				< 260	260	U	100	< 260	260	U	100
2,4,5-Trichlorophenol	95-95-4	ug/Kg				< 260	260	U	95	< 260	260	U	97
2,4,6-Trichlorophenol	88-06-2	ug/Kg				< 260	260	U	120	< 260	260	U	120
2,4-Dichlorophenol	120-83-2	ug/Kg				< 260	260	U	130	< 260	260	U	130
2,4-Dimethylphenol	105-67-9	ug/Kg				< 260	260	U	90	< 260	260	U	92
2,4-Dinitrophenol	51-28-5	ug/Kg				< 360	360	U	180	< 370	370	U	190
2,4-Dinitrotoluene	121-14-2	ug/Kg				< 260	260	U	140	< 260	260	U	150
2,6-Dinitrotoluene	606-20-2	ug/Kg				< 260	260	U	120	< 260	260	U	120
2-Chloronaphthalene	91-58-7	ug/Kg				< 260	260	U	100	< 260	260	U	110
2-Chlorophenol	95-57-8	ug/Kg				< 260	260	U	100	< 260	260	U	110
2-Methylnaphthalene	91-57-6	ug/Kg				< 260	260	U	110	< 260	260	U	110
2-Methylphenol (o-cresol)	95-48-7	ug/Kg	500,000	100,000	330	< 260	260	U	150	< 260	260	U	150
2-Nitroaniline	88-74-4	ug/Kg				< 360	360	U	150	< 370	370	U	150
2-Nitrophenol	88-75-5	ug/Kg				< 260	260	U	150	< 260	260	U	150
3&4-Methylphenol (m&p-cresol)	PHNX - M&P CRESOL	ug/Kg			330	< 330	330	U	140	< 330	330	U	150
3,3'-Dichlorobenzidine	91-94-1	ug/Kg				< 260	260	U	170	< 260	260	U	180
3-Nitroaniline	99-09-2	ug/Kg				< 360	360	U	150	< 370	370	U	150
4,6-Dinitro-2-methylphenol	534-52-1	ug/Kg				< 360	360	U	150	< 370	370	U	150
4-Bromophenyl phenyl ether	101-55-3	ug/Kg				< 360	360	U	110	< 370	370	U	110
4-Chloro-3-methylphenol	59-50-7	ug/Kg				< 260	260	U	130	< 260	260	U	130
4-Chloroaniline	106-47-8	ug/Kg				< 260	260	U	150	< 260	260	U	150
4-Chlorophenyl phenyl ether	7005-72-3	ug/Kg				< 260	260	U	120	< 260	260	U	120
4-Nitroaniline	100-01-6	ug/Kg				< 580	580	U	120	< 590	590	U	120
4-Nitrophenol	100-02-7	ug/Kg				< 260	260	U	73	< 260	260	U	74
Acenaphthene	83-32-9	ug/Kg	500,000	100,000	20,000	< 260	260	U	110	< 260	260	U	110
Acenaphthylene	208-96-8	ug/Kg	500,000	100,000	100,000	< 260	260	U	100	< 260	260	U	100
Acetophenone	98-86-2	ug/Kg				< 260	260	U	110	< 260	260	U	120
Aniline	62-53-3	ug/Kg				< 360	360	U	150	< 370	370	U	150
Anthracene	120-12-7	ug/Kg	500,000	100,000	100,000	< 260	260	U	120	< 260	260	U	120
Benz(a)anthracene	56-55-3	ug/Kg	5,600	1,000	1,000	< 260	260	U	120	< 260	260	U	120
Benzidine	92-87-5	ug/Kg				< 260	260	U	150	< 260	260	U	150
Benzo(a)pyrene	50-32-8	ug/Kg	1,000	1,000	1,000	< 260	260	U	120	< 260	260	U	120
Benzo(b)fluoranthene	205-99-2	ug/Kg	5,600	1,000	1,000	< 260	260	U	120	< 260	260	U	130
Benzo(ghi)perylene	191-24-2	ug/Kg	500,000	100,000	100,000	< 260	260	U	120	< 260	260	U	120
Benzo(k)fluoranthene	207-08-9	ug/Kg	56,000	3,900	800	< 260	260	U	120	< 260	260	U	120
Benzoic acid	65-85-0	ug/Kg				< 730	730	U	150	< 740	740	U	150
Benzyl butyl phthalate	85-68-7	ug/Kg				< 260	260	U	94	< 260	260	U	96
Bis(2-chloroethoxy)methane	111-91-1	ug/Kg				< 260	260	U	100	< 260	260	U	100
Bis(2-chloroethyl)ether	111-44-4	ug/Kg				< 360	360	U	98	< 370	370	U	100
Bis(2-ethylhexyl)phthalate	117-81-7	ug/Kg				< 360	360	U	100	< 370	370	U	110
Carbazole	86-74-8	ug/Kg				< 360	360	U	150	< 370	370	U	150
Chrysene	218-01-9	ug/Kg	56,000	3,900	1,000	< 260	260	U	120	< 260	260	U	120
Dibenz(a,h)anthracene	53-70-3	ug/Kg	560	330	330	< 260	260	U	120	< 260	260	U	120
Dibenzofuran	132-64-9	ug/Kg	350,000	59,000	7,000	< 260	260	U	110	< 260	260	U	110
Diethyl phthalate	84-66-2	ug/Kg				< 260	260	U	120	< 260	260	U	120

Table 6
Post Ramp Excavation Endpoint Sample Analytical Summary
46-70 McLean Avenue, Yonkers, NY (BCP #C360211)

	Lab Sample Id					CT76711				CT76712			
	Collection Date					7/14/2025				7/14/2025			
	Client Id					EP-1-RAMP				EP-2-RAMP			
	Matrix					Soil				Soil			
Project Id : 15514													
	CAS	Units	NY-Com.	NY-ResRestrict	NY-UnRestricted SCO	Result	RL	Qual	MDL	Result	RL	Qual	MDL
Dimethylphthalate	131-11-3	ug/Kg				< 260	260	U	110	< 260	260	U	120
Di-n-butylphthalate	84-74-2	ug/Kg				< 360	360	U	150	< 370	370	U	150
Di-n-octylphthalate	117-84-0	ug/Kg				< 260	260	U	94	< 260	260	U	96
Fluoranthene	206-44-0	ug/Kg	500,000	100,000	100,000	< 260	260	U	120	< 260	260	U	120
Fluorene	86-73-7	ug/Kg	500,000	100,000	30,000	< 260	260	U	120	< 260	260	U	120
Hexachlorobenzene	118-74-1	ug/Kg	6,000	1,200	330	< 260	260	U	110	< 260	260	U	110
Hexachlorobutadiene	87-68-3	ug/Kg				< 260	260	U	130	< 260	260	U	130
Hexachlorocyclopentadiene	77-47-4	ug/Kg				< 260	260	U	110	< 260	260	U	110
Hexachloroethane	67-72-1	ug/Kg				< 260	260	U	110	< 260	260	U	110
Indeno(1,2,3-cd)pyrene	193-39-5	ug/Kg	5,600	500	500	< 260	260	U	120	< 260	260	U	120
Isophorone	78-59-1	ug/Kg				< 260	260	U	100	< 260	260	U	100
Naphthalene	91-20-3	ug/Kg	500,000	100,000	12,000	< 260	260	U	100	< 260	260	U	110
Nitrobenzene	98-95-3	ug/Kg				< 260	260	U	130	< 260	260	U	130
N-Nitrosodimethylamine	62-75-9	ug/Kg				< 360	360	U	100	< 370	370	U	100
N-Nitrosodi-n-propylamine	621-64-7	ug/Kg				< 260	260	U	120	< 260	260	U	120
N-Nitrosodiphenylamine	86-30-6	ug/Kg				< 360	360	U	140	< 370	370	U	140
Pentachloronitrobenzene	82-68-8	ug/Kg				< 360	360	U	110	< 370	370	U	110
Pentachlorophenol	87-86-5	ug/Kg	6,700	6,700	800	< 360	360	U	140	< 370	370	U	140
Phenanthrene	85-01-8	ug/Kg	500,000	100,000	100,000	< 260	260	U	100	< 260	260	U	110
Phenol	108-95-2	ug/Kg	500,000	100,000	330	< 260	260	U	120	< 260	260	U	120
Pyrene	129-00-0	ug/Kg	500,000	100,000	100,000	< 260	260	U	130	< 260	260	U	130
Pyridine	110-86-1	ug/Kg				< 360	360	U	90	< 370	370	U	91
Pesticides - Soil By SW8081B													
4,4' -DDD	72-54-8	ug/Kg	92,000	13,000	3.3	< 2.2	2.2	U	2.2	< 2.2	2.2	U	2.2
4,4' -DDE	72-55-9	ug/Kg	62,000	8,900	3.3	< 2.2	2.2	U	2.2	< 2.2	2.2	U	2.2
4,4' -DDT	50-29-3	ug/Kg	47,000	7,900	3.3	3.6	2.2		2.2	< 2.2	2.2	U	2.2
a-BHC	319-84-6	ug/Kg	3,400	480	20	< 7.4	7.4	U	7.4	< 7.5	7.5	U	7.5
a-Chlordane	5103-71-9	ug/Kg	24,000	4,200	94	12	3.7		3.7	6.4	3.7		3.7
Alachlor	15972-60-8	ug/Kg				< 3.7	3.7	U	3.7	< 3.7	3.7	U	3.7
Aldrin	309-00-2	ug/Kg	680	97	5	< 3.7	3.7	U	3.7	< 3.7	3.7	U	3.7
b-BHC	319-85-7	ug/Kg	3,000	360	36	< 7.4	7.4	U	7.4	< 7.5	7.5	U	7.5
Chlordane	57-74-9	ug/Kg				49	37		37	25	15		15
d-BHC	319-86-8	ug/Kg	500,000	100,000	40	< 7.4	7.4	U	7.4	< 7.5	7.5	U	7.5
Dieldrin	60-57-1	ug/Kg	1,400	200	5	< 3.7	3.7	U	3.7	< 3.7	3.7	U	3.7
Endosulfan I	959-98-8	ug/Kg	200,000	24,000	2,400	< 7.4	7.4	U	7.4	< 7.5	7.5	U	7.5
Endosulfan II	33213-65-9	ug/Kg	200,000	24,000	2,400	< 7.4	7.4	U	7.4	< 7.5	7.5	U	7.5
Endosulfan sulfate	1031-07-8	ug/Kg	200,000	24,000	2,400	< 7.4	7.4	U	7.4	< 7.5	7.5	U	7.5
Endrin	72-20-8	ug/Kg	89,000	11,000	14	< 7.4	7.4	U	7.4	< 7.5	7.5	U	7.5
Endrin aldehyde	7421-93-4	ug/Kg				< 7.4	7.4	U	7.4	< 7.5	7.5	U	7.5
Endrin ketone	53494-70-5	ug/Kg				< 7.4	7.4	U	7.4	< 7.5	7.5	U	7.5
g-BHC	58-89-9	ug/Kg	9,200	1,300	100	< 1.5	1.5	U	1.5	< 1.5	1.5	U	1.5
g-Chlordane	5103-74-2	ug/Kg				9.1	3.7		3.7	5.1	3.7		3.7
Heptachlor	76-44-8	ug/Kg	15,000	2,100	42	< 7.4	7.4	U	7.4	< 7.5	7.5	U	7.5
Heptachlor epoxide	1024-57-3	ug/Kg				< 7.4	7.4	U	7.4	< 7.5	7.5	U	7.5
Methoxychlor	72-43-5	ug/Kg				< 37	37	U	37	< 37	37	U	37
Toxaphene	8001-35-2	ug/Kg				< 150	150	U	150	< 150	150	U	150
1,4-dioxane By SW8260D													
1,4-dioxane	123-91-1	ug/kg	130,000	13,000	100	< 83	83	U	44	< 96	96	U	51

Qualifiers	
U	The compound was anlayzed for but not detected at or above the MDL. The number immediately preceding the "U" represents the PQL reporting level corrected for percent solids, weight and/or volume calculations, and dilution factors.
J	The value is estimated. This flag is used a) on form 1 when the compound is reported above the MDL, but below the PQL, and b) on the Tentatively Identified Compounds (TIC) form for all compounds identified.
N	The concentration is based on the response fo the nearest internal. This flag is used on the TIC form for all compounds identified.
S	This compound is a solvent that is used in the laboratory. Laboratory contamination is suspected if concentration is less than five times the reporting level.
D	The reported concentration is the result of a diluted analysis.
Q	For TICS, this compound was quantitated using a calibration curve.
(*)	See report for comment.
Result Detected	
RL Exceeds Criteria	
Result Exceeds Criteria	

Table 7
Post Gasoline UST Removal Standing Groundwater Analytical Summary
46-70 McLean Avenue, Yonkers, NY (BCP #C360211)

	Lab Sample Id			CT42118			
	Collection Date			6/2/2025			
	Client Id			TANK-GW-1			
	Matrix			Ground Water			
Project Id : 60 MCLEAN AVE YONKERS							
	CAS	Units	TOGS 1.1.1 WQ/GA Table 1	Result	RL	Qual	MDL
Volatiles By SW8260D							
1,1,1,2-Tetrachloroethane	630-20-6	ug/L	5	< 25	25	U	25
1,1,1-Trichloroethane	71-55-6	ug/L	5	< 25	25	U	25
1,1,2,2-Tetrachloroethane	79-34-5	ug/L	5	< 25	25	U	25
1,1,2-Trichloroethane	79-00-5	ug/L	1	< 25	25	U	25
1,1-Dichloroethane	75-34-3	ug/L	5	< 25	25	U	25
1,1-Dichloroethene	75-35-4	ug/L	5	< 25	25	U	25
1,1-Dichloropropene	563-58-6	ug/L	5	< 25	25	U	25
1,2,3-Trichlorobenzene	87-61-6	ug/L		< 25	25	U	63
1,2,3-Trichloropropane	96-18-4	ug/L	0.04	< 25	25	U	25
1,2,4-Trichlorobenzene	120-82-1	ug/L		< 25	25	U	25
1,2,4-Trimethylbenzene	95-63-6	ug/L	**5**	**2,200**	25		25
1,2-Dibromo-3-chloropropane	96-12-8	ug/L	0.04	< 25	25	U	25
1,2-Dibromoethane	106-93-4	ug/L	0.0006	< 25	25	U	25
1,2-Dichlorobenzene	95-50-1	ug/L		< 25	25	U	25
1,2-Dichloroethane	107-06-2	ug/L	**0.6**	**250**	25		25
1,2-Dichloropropane	78-87-5	ug/L	1	< 25	25	U	25
1,3,5-Trimethylbenzene	108-67-8	ug/L	**5**	**740**	25		25
1,3-Dichlorobenzene	541-73-1	ug/L	3	< 25	25	U	25
1,3-Dichloropropane	142-28-9	ug/L	5	< 25	25	U	25
1,4-Dichlorobenzene	106-46-7	ug/L		< 25	25	U	25
2,2-Dichloropropane	594-20-7	ug/L	5	< 25	25	U	25
2-Chlorotoluene	95-49-8	ug/L	5	< 25	25	U	25
2-Hexanone	591-78-6	ug/L	50	< 50	50	U	50
2-Isopropyltoluene	527-84-4	ug/L	5	< 25	25	U	25
4-Chlorotoluene	106-43-4	ug/L	5	< 25	25	U	25
4-Methyl-2-pentanone	108-10-1	ug/L		< 50	50	U	50
Acetone	67-64-1	ug/L	50	< 50	50	U	50
Acrylonitrile	107-13-1	ug/L	5	< 25	25	U	25
Benzene	71-43-2	ug/L	**1**	**5,800**	25		25
Bromobenzene	108-86-1	ug/L	5	< 25	25	U	25
Bromochloromethane	74-97-5	ug/L	5	< 25	25	U	25
Bromodichloromethane	75-27-4	ug/L	50	< 50	50	U	50
Bromoform	75-25-2	ug/L	50	< 50	50	U	50
Bromomethane	74-83-9	ug/L	5	< 25	25	U	25
Carbon Disulfide	75-15-0	ug/L		< 50	50	U	50
Carbon tetrachloride	56-23-5	ug/L	5	< 25	25	U	25
Chlorobenzene	108-90-7	ug/L	5	< 25	25	U	25
Chloroethane	75-00-3	ug/L	5	< 25	25	U	25
Chloroform	67-66-3	ug/L	7	< 25	25	U	25
Chloromethane	74-87-3	ug/L	5	< 25	25	U	25
cis-1,2-Dichloroethene	156-59-2	ug/L	5	< 25	25	U	25
cis-1,3-Dichloropropene	10061-01-5	ug/L	0.4	< 25	25	U	25
Dibromochloromethane	124-48-1	ug/L	50	< 50	50	U	50
Dibromomethane	74-95-3	ug/L	5	< 25	25	U	25
Dichlorodifluoromethane	75-71-8	ug/L	5	< 25	25	U	25
Ethylbenzene	100-41-4	ug/L	**5**	**1,600**	25		25
Hexachlorobutadiene	87-68-3	ug/L	0.5	< 25	25	U	25
Isopropylbenzene	98-82-8	ug/L	**5**	**220**	25		25
m&p-Xylene	179601-23-1	ug/L		**4,100**	250		63
Methyl ethyl ketone	78-93-3	ug/L	50	< 50	50	U	50
Methyl t-butyl ether (MTBE)	1634-04-4	ug/L		< 250	250	U	63
Methylene chloride	75-09-2	ug/L	5	< 25	25	U	25
Naphthalene	91-20-3	ug/L	**10**	**780**	25		25
n-Butylbenzene	104-51-8	ug/L	**5**	**130**	25		25
n-Propylbenzene	103-65-1	ug/L	**5**	**330**	25		25
o-Xylene	95-47-6	ug/L	**5**	**1,900**	25		25
p-Isopropyltoluene	99-87-6	ug/L	**5**	**180**	25		25
sec-Butylbenzene	135-98-8	ug/L	**5**	**91**	25		25
Styrene	100-42-5	ug/L	5	< 25	25	U	25
tert-Butylbenzene	98-06-6	ug/L	5	< 25	25	U	25
Tetrachloroethene	127-18-4	ug/L	5	< 25	25	U	25
Tetrahydrofuran (THF)	109-99-9	ug/L	50	< 50	50	U	50
Toluene	108-88-3	ug/L	**5**	**8,500**	50		50
Total Xylenes	1330-20-7	ug/L	**5**	**6,000**	25		25

Table 7
Post Gasoline UST Removal Standing Groundwater Analytical Summary
46-70 McLean Avenue, Yonkers, NY (BCP #C360211)

	Lab Sample Id			CT42118			
	Collection Date			6/2/2025			
	Client Id			TANK-GW-1			
	Matrix			Ground Water			
Project Id : 60 MCLEAN AVE YONKERS							
	CAS	Units	TOGS 1.1.1 WQ/GA Table 1	Result	RL	Qual	MDL
trans-1,2-Dichloroethene	156-60-5	ug/L	5	< 25	25	U	25
trans-1,3-Dichloropropene	10061-02-6	ug/L	0.4	< 25	25	U	25
trans-1,4-dichloro-2-butene	110-57-6	ug/L	5	< 25	25	U	25
Trichloroethene	79-01-6	ug/L	5	< 25	25	U	25
Trichlorofluoromethane	75-69-4	ug/L	5	< 25	25	U	25
Trichlorotrifluoroethane	76-13-1	ug/L	5	< 25	25	U	25
Vinyl chloride	75-01-4	ug/L	2	< 25	25	U	25
Semivolatiles By SW8270E							
1,2,4,5-Tetrachlorobenzene	95-94-3	ug/L		< 35	35	U	35
1,2,4-Trichlorobenzene	120-82-1	ug/L		< 51	51	U	15
1,2-Dichlorobenzene	95-50-1	ug/L		< 4.7	4.7	U	4.7
1,2-Diphenylhydrazine	122-66-7	ug/L		< 51	51	U	15
1,3-Dichlorobenzene	541-73-1	ug/L	3	< 5.1	5.1	U	5.1
1,4-Dichlorobenzene	106-46-7	ug/L		< 5.0	5.0	U	5.0
2,2'-Oxybis(1-Chloropropane)	108-60-1	ug/L	5	< 5.0	5.0	U	5.0
2,4,5-Trichlorophenol	95-95-4	ug/L	1	< 9.1	9.1	U	9.1
2,4,6-Trichlorophenol	88-06-2	ug/L	1	< 5.1	5.1	U	5.1
2,4-Dichlorophenol	120-83-2	ug/L	1	< 5.1	5.1	U	5.1
2,4-Dimethylphenol	105-67-9	ug/L	1	< 5.1	5.1	U	5.1
2,4-Dinitrophenol	51-28-5	ug/L	1	< 9.1	9.1	U	9.1
2,4-Dinitrotoluene	121-14-2	ug/L	5	< 5.0	5.0	U	5.0
2,6-Dinitrotoluene	606-20-2	ug/L	5	< 5.0	5.0	U	5.0
2-Chloronaphthalene	91-58-7	ug/L	10	< 10	10	U	10
2-Chlorophenol	95-57-8	ug/L	1	< 5.1	5.1	U	5.1
2-Methylnaphthalene	91-57-6	ug/L		260	51		10
2-Methylphenol (o-cresol)	95-48-7	ug/L	1	< 10	10	U	9.1
2-Nitroaniline	88-74-4	ug/L	5	< 5.0	5.0	U	5.0
2-Nitrophenol	88-75-5	ug/L	1	< 9.1	9.1	U	9.1
3&4-Methylphenol (m&p-cresol)	PHNX - M&P CRESOL	ug/L		< 10	10	U	10
3,3'-Dichlorobenzidine	91-94-1	ug/L	5	< 5.0	5.0	U	5.0
3-Nitroaniline	99-09-2	ug/L	5	< 5.0	5.0	U	5.0
4,6-Dinitro-2-methylphenol	534-52-1	ug/L	1	< 9.1	9.1	U	9.1
4-Bromophenyl phenyl ether	101-55-3	ug/L		< 51	51	U	15
4-Chloro-3-methylphenol	59-50-7	ug/L	1	< 9.1	9.1	U	9.1
4-Chloroaniline	106-47-8	ug/L	5	< 5.0	5.0	U	5.0
4-Chlorophenyl phenyl ether	7005-72-3	ug/L		< 10	10	U	9.1
4-Nitroaniline	100-01-6	ug/L	5	< 5.0	5.0	U	5.0
4-Nitrophenol	100-02-7	ug/L	1	< 10	10	U	10
Acenaphthene	83-32-9	ug/L	20	< 20	20	U	10
Acenaphthylene	208-96-8	ug/L		< 20	20	U	10
Acetophenone	98-86-2	ug/L		< 51	51	U	16
Aniline	62-53-3	ug/L	5	< 5.0	5.0	U	5.0
Anthracene	120-12-7	ug/L	50	< 50	50	U	10
Benzidine	92-87-5	ug/L	5	< 5.0	5.0	U	5.0
Benzoic acid	65-85-0	ug/L		< 50	50	U	50
Benzyl butyl phthalate	85-68-7	ug/L	50	< 50	50	U	13
Bis(2-chloroethoxy)methane	111-91-1	ug/L	5	< 5.0	5.0	U	5.0
Bis(2-chloroethyl)ether	111-44-4	ug/L	1	< 5.1	5.1	U	5.1
Bis(2-ethylhexyl)phthalate	117-81-7	ug/L	5	< 5.0	5.0	U	5.0
Carbazole	86-74-8	ug/L		< 51	51	U	38
Dibenzofuran	132-64-9	ug/L		< 5.0	5.0	U	5.0
Diethyl phthalate	84-66-2	ug/L	50	< 50	50	U	9.1
Dimethylphthalate	131-11-3	ug/L	50	< 50	50	U	16
Di-n-butylphthalate	84-74-2	ug/L	50	< 50	50	U	13
Di-n-octylphthalate	117-84-0	ug/L	50	< 50	50	U	13
Fluoranthene	206-44-0	ug/L	50	< 50	50	U	10
Fluorene	86-73-7	ug/L	50	< 50	50	U	10
Hexachlorobenzene	118-74-1	ug/L	0.04	< 5.1	5.1	U	5.1
Hexachlorobutadiene	87-68-3	ug/L	0.5	< 10	10	U	10
Hexachlorocyclopentadiene	77-47-4	ug/L	5	< 5.0	5.0	U	5.0
Hexachloroethane	67-72-1	ug/L	5	< 5.0	5.0	U	5.0
Isophorone	78-59-1	ug/L	50	< 50	50	U	14
Naphthalene	91-20-3	ug/L	**10**	**560**	5.0		5.0
Nitrobenzene	98-95-3	ug/L	0.4	< 1.0	1.0	U	1.0
N-Nitrosodimethylamine	62-75-9	ug/L		< 51	51	U	14

Table 7
Post Gasoline UST Removal Standing Groundwater Analytical Summary
46-70 McLean Avenue, Yonkers, NY (BCP #C360211)

	Lab Sample Id			CT42118			
	Collection Date			6/2/2025			
	Client Id			TANK-GW-1			
	Matrix			Ground Water			
Project Id : 60 MCLEAN AVE YONKERS							
	CAS	Units	TOGS 1.1.1 WQ/GA Table 1	Result	RL	Qual	MDL
N-Nitrosodi-n-propylamine	621-64-7	ug/L		< 51	51	U	16
N-Nitrosodiphenylamine	86-30-6	ug/L	50	< 50	50	U	19
Pentachloronitrobenzene	82-68-8	ug/L		< 25	25	U	25
Pentachlorophenol	87-86-5	ug/L	1	< 10	10	U	8.1
Phenanthrene	85-01-8	ug/L	50	< 0.51	0.51	U	0.51
Phenol	108-95-2	ug/L	1	< 5.1	5.1	U	5.1
Pyrene	129-00-0	ug/L	50	< 50	50	U	17
Pyridine	110-86-1	ug/L	50	< 5.1	5.1	U	5.1
Semivolatiles (SIM) By SW8270E (SIM)							
Benz(a)anthracene	56-55-3	ug/L	**0.002**	**0.09**	0.02		0.02
Benzo(a)pyrene	50-32-8	ug/L		0.07	0.02		0.02
Benzo(b)fluoranthene	205-99-2	ug/L	**0.002**	**0.08**	0.02		0.02
Benzo(ghi)perylene	191-24-2	ug/L		< 0.51	0.51	U	0.51
Benzo(k)fluoranthene	207-08-9	ug/L	**0.002**	**0.07**	0.02		0.02
Chrysene	218-01-9	ug/L	**0.002**	**0.18**	0.02		0.02
Dibenz(a,h)anthracene	53-70-3	ug/L		< 0.51	0.51	U	0.51
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	**0.002**	**0.06**	0.02		0.02

Qualifiers

U — The compound was anlayzed for but not detected at or above the MDL.
The number immediately preceding the "U" represents the PQL reporting level
corrected for percent solids, weight and/or volume calculations, and dilution factors.

Result Detected **BOLD**

Result Exceeds Criteria **BOLD**

APPENDICES

46-70 McLean Avenue, Yonkers, NY

Site Management Plan
NYSDEC BCP #C360211

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
TEL: (631) 268-8800
FAX: (631) 269-1599

Appendix A

46-70 McLean Avenue, Yonkers, NY

EASEMENT/Metes and Bounds

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
TEL: (631) 268-8800
FAX: (631) 269-1599

Appendix B

46-70 McLean Avenue, Yonkers, NY

Site Contacts

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
TEL: (631) 268-8800
FAX: (631) 269-1599

APPENDIX B – LIST OF SITE CONTACTS

Name	Phone/Email Address
Site Owner: SnL Yonkers, LLC	(516) 472-7880 as@snlstorage.com
Qualified Environmental Professional: Greg Mendez-Chicas	(631) 252-5480 gmendez-chicas@impactenvironmental.com
Remedial Engineer: Xin Yuan	(412) 719-2487 xyuan@impactenvironmental.com
NYSDEC DER Project Manager: Matthew Hubicki	(518) 402-9605 Matthew.hubicki@dec.ny.gov
NYSDEC DER Project Manager's Supervisor: Kerry Maloney	(518) 402-9629 Kerry.maloney@dec.ny.gov
NYSDOH Project Manager: Jim Sullivan	(518) 402-7860 Jim.sullivan@health.ny.gov
Remedial Party Attorney: Linda Shaw	(585) 546-8430 lshaw@nyenvlaw.com

Appendix C

46-70 McLean Avenue, Yonkers, NY

Soil Boring Logs

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
TEL: (631) 268-8800
FAX: (631) 269-1599

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**	
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-1**	
	Site Address: 60 McLean Avenue, Yonkers		
	Weather: Showers, 53 deg F		
	Geologist: Alex Keenan	Total Depth: 1.5'	
Start Date: 5/3/2022	Drilling Company: Coastal	GW: NA	
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A	
Completion Date: 5/3/2022	Drill Rig: 7822DT	GPS Coordinates:	
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y	

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0						3" concrete slab	
1		SB-1 (0-2)	0-1.5'	moist/wet	9"	SM/ Bedrock	refusal at 1.5' 2" concrete slab, 9" of brown m-fine sand trace silt and bedrock, slight saturation of water at 5" below	
	0.0							
2	0.0						end of boring at 1.5' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-2**
	Site Address: 60 McLean Avenue, Yonkers	
	Weather: Showers, 53 deg F	
	Geologist: Alex Keenan	Total Depth: 2'
Start Date: 5/3/2022	Drilling Company: Coastal	GW: NA
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/3/2022	Drill Rig: 7822DT	GPS Coordinates:
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
1	0.0	SB-2 (0-2)	0-2'	Moist	10"	SM/ Bedrock	2" concrete slab	
	0.0						refusal at 2.0', brown, fine to medium SAND, trace silt and bedrock	
2	0.0						end of boring at 2' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**	
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-3**	
	Site Address: 60 McLean Avenue, Yonkers		
	Weather: Showers, 53 deg F		
	Geologist: Alex Keenan	Total Depth: 2'	
Start Date: 5/3/2022	Drilling Company: Coastal	GW: NA	
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A	
Completion Date: 5/3/2022	Drill Rig: 7822DT	GPS Coordinates:	
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y	

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0	SB-3 (0-2)	0-2'	Moist	10"	SM/ Bedrock	2" concrete slab	
1							refusal at 2.0', brown, fine to medium SAND, trace silt and bedrock	
	0.0							
2	0.0						end of boring at 2' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**	
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-4**	
	Site Address: 60 McLean Avenue, Yonkers		
	Weather: Showers, 53 deg F		
	Geologist: Alex Keenan	Total Depth: 2'	
Start Date: 5/3/2022	Drilling Company: Coastal	GW: NA	
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A	
Completion Date: 5/3/2022	Drill Rig: 7822DT	GPS Coordinates:	
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y	

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
1	0.0	SB-4 (0-2)	0-2'	Moist	8"	SM/ Bedrock	2" concrete slab	
	0.0						refusal at 2.0', brown, fine to medium SAND, trace silt and bedrock	
2	0.0						end of boring at 2' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-5**
	Site Address: 60 McLean Avenue, Yonkers	
	Weather: Showers, 53 deg F	
	Geologist: Alex Keenan	Total Depth: 2'
Start Date: 5/3/2022	Drilling Company: Coastal	GW: NA
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/3/2022	Drill Rig: 7822DT	GPS Coordinates:
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
1	0.0	SB-5 (0-2)	0-2'	Moist	9"	SM/ Bedrock	2" concrete slab	
	0.0						refusal at 2.0', brown, fine to medium SAND, trace silt and bedrock	
2	0.0						end of boring at 2' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc.
170 Keyland Court
Bohemia, NY 11716
P. (631) 269-8800
F. (631) 269-1599

	Project #: 15514	**Boring ID:**
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-6**
	Site Address: 60 McLean Avenue, Yonkers	
	Weather: Showers, 53 deg F	
	Geologist: Alex Keenan	Total Depth: 10'
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
							3" concrete slab	
1	0.0	SB-6 (0-2)	0-5'	Dry	45"	SP	SILTY SAND, trace small gravel, some silt, fine to medium grained, brown	
	0.0							
2								
	0.0							
3								
	0.0							
4								
	0.0							
5								
	0.0		5-10'	Dry	55"		SILTY SAND, fine grained, brown	
6								
	0.0							
7								
	0.0	SB-6 (7-9)					Silt weathered bedrock, grey/white, abundant mica	
8	0.0							
9								
	0.0						End of boring @ 10' BGS	
10								

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc.
170 Keyland Court
Bohemia, NY 11716
P. (631) 269-8800
F. (631) 269-1599

	Project #: 15514	**Boring ID:**
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-7**
	Site Address: 60 McLean Avenue, Yonkers	
	Weather: Showers, 53 deg F	
	Geologist: Alex Keenan	Total Depth: 10'
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
							2" concrete slab	
1	0.0	SB-7 (0-2)	0-5'	Dry	50"	SP	SAND, with trace gravel, medium grained, brown	
	0.0							
2	0.0							
3	0.0							
4	0.0							
5	0.0		5-10'	Moist	45"	SP	SAND, with trace gravel, medium grained, brown	
6	0.0							
7	0.0	SB-7 (7-9)				ML	SILT, with trace clay, brown, low plasticity	
8	0.0					SP	SAND, with trace gravel, medium grained, brown	
9	0.0							
10							End of boring @ 10' BGS	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**	
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-8a**	
	Site Address: 60 McLean Avenue, Yonkers		
	Weather: Showers, 53 deg F		
	Geologist: Alex Keenan	Total Depth: N/A	
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA	
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A	
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:	
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y	

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0		0-1'	N/A	None	N/A	3" concrete slab	
1							No recovery	
	0.0							

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**	
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-8b/MW-4A**	
	Site Address: 60 McLean Avenue, Yonkers		
	Weather: Showers, 53 deg F		
	Geologist: Alex Keenan	Total Depth: 1.5'	
Start Date: 5/2/2022	Drilling Company: Coastal	GW: 1.44	
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A	
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:	
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y	

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
1	0.0 0.0	SB-8 (0-2)	0-1.5'	Moist/Wet	7"	Fill/Bedrock	3" concrete slab Very limited recovery. mostly gravel, wood pieces, trace sand, mostly fill, sheen observed sitting on top of bedrock. refusal at 1.5' end of boring at 1.5' bgs	
2								

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc.
170 Keyland Court
Bohemia, NY 11716
P. (631) 269-8800
F. (631) 269-1599

	Project #: 15514	**Boring ID: SB-9**
	Site/Project Name: 60 McLean Avenue, Yonkers	
	Site Address: 60 McLean Avenue, Yonkers	
	Weather: Showers, 53 deg F	
	Geologist: Alex Keenan	Total Depth: 4'
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates: X,Y
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0	SB-1 (0-2)	0-4'	Dry/Moist	12"	SP	3" concrete slab	
1	0.0						Refusal at 4', Fine to medium brown SAND and weathered bedrock.	
2	0.0							
3	0.0							
4							end of boring at 4' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-10**
	Site Address: 60 McLean Avenue, Yonkers	
	Weather: Showers, 53 deg F	
	Geologist: Alex Keenan	Total Depth: 3'
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0	SB-10a (0-3)	0-3'	Moist/Wet	7"	Fill/Bedrock	3" concrete slab	
1	0.0						soft weathered micatious bedrock grey to white, fine grained silt	
2	0.0							
3							end of boring at 3' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc.
170 Keyland Court
Bohemia, NY 11716
P. (631) 269-8800
F. (631) 269-1599

	Project #: 15514	**Boring ID:**
	Site/Project Name: 60 McLean Avenue, Yonkers	
	Site Address: 60 McLean Avenue, Yonkers	**SB-10b/MW-5A**
	Weather: Showers, 53 deg F	
	Geologist: Alex Keenan	Total Depth: 3'
Start Date: 5/2/2022	Drilling Company: Coastal	GW: 3.0
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0	SB-10b (0-3)	0-3'	Moist/Wet	7"	Fill/Bedrock	3" concrete slab	
1	0.0						soft weathered micatious bedrock with some larger bedrock pieces, grey to white, fine grained silt,	
2	0.0							
3	0.0						end of boring at 3' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**	
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-11**	
	Site Address: 60 McLean Avenue, Yonkers		
	Weather: Showers, 53 deg F		
	Geologist: Alex Keenan	Total Depth: 3'	
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA	
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A	
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:	
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y	

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0	SB-11 (0-2)	0-4'	Dry	35"	Fill/Bedrock/SP	3" concrete slab	
1	0.0						bedrock pieces, coarse gravel, broken quartz nodules, tan to white coarse SAND	
2	0.0	SB-11 (2-4)						
3	0.0							
4							end of boring at 4' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc.
170 Keyland Court
Bohemia, NY 11716
P. (631) 269-8800
F. (631) 269-1599

	Project #: 15514	**Boring ID:**
	Site/Project Name: 60 McLean Avenue, Yonkers	
	Site Address: 60 McLean Avenue, Yonkers	**SB-12**
	Weather: Showers, 53 deg F	
	Geologist: Alex Keenan	Total Depth: 3'
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0	SB-14 (0-4)	0-4'	Dry	20"	SP	3" concrete slab	
1	0.0						bedrock pieces, fine to medium grained SAND	
2	0.0							
3	0.0							
4							end of boring at 4' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc.
170 Keyland Court
Bohemia, NY 11716
P. (631) 269-8800
F. (631) 269-1599

	Project #: 15514	**Boring ID:**
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-13**
	Site Address: 60 McLean Avenue, Yonkers	
	Weather: Showers, 53 deg F	
	Geologist: Alex Keenan	Total Depth: 2'
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0	no sample	1.5	dry	none	Bedrock	3" concrete slab	
1	0.0						bedrock pieces no soil recovery	
2							end of boring at 2' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**	
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-14**	
	Site Address: 60 McLean Avenue, Yonkers		
	Weather: Showers, 53 deg F		
	Geologist: Alex Keenan	Total Depth: 4'	
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA	
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A	
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:	
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y	

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0	SB-14 (0-4)	0-4'	Moist	18"	SP	3" concrete slab	
1	0.0						fine to medium grained, stained SAND, trace silt	
2	0.0							
3	0.0							
4							End of boring @ 10' BGS	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-16**
	Site Address: 60 McLean Avenue, Yonkers	
	Weather: Showers, 53 deg F	
	Geologist: Alex Keenan	Total Depth: 4'
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0	SB-16 (0-4)	0-4'	Dry	35"	SM	4" concrete slab	
1	0.0						Brown SILTY SAND, fine grained, refusal at 4' due to soilid bedrock. Shoe very hot.	
2	0.0							
3	0.0							
4	0.0						end of boring at 4' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**	
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-17**	
	Site Address: 60 McLean Avenue, Yonkers		
	Weather: Showers, 53 deg F		
	Geologist: Alex Keenan	Total Depth: 4'	
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA	
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A	
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:	
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y	

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
	0.0	SB-17 (0-2) and 2-4)	0-3'	Moist/Wet	7"	SP/Bedrock	3" concrete slab	
1	0.0						brown silty SAND, bedrock refusal at 4'	
2	0.0							
3	0.0							
4	0.0						end of boring at 4' bgs	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514 Site/Project Name: 60 McLean Avenue, Yonkers Site Address: 60 McLean Avenue, Yonkers Weather: Showers, 53 deg F Geologist: Alex Keenan	**Boring ID:** **SB-18/MW-7A** Total Depth: 15'
Start Date: 5/2/2022	Drilling Company: Coastal	GW: 10.45
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
1	0.0	SB-18 (0-2)	0-5'	Dry	50"	SP	2" concrete slab	
	0.0						Brown silty SAND, fine to medium grained	
2	52.7							
3	0.0							
4	0.0							
5	76.6		5-10'	Wet	50"	SP	Brown silty SAND, fine to medium grained	
6	0.0							
7	82.5	SB-18 (7-9)						
8	0.0							
9	328.0							
10	1684.0		10-15'	Wet	60"		SAND, with trace gravel, medium grained, brown	
11	0.0							
12	0.0						SILT, with trace clay, brown, low plasticity	
13	0.0						SAND, with trace gravel, medium grained, brown	
14	0.0						End of boring @ 15' BGS	
15								

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc. 170 Keyland Court Bohemia, NY 11716 P. (631) 269-8800 F. (631) 269-1599	Project #: 15514	**Boring ID:**	
	Site/Project Name: 60 McLean Avenue, Yonkers	**SB-19**	
	Site Address: 60 McLean Avenue, Yonkers		
	Weather: Showers, 53 deg F		
	Geologist: Alex Keenan	Total Depth: 15'	
Start Date: 5/2/2022	Drilling Company: Coastal	GW: NA	
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A	
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:	
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y	

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
1	0.0	SB-19 (0-2)	0-5'	Dry	50"	SM	2" concrete slab	
	1200.0						0-5 fine sand some silt stained grey to brown, odors, 1200 ppm	
2	1200.0							
3	975.0							
4	450.0							
5	325.0		5-10'	Wet	50"	SM	5-10 fine brown silt odors, 224 ppm	
6	300.0							
7	224.0	SB-19 (7-9)						
8	200.0							
9	181.0							
10	127.0		10-15'	Wet	60"	SM	10-15 brown silt with some sand, odors, 137 ppm	
11	141.0							
12	137.0							
13	130.0							
14	122.0							
15							End of boring @ 15' BGS	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Impact Environmental Closures, Inc.
170 Keyland Court
Bohemia, NY 11716
P. (631) 269-8800
F. (631) 269-1599

	Project #: 15514	**Boring ID:**
	Site/Project Name: 60 McLean Avenue, Yonkers	
	Site Address: 60 McLean Avenue, Yonkers	**SB-20/MW-9A**
	Weather: Showers, 53 deg F	
	Geologist: Alex Keenan	Total Depth: 10'
Start Date: 5/2/2022	Drilling Company: Coastal	GW: 10.57
Start Time: 8:00	Driller: Brandon Sullivan	GW Stabilized: N/A
Completion Date: 5/2/2022	Drill Rig: 7822DT	GPS Coordinates:
Completion Time: 15:00	Sampler Type/Len: discrete/duel tube	X,Y

Depth (Feet)	PID (ppmv)	Sample ID	Depth (From-To)	Moisture Content	Recovery (Inches)	USCS Symbol	Soil Description	Notes
1	0.0	SB-20 (0-2)	0-5'	Moist	60"	SP/ML	3" concrete slab	
	45.0						fine to medium silty SAND, stained, odors	
2	168.0							
3	232.0							
4	163.0							
5	216.0		5-10'	Moist	60"	ML	fine sandy SILT, stained, odors	
6	284.0							
7	350.0	SB-20 (7-9)						
8	246.0							
9	197.0							
10							End of boring @ 10' BGS	

TRACE = 1 - 10% LITTLE = 11 - 20% SOME = 21 - 35% AND = 36 - 50 %

SOIL BORING LOG

Gravels (more than 50% of coarse fraction larger than No. 4 sieve size)	GW GP GM GC
Sands (50% or more of coarse fraction smaller than No. 4 sieve size)	SW SP SM SC
Silts and Clays (liquid limit less than 50%)	ML CL OL
Silts and clays (liquid limit 50% or greater)	MH CH OH
Highly organic soils	PT

SOIL BORING LOG

Unified Soil Classification System

Coarse-Grained Soils (More than 50% pf material is larger than No. 200 sieve size)

Clean Gravel (less than 5% fines)

Well-graded gravels,gravel-sand mixtures, little or no fine

Poorly-graded gravels, granvel-sand mixtures, little or no fines

Gravels with fines (more than 12% fines)

Silty Gravels, gravel-sand-silt-mixtures

Clayey gravels, gravel-sand-clay mixtures

Clean Sands (Less than 5% fines)

Well-graded sands, gravelly sands, little or no fines

Poorly graded sands, gravelly sands, little or no fines

Sands with fines (more than 12% fines)

Silty sands, sand-silt mixtures

Slayey sands, sand-clay mixtures

Fine-Grained Soils (50% or more of material is smaller than No. 20 sieve size)

Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity

Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

Organic silts and organic silt clays of low plasticity

Inorganic silts, micaetous or diatomaceous fine sandy or silty soils, elastic silts

Inorganic clays of high plasticity, fat clays

Organic clays of medium to high plasticity, organic silts

Peat and other highly organic soils

SOIL BORING LOG

Determine percentages of sand and gravel. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5% fines	GW,GP,SW,SP
More than 12% fines	GM,GC,SM,SC
5 to 12 % fines	borderline case requiring duel symbols

Appendix D

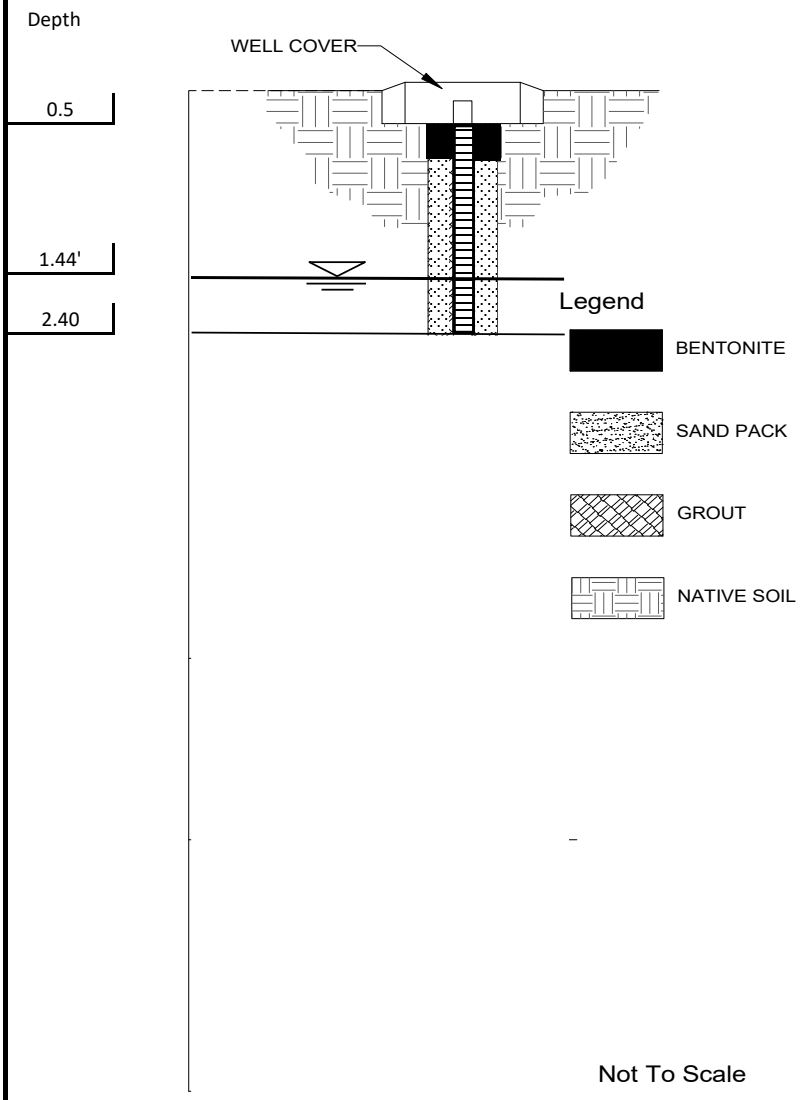
46-70 McLean Avenue, Yonkers, NY

Well Construction Logs

IMPACT ENVIRONMENTAL
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IMPACT ENVIRONMENTAL
170 Keyland Court, Bohemia, New York 11716
631.269.8800 telephone | 631. 269.1599 facsimile
impactenvironmental.com

Well Code:	**MW-4A**		
Site Location:	60 McLean Avenue, Yonkers, NY	**Installer:**	Coastal
Job Number:	15514	**Installation Method:**	7782DT Direct Push
Client:	SnL Construction LLC	**Installation Date:**	5/3/2022



Surface Pad
- Type: Concrete, roadbox, manhole cover

Well Cap
- Type: J-Plug

Surface Casing
- Type: 8" Steel Manhole

Riser Pipe
- Type: NA
- Diameter: NA
- Length: NA
- Interval (BEG): NA

Annular Seal
- Type: NA
- Length: NA
- Interval (BEG): NA

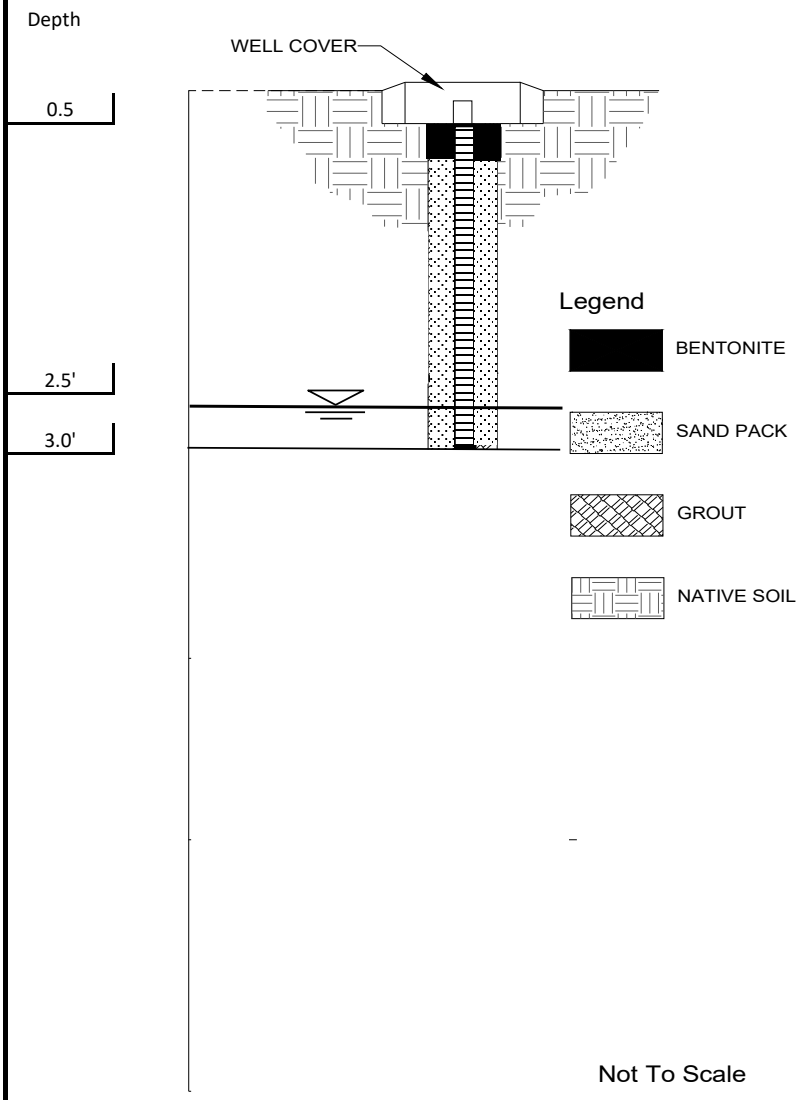
Bentonite Seal
- Type: Granular 3/8"
- Length: 5"
- Interval (BEG): 0-0.5"

Filter Pack
- Type: Sand #2
- Length: 0.9'
- Interval (BEG): 0.5" - 2.40'

Screen
- Type: Schedule 40 PVC
- Diameter: 2"
- Length: 2.40'
- Slot Size: 0.010"
- Interval (BEG): 0-2.40'

IMPACT ENVIRONMENTAL
170 Keyland Court, Bohemia, New York 11716
631.269.8800 telephone | 631. 269.1599 facsimile
impactenvironmental.com

Well Code:	**MW-5A**		
Site Location:	60 McLean Avenue, Yonkers, NY	**Installer:**	Coastal
Job Number:	15514	**Installation Method:**	7782DT Direct Push
Client:	SnL Construction LLC	**Installation Date:**	5/3/2022



Surface Pad
- Type: Concrete, roadbox, manhole cover

Well Cap
- Type: J-Plug

Surface Casing
- Type: 8" Steel Manhole

Riser Pipe
- Type: NA
- Diameter: NA
- Length: NA
- Interval (BEG): NA

Annular Seal
- Type: NA
- Length: NA
- Interval (BEG): NA

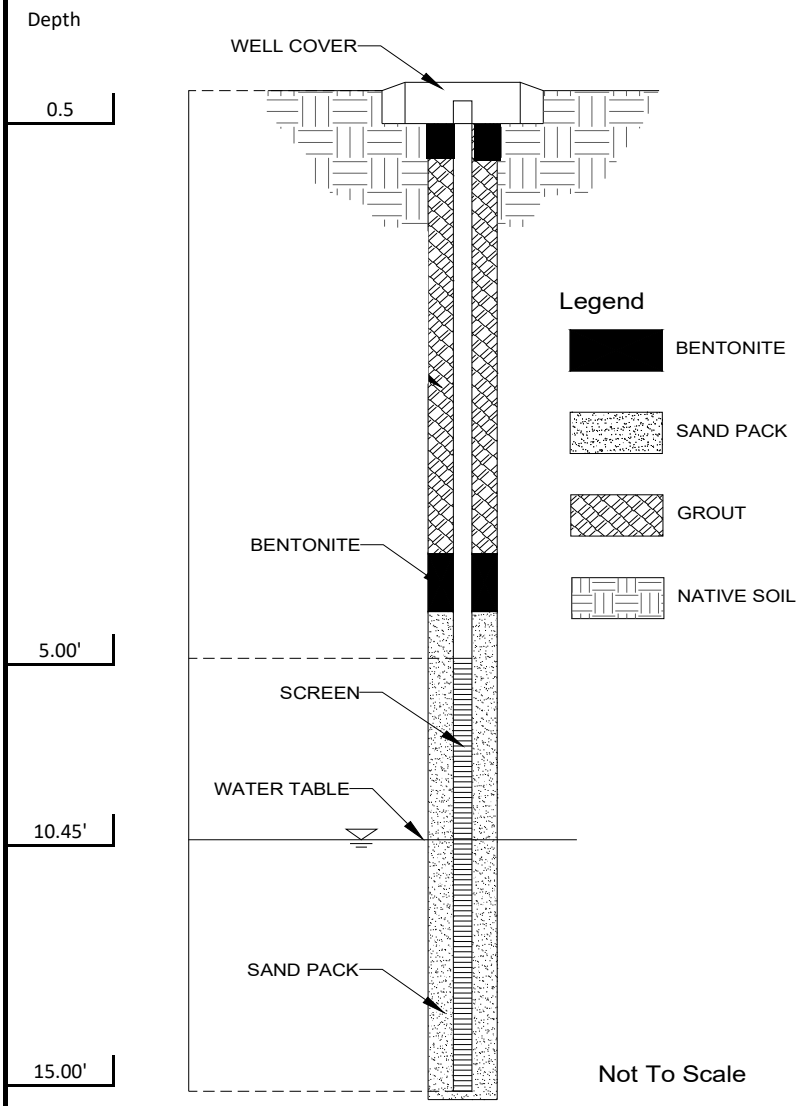
Bentonite Seal
- Type: Granular 3/8"
- Length: 5"
- Interval (BEG): 0-0.5"

Filter Pack
- Type: Sand #2
- Length: 2.5'
- Interval (BEG): 0.5" - 3.0''

Screen
- Type: Schedule 40 PVC
- Diameter: 2"
- Length: 3.0'
- Slot Size: 0.010"
- Interval (BEG): 0-3.0'

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631.269.8800 telephone | 631. 269.1599 facsimile
impactenvironmental.com

Well Code:	**MW-7A**		
Site Location:	60 McLean Avenue, Yonkers, NY	**Installer:**	Coastal
Job Number:	15514	**Installation Method:**	7782DT Direct Push
Client:	SnL Construction LLC	**Installation Date:**	5/3/2022



Surface Pad
- Type: Concrete, roadbox, manhole cover

Well Cap
- Type: J-Plug

Surface Casing
- Type: 8" Steel Manhole

Riser Pipe
- Type: Schedule 40 PVC
- Diameter: 2"
- Length: 5.00'
- Interval (BEG): 0-5.00'

Annular Seal
- Type: Sand #2 + Concrete
- Length: 2'
- Interval (BEG): 0-2.00'

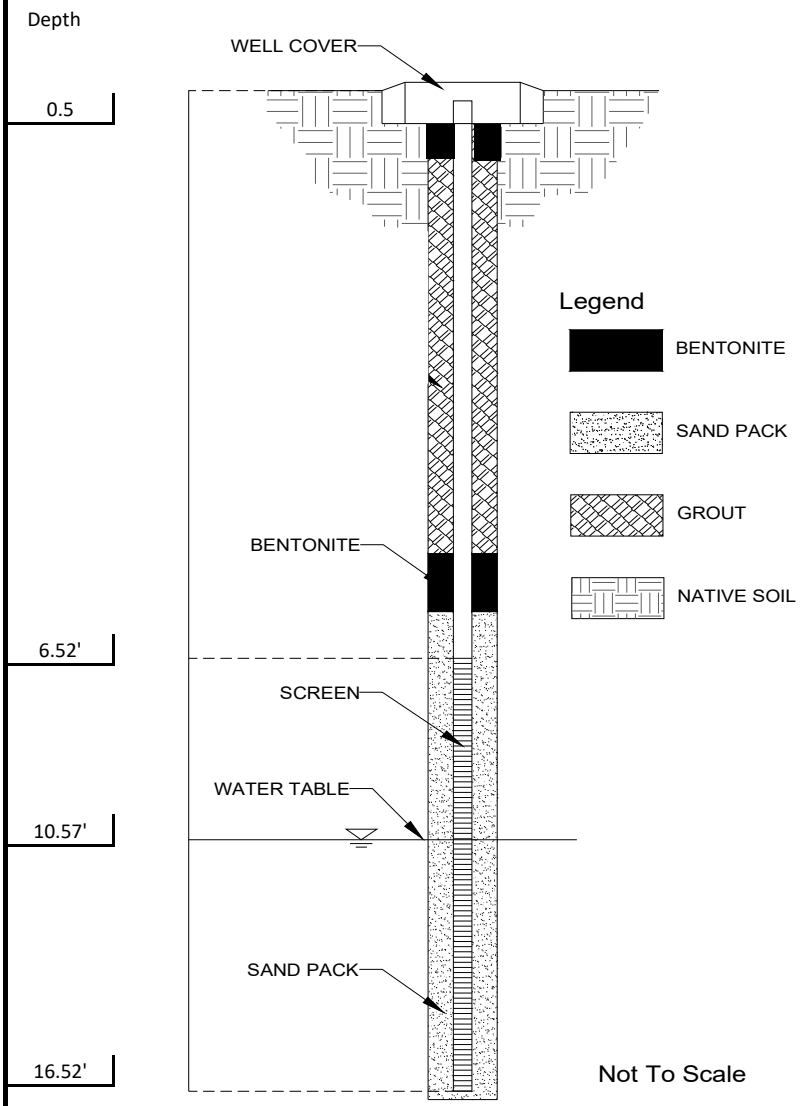
Bentonite Seal
- Type: Granular 3/8"
- Length: 2'
- Interval (BEG): 2.00-4.00'

Filter Pack
- Type: Sand #2
- Length: 11.00'
- Interval (BEG): 4.00' - 15.00'

Screen
- Type: Schedule 40 PVC
- Diameter: 2"
- Length: 10'
- Slot Size: 0.010"
- Interval (BEG): 5-15'

IMPACT ENVIRONMENTAL
170 Keyland Court, Bohemia, New York 11716
631.269.8800 telephone | 631. 269.1599 facsimile
impactenvironmental.com

Well Code:	**MW-9A**		
Site Location:	60 McLean Avenue, Yonkers, NY	**Installer:**	Coastal
Job Number:	15514	**Installation Method:**	7782DT Direct Push
Client:	SnL Construction LLC	**Installation Date:**	5/3/2022



Surface Pad
- Type: Concrete, roadbox, manhole cover

Well Cap
- Type: J-Plug

Surface Casing
- Type: 8" Steel Manhole

Riser Pipe
- Type: Schedule 40 PVC
- Diameter: 2"
- Length: 6.52'
- Interval (BEG): 0-6.52'

Annular Seal
- Type: Sand #2 + Concrete
- Length: 4'
- Interval (BEG): 0-3.00'

Bentonite Seal
- Type: Granular 3/8"
- Length: 2'
- Interval (BEG): 3.00-5.52'

Filter Pack
- Type: Sand #2
- Length: 11.00'
- Interval (BEG): 5.52' - 16.52'

Screen
- Type: Schedule 40 PVC
- Diameter: 2"
- Length: 10'
- Slot Size: 0.010"
- Interval (BEG): 6.52'-16.52'

GROUNDWATER LOG MW-1B

PROJECT NUMBER 15514
PROJECT NAME 60 Mclean Ave. Yonkers, NY
ADDRESS 60 Mclean Ave. Yonkers, NY

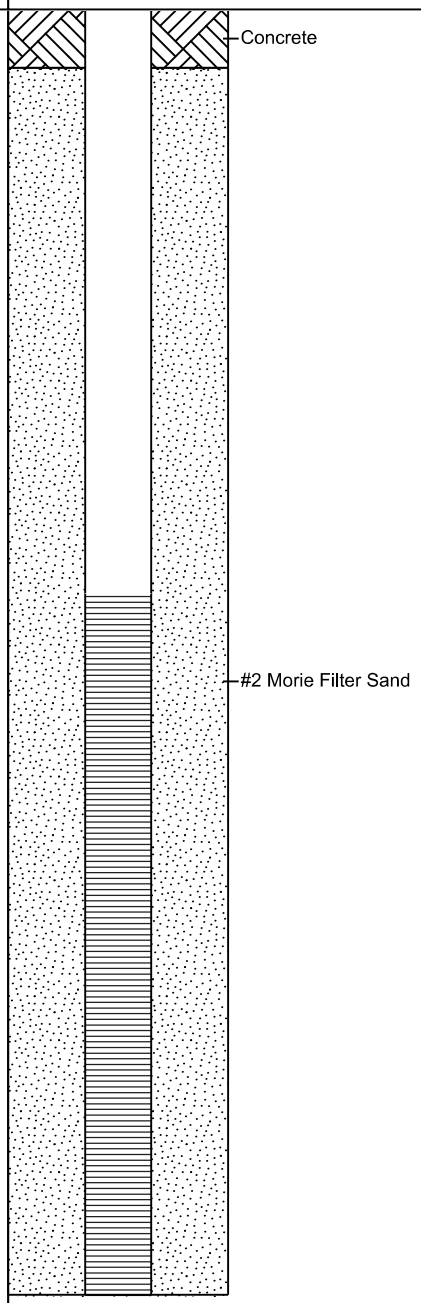
DRILLING DATE 09/12/2025
TOTAL DEPTH 10 Feet
DIAMETER 2 Inch
CASING 5 Feet
SCREEN 6 Feet

GW Depth N/A

COMMENTS Refusal of Drill rig at 11', Well was capped with a J-Plug and Cover.

LOGGED BY TB

Water	Depth (m)	Well Diagram	Additional Observations



Disclaimer This bore log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 01 Oct 2025

GROUNDWATER LOG MW-2B

PROJECT NUMBER 15514
PROJECT NAME 60 Mclean Ave. Yonkers, NY
ADDRESS 60 Mclean Ave. Yonkers, NY

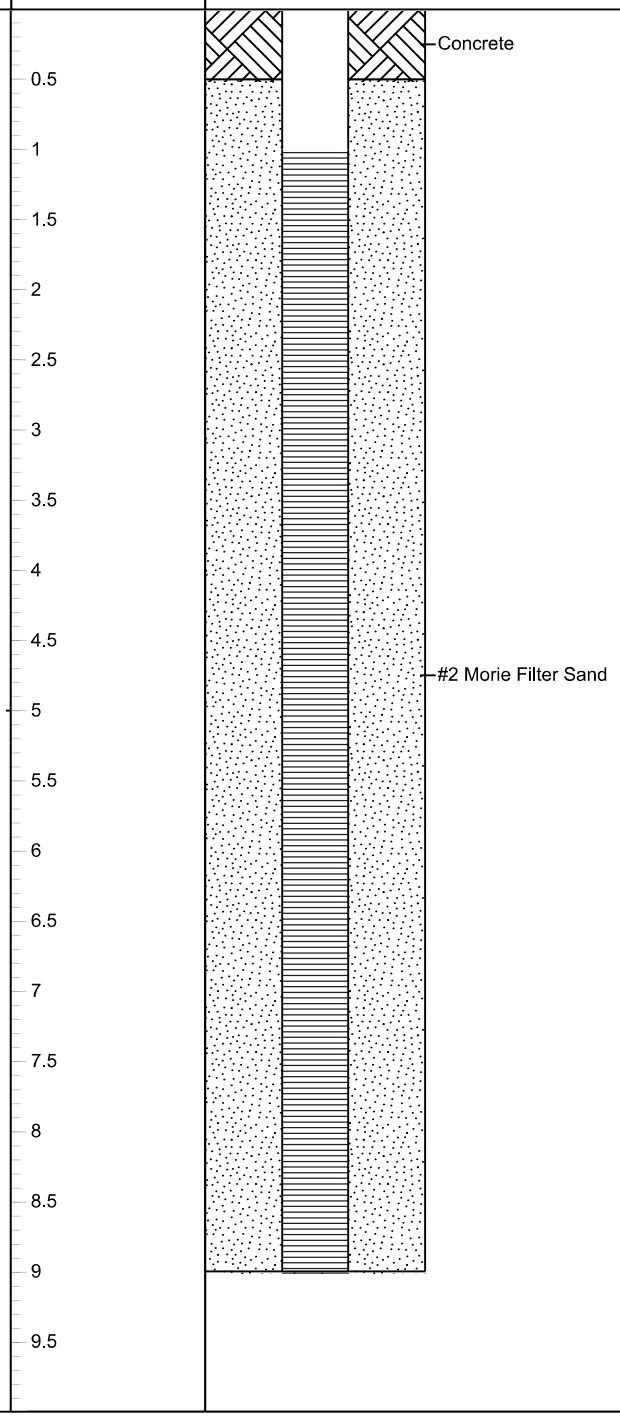
DRILLING DATE 09/15/2025
TOTAL DEPTH 9 Feet
DIAMETER 2 Inch
CASING 1 foot
SCREEN 9 Feet

GW Depth N/A

COMMENTS Refusal of Drill Rig at 9', Well was capped with a J-Plug and Cover.

LOGGED BY TB

Water	Depth (m)	Well Diagram	Additional Observations



Disclaimer This bore log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 01 Oct 2025

GROUNDWATER LOG MW-3B

PROJECT NUMBER 15514
PROJECT NAME 60 Mclean Ave. Yonkers, NY
ADDRESS 60 Mclean Ave. Yonkers, NY

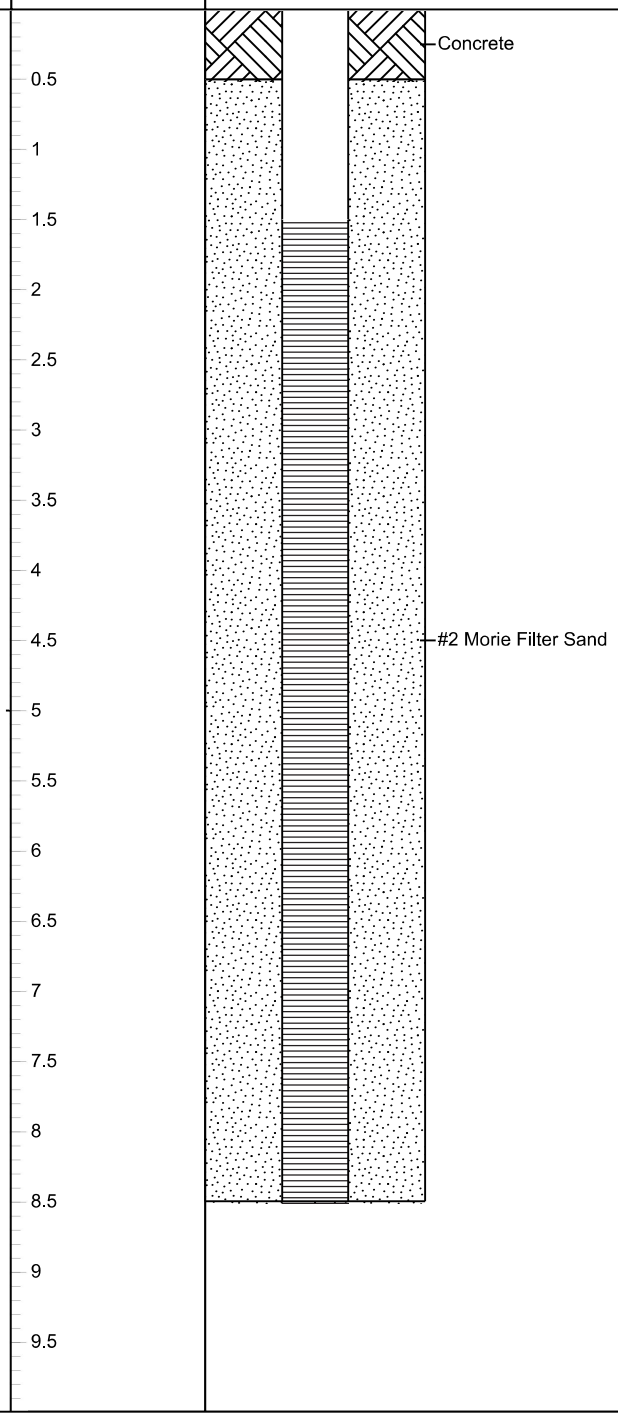
DRILLING DATE 09/15/2025
TOTAL DEPTH 8.5 Feet
DIAMETER 2 Inch
CASING 1.5 foot
SCREEN 7 Feet

GW Depth N/A

COMMENTS Refusal of Drill Rig at 8.5', Well was capped with a J-Plug and Cover.

LOGGED BY TB

Water	Depth (m)	Well Diagram	Additional Observations



Disclaimer This bore log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 01 Oct 2025

GROUNDWATER LOG MW-4B

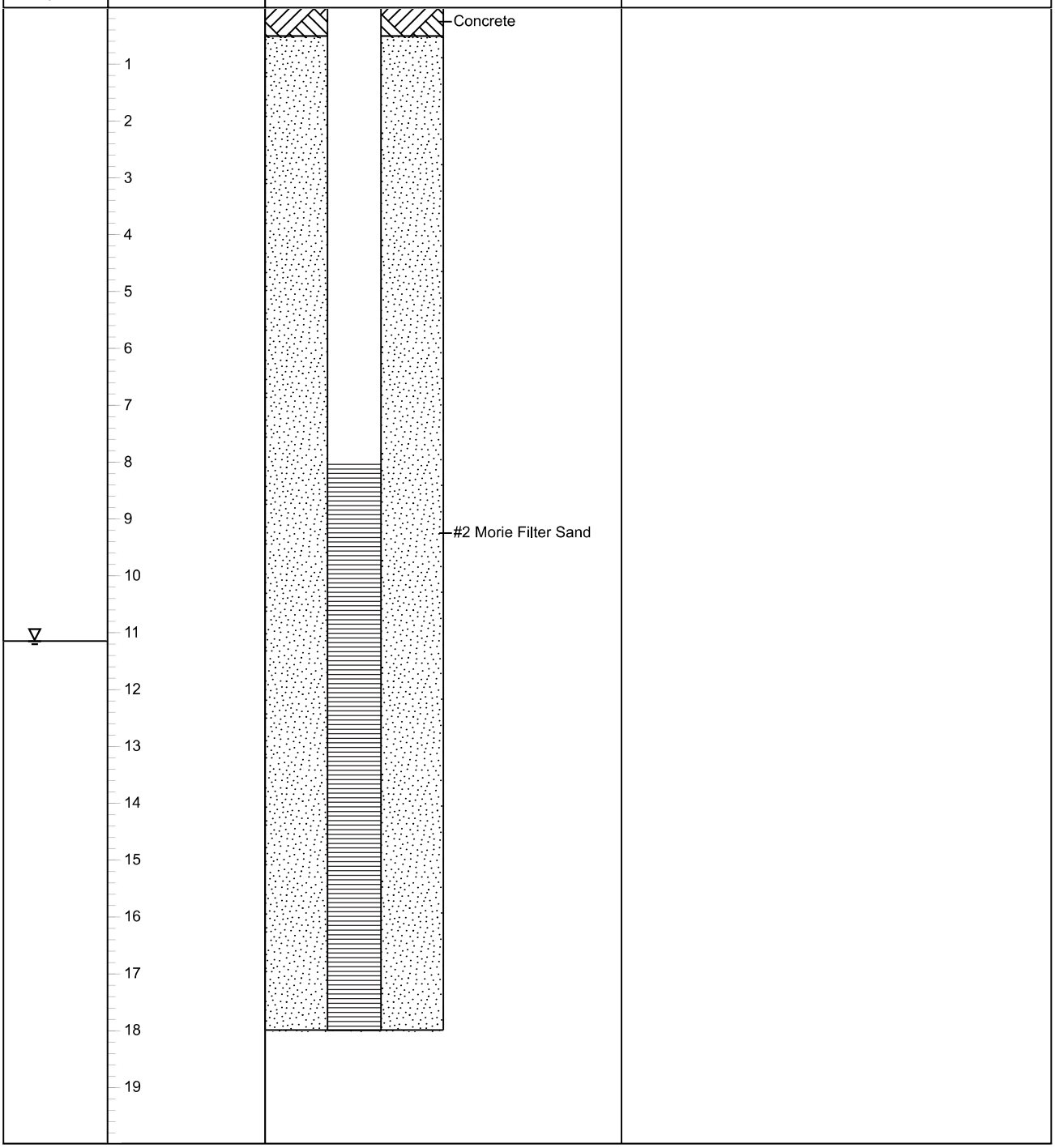
PROJECT NUMBER 15514
PROJECT NAME 60 Mclean Ave. Yonkers, NY
ADDRESS 60 Mclean Ave. Yonkers, NY

DRILLING DATE 09/15/2025
TOTAL DEPTH 18 Feet
DIAMETER 2 Inch
CASING 8 foot
SCREEN 10 Feet

GW Depth 11.15 Feet

COMMENTS Well was capped with a J-Plug and Cover.

LOGGED BY TB



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produced by ESlog.ESdat.net on 01 Oct 2025

GROUNDWATER LOG MW-6B

PROJECT NUMBER 15514
PROJECT NAME 60 Mclean Ave. Yonkers, NY
ADDRESS 60 Mclean Ave. Yonkers, NY

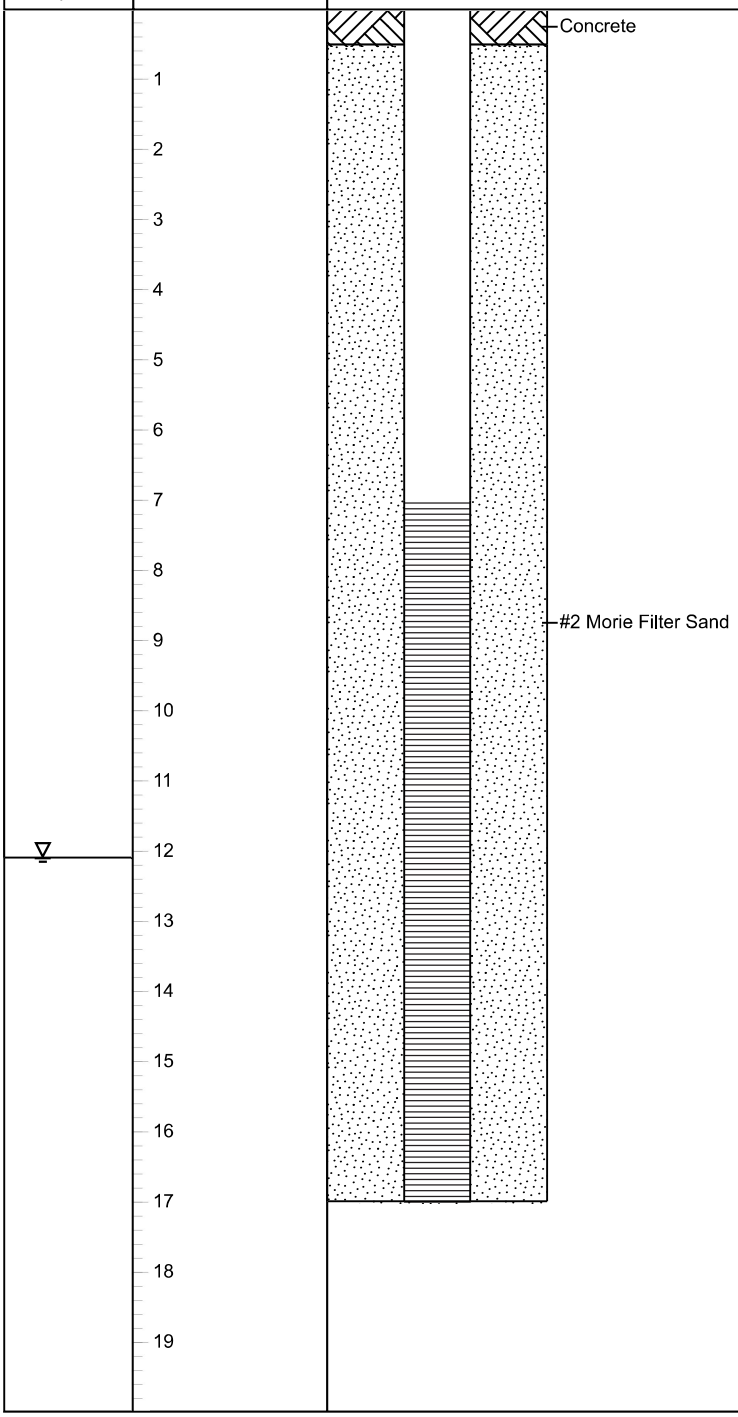
DRILLING DATE 09/12/2025
TOTAL DEPTH 17 Feet
DIAMETER 2 Inch
CASING 7 foot
SCREEN 10 Feet

GW Depth 12.10 Feet

COMMENTS Well was capped with a J-Plug and Cover.

LOGGED BY TB

Water	Depth (m)	Well Diagram	Additional Observations



Appendix E

46-70 McLean Avenue, Yonkers, NY

CAMP

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
TEL: (631) 268-8800
FAX: (631) 269-1599

NYSDEC BROWNFIELD CLEANUP PROGRAM

Community Air Monitoring Plan – BCP # C360211

August 16, 2023

conducted at:

46-70 McLean Avenue Auto Repair Laundry
46-70 McLean Avenue, Yonkers, New York
Westchester County Tax Map Designation: Section 1, Block 203, Lot 51.61

Submitted to:

New York State Department of Environmental Conservation
Chief, Site Control Section
Region 3, Division of Environmental Remediation
625 Broadway, Albany, NY 12233-7020

Prepared For:

SNL Yonkers, LLC
3333 New Hyde Park Road, Suite 200
Lake Success, New York, 11042

IEC Project # 15514

IMPACT ENVIRONMENTAL | 170 Keyland Court | Bohemia | New York | 11716 | 631.269.8800

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APPENDIX B ON-SITE DUST AND VOLATILE ORGANIC VAPOR MONITORING LOG

LIST OF ACRONYMS

Acronym	Definition
DER	Division of Environmental Remediation
CAMP	Community Air Monitoring Unit
Mcg/m3	Micrograms Per Cubic Meter
NYS DEC	New York State Department of Environmental Conservation
NYS DOH	New York State Department of Health
PID	Photoionization Detector
PM-10	Particulate Matter Less Than 10 Micrometers in Size
PPM	Parts Per Million
VOC	Volatile Organic Compound

CERTIFICATION

I, Xin Yuan am a Professional Engineer (PE) as defined in §43-140. I have primary direct responsibility for implementation of the Community Air Management Plan (CAMP) for the 46-70 McLean Avenue Auto Repair Laundry Site (DEC Site # C360211).

I certify that the CAMP has a plan for handling the prevention of exposure to the public from potential contaminant releases resulting from on-site investigative or remedial activities.

Xin Yuan, P.E.

Name

Signature

Date

1 INTRODUCTION

Impact Environmental Closures, Inc (IEC) prepared this Community Air Monitoring Plan (CAMP) to protect the community from any potential airborne releases that could result from field activities associated with construction activities for development (foundation installations, support of excavation, etc.) or remediation activities (remedial investigations or remedial action) at the property located at 46-70 McLean Avenue, Yonkers, New York, herein referred to as the "Site". This work is being performed under the auspices of the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program, DEC Project # C360211. This document has been prepared in accordance with the NYSDEC Program Policy Division of Environmental Remediation (DER)-10/Technical Guidance for Site Investigation and Remediation, dated May 3, 2010.

The CAMP is intended to protect off-site receptors and those not directly involved with remedial activities from potential airborne contaminant releases that result directly from investigative or remedial activities.

1.1 Objectives

The overall objectives of this document are as follows:

- Prevent exposure to the public from potential contaminant releases resulting from on-site investigative or remedial activities;
- Specify monitoring and documentation requirements; and
- Provide contingency details.

2 MONITORING

2.1 Community Air Monitoring Plan

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels with instrumentation and visual monitoring of fugitive dust migration will be performed at the perimeter of the exclusion zone or work area. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, the installation of soil borings or monitoring wells and demolition of contaminated or potentially contaminated structures.

Periodic monitoring for VOCs will be performed 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, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed 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. Exceedances of action levels observed during performance of the CAMP will be reported to the DEC Project Manager and included in the Daily Report.

2.2 VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a photoionization detector (PID). The PID will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will 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.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

All 15-minute readings must be recorded and be available for DEC personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

2.3 Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will 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 will 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.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m3 above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

2.4 Meteorological Monitoring

Meteorological monitoring will take place on a daily basis. It will consist of temperature, wind direction, and general atmospheric conditions (i.e. rain, snow, etc.). These parameters will be evaluated each morning and recorded in the field notebook. Wind direction should be monitored throughout the day so that upwind and downwind sampling locations can be adjusted if necessary.

All readings will be recorded and be available for DEC personnel to review.

3 DOCUMENTATION

During the implementation of the CAMP, the following information will be recorded and maintained:

- Climatological conditions including temperature wind direction, and other atmospheric conditions along with the date and time of observations;
- Calibration of field instruments;
- VOC 15-min readings as well as instantaneous readings, if necessary; All particulate readings; and
- Any exceedances to the response levels and the respective corrective actions.

VOC 15-min readings will be available for review by the State (DEC and NYSDOH) if requested. All particulate readings will be made available for review if requested.

IMPACT ENVIRONMENTAL | 170 Keyland Court | Bohemia | New York | 11716 | 631.269.8800

DAILY STATUS REPORT

Prepared by: _____

WEATHER	Snow		Rain		Overcast		Partly Cloudy		Bright Sun	
TEMP.	< 32		32-50		50-70		70-85		> 85	

DEC Project. No.		DEC Site No.		Date:	
Project Name:					

Environmental Consultant: Impact Environmental Closures, Inc 170 Keyland Court Bohemia, NY 11716.	**Environmental Safety Officer:**
General Contractor:	**Site Manager/ Supervisor:**
Work Activities Performed (Since Last Report)	
Working In Area:	

Samples Collected (Since Last Report):
Air Monitoring (Since Last Report): Prestart Conditions – PID = ___0.0__ppm, Dust = _____ mg/m^3@ High Conditions – PID = __0.0__ ppm @ Dust = __mg/m^3 @
Problems Encountered:
Planned Activities for the Next Day/ Week:

SOIL DISPOSAL INFORMATION

Facility #: **Name/ Location:** **Type of Waste:**	Facility:		Facility:		Facility:	
(# of Trucks, # of Cu.Yds.)	Trucks	Cu. Yds.	Trucks	Cu. Yds.	Trucks	Cu. Yds.
Today						
Weekly Total						
Total to Date						

SOIL IMPORTED INFORMATION

Facility #: **Name/ Location:** **Type of Import:**	Facility:		Facility:		Facility:	
(# of Trucks, # of Cu.Yds.)	Trucks	Cu. Yds.	Trucks	Cu. Yds.	Trucks	Cu. Yds.
Today						
Weekly Total						
Total to Date						

Site Grid Map

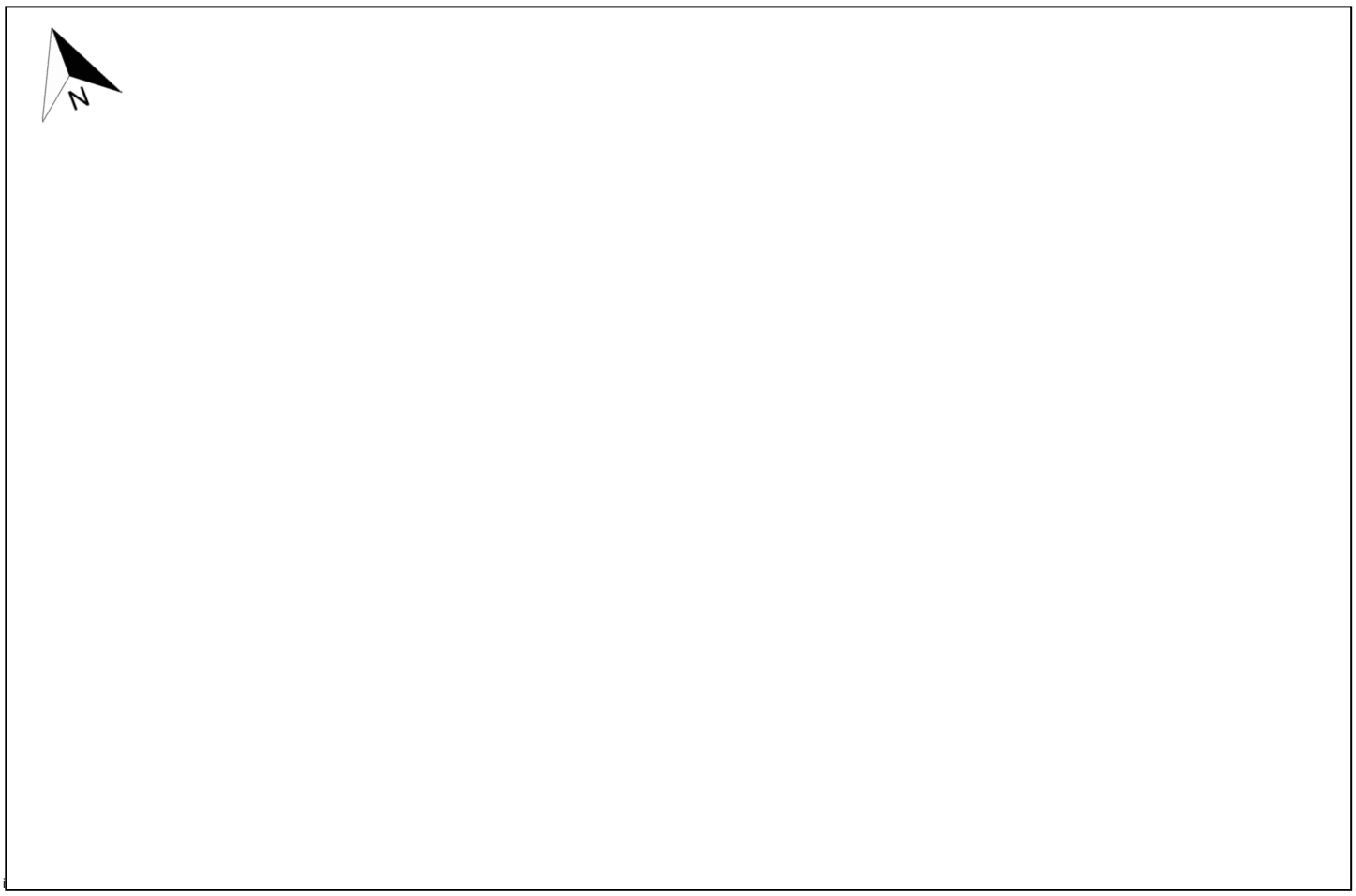


Photo Log

Photo 1 –	
Photo 2-	

Photo 3 –	

On- Site Dust and Volatile Organic Vapor Monitoring

Project: _____ Job No.: _____

Location: _____ On-site Personnel: _____

Day & Date: _____ Weather: _____

	AM	PM	Sample Interval: 15 minutes
Wind Direction			Background Reading (particulates) **mg/m^3**
Temperature Range:		°F	Background Reading (organic vapors) **ppm**

Calibration Dates: Particulate Meters: Photoionization Detector:

Action Level/Response: Organic vapors: > 5ppm above background levels/ 15 minute readings

Particulates: 0.100 mg/m^3 above up wind reading/15 minute period

Time	Particulate levels:		ORGANIC VAPOR LEVELS	NOTES
	UPWIND (mg/m^3)	DOWNWIND (mg/m^3)	(ppm)	
0700				
0715				
0730				
0745				
0800				
0815				
0830				
0845				
0900				
0915				
0930				
0945				
1000				
1015				
1030				
1045				
1100				
1115				
1130				
1145				
1200				

Project: _____ Job No.: _____

Location: _____ Day & Date: _____

Time	Particulate levels:		ORGANIC VAPOR LEVELS	NOTES
	UPWIND (mg/m^3)	DOWNWIND (mg/m^3)	(ppm)	
1215				
1230				
1245				
1300				
1315				
1330				
1345				
1400				
1415				
1430				
1445				
1500				
1515				
1530				
1545				
1600				
1615				
1630				
1645				
1700				

Appendix F

46-70 McLean Avenue, Yonkers, NY

As Built Development Drawings

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
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Appendix G

46-70 McLean Avenue, Yonkers, NY

QAPP

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
TEL: (631) 268-8800
FAX: (631) 269-1599

QUALITY ASSURANCE PROJECT PLAN

NYSDEC BROWNFIELD CLEANUP PROGRAM

Submitted for:

46-70 McLean Avenue Auto Repair Laundry Site
46-70 McLean Avenue
Yonkers, New York 10705
Westchester Tax Map Designation: Section 1, Block 203; Lot 51.61

Submitted to:

Environmental Remediation - Site Control Section
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-7020

Prepared for:

SnL Yonkers, LLC
3333 New Hyde Park Road, Suite 200
Lake Success, New York 11042

July 28, 2023
***IEC Project Number:* #15514**

IMPACT ENVIRONMENTAL | 170 Keyland Court | Bohemia | New York | 11716 | 631.269.8800

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1 INTRODUCTION

Impact Environmental Closures, Inc. (Impact) has been retained by SNL Yonkers, LLC to prepare a Remedial Action Work Plan (RAWP) for a property located at 46-70 McLean Avenue, Yonkers, New York ("Site"), in accordance with the provisions of the New York State Department of Environmental Conservation's Brownfield Cleanup Program.

This Quality Assurance Project Plan (QAPP) provides an outline of the field and laboratory procedures that will be used during the Remedial Action (RA) proposed for the Site. The QAPP is used to ensure the accuracy and precision of data collected and interpreted during the investigation in order to meet project requirements. The QAPP identifies procedures for sample collection to maintain consistency among datasets and mitigate the potential for cross-contamination, as well as analytical requirements necessary to allow for independent data validation. A Sampling and Analysis Plan (SAP) identifying methods for sample collection, decontamination, handling and shipping, is provided in the following sections.

This QAPP has been prepared in accordance with United States Environmental Protection Agency (USEPA) *Requirements for Quality Assurance Project Plans*; the USEPA Region II *CERCLA Quality Assurance Manual*, and New York State Department of Environmental Conservation (NYSDEC) *DER-10 Technical Guidance for Site Investigation and Remediation* (May 2010) and subsequent updates.

1.1 Scope and Goals

This QAPP has been prepared to support the remedial activities planned for the Site. The goals of the RA are to remove soil contamination, and monitor groundwater and soil vapor contamination identified during previous RI activities and collect additional data to confirm success of remedial actions. This QAPP was prepared to provide quality assurance guidelines to be implemented during the RA activities to fulfill the RA goals for the Site. This document may be modified for subsequent phases of investigative work, as necessary. The QAPP provides:

- A means to communicate exactly what is to be done, by whom, and when to the individuals executing the various activities;
- A culmination to the planning process that ensures that the program includes provisions for obtaining quality data (e.g., suitable methods of field operations);
- A historical record that documents the investigation in terms of the methods used, calibration standards and frequencies planned, and auditing planned;
- A document that can be used by the Project Manager's and the QA Officer to assess if the activities planned are being implemented and their importance for accomplishing the goal of quality data;
- A plan to document and track project data and results; and,

- Detailed descriptions of the data documentation materials and procedures, project files, and tabular and graphical reports.

The QAPP is primarily concerned with the quality assurance (QA) and quality control (QC) aspects of the procedures involved in the collection, preservation, packaging, and transportation of samples; field testing; record keeping; data management; chain-of-custody procedures; laboratory analyses; and other necessary matters to assure that the investigation activities, once completed, will yield data whose integrity can be defended.

QA refers to the conduct of all planned and systematic actions necessary to perform satisfactorily all task-specific activities and to provide information and data confidence as a result of such activities. The QA for task-specific activities includes the development of procedures, auditing, monitoring and surveillance of the performance.

QC refers to the activity performed to determine if the work activities conform to the requirements. This includes activities such as inspections of the work activities in the field (e.g., verification that the items and materials installed conform to applicable codes and design specifications). QA is an overview monitoring of the performance of QC activities through audits rather than first time inspections.

1.2 Cleanup Criteria and Laboratory Reporting Limits

The following soil cleanup criteria will be used to evaluate the analytical data collected as part of the RI:

Soil:	6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs) listed in Table 375-6.8(a), Protection of Public Health Restricted Use SCOs and the Protection of Groundwater SCOs listed in Table 375-6.8(b).

The following groundwater cleanup criteria will be used to evaluate the analytical data collected as part of the RI:

Groundwater:	6 NYCRR Part 703 Groundwater Quality Standards and the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards and Guidance Values

The following criteria will be used for evaluation of the soil vapor and indoor air quality sample analytical data collected as part of the RI:

Soil Vapor/Indoor Air Quality:	NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York and Subsequent Final Guidance Updates Air Guidance Values and Matrices.

For 1,4-dioxane and Per- and Polyfluoroalkyl substances (PFAS), NYSDEC issued sampling guidance in June 2019. More recently, NYSDEC issued Sampling, Analysis and Assessment of PFAS under NYSDEC's Part 375 Remedial Program Guidance dated October 2020. Sampling procedures, PFAS guidance values, QA/QC standards and reporting objectives for these emerging contaminates will be implemented within this QAPP based on said NYSDEC documents. Soil vapor sampling for 1,4-Dioxane and PFAS are not required.

The environmental analytical laboratory selected for this RA must have reporting limits that are low enough to meet the above referenced cleanup standard and QA/QC objectives specified in NYSDEC DER-10 Remedial Program Guidance. As part of project planning and throughout the project life cycle, the environmental consultant will maintain close communications with the contracted laboratory to convey the necessity for establishing and achieving data reporting goals. Additional information regarding the contracted lab and reporting limits are provided in *Section 4.6* of this document.

2 QAPP ORGANIZATION AND RESPONSIBILITY

The principal organizations involved in verifying achievement of data collection goals for the Site include: the NYSDEC, NYSDOH, Applicant, Consultant, drilling subcontractor(s), independent environmental laboratory and the independent third-party data validator. Roles, responsibilities, and required qualifications of these organizations are discussed in the following subsections.

2.1 NYSDEC and NYSDOH

It is the responsibility of the NYSDEC, in conjunction with NYSDOH, to review the RIWP and supporting documents, for completeness and conformance with the site-specific cleanup objectives and to make a decision to accept or reject these documents based on this review. The NYSDEC also has the responsibility and authority to review and approve all QA documentation collected during brownfield cleanup construction and to confirm that the QAPP was followed.

2.2 Applicant

SNL Yonkers, LLC ("Applicant") will be responsible for complying with the QA requirements as specified herein and for monitoring and controlling the quality of the Brownfield cleanup construction either directly or through their designated environmental consultant and/or legal counsel. The Applicant will also have the authority to a select Remedial Action Contractor(s) to assist them in fulfilling these responsibilities. The designated Project Manager is responsible for implementing the project and has the authority to commit the resources necessary to meet project objectives and requirements.

2.3 Environmental Consultant

Impact is the prime consultant on this project and is responsible for the performance of the services required to implement each phase of the RAWP, including, but not limited to, field operations, laboratory testing, data management, data analysis and reporting. Any one member of Impact's staff may fill more than one of the identified project positions (e.g., field team leader and site safety and health officer). The various quality assurance, field, laboratory and management responsibilities of key project personnel are defined below and the resumes are provided in **Appendix A**.

<u>Impact Project Manager (PM): Chris Connolly</u>

The Impact PM has the responsibility for ensuring that the project meets the Work Plan objectives. The PM will report directly to the SNL Yonkers, LLC Project Coordinator and the NYSDEC/NYSDOH Project Coordinators and is responsible for technical and project oversight. The PM will:

- Define project objectives and develop a detailed work plan schedule.

- Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task.
- Acquire and apply technical and corporate resources as needed to assure performance within budget and schedule constraints.
- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product.
- Review the work performed on each task to assure its quality, responsiveness, and timeliness.
- Review and analyze overall task performance with respect to planned requirements and authorizations.
- Review and approve all deliverables before their submission to NYSDEC.
- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product.
- Ultimately be responsible for the preparation and quality of interim and final reports.
- Represent the project team at meetings.

Impact Field Team Leader (FTL): Marius Sidlauskas

The Field Team Leader (FTL) has the responsibility for implementation of specific project tasks identified at the Site, and is responsible for the supervision of project field personnel, subconsultants, and subcontractors. The FTL reports directly to the Project Manager. The FTL will:

- Define daily work activities.
- Orient field staff concerning the project's special considerations.
- Monitor and direct subcontractor personnel.
- Review the work performed on each task to ensure its quality, responsiveness, and timeliness.
- Assure that field activities, including sample collection and handling, are carried out in accordance with this QAPP.

For this project, the FTL will also serve as the Site Safety and Health Officer (SSHO). As such, he is responsible for implementing the procedures and required components of the Site Health and Safety Plan (HASP), determining levels of protection needed during field tasks, controlling site entry/exit, briefing the field team and subcontractors on site-specific health and safety issues, and all other responsibilities as identified in the HASP.

Impact Field Personnel (FS):

The field personnel hold a minimum of a bachelor's degree in a relevant natural or physical science or engineering. The field personnel will complete the collection of environmental samples from the Site in accordance with the requirements of the remedial investigation work plan and the QAPP and oversee subcontractor work. The field personnel will:

- Implement sample collection protocols in accordance with applicable procedures for soil, soil vapor and groundwater sample collection.
- Ensure quality control procedures are being implemented.
- Ensure adherence to and successful completion of RIWP tasks.
- Oversee subcontractors to ensure field work is completed in accordance with the RAWP and QAPP.
- Record field notes and provide daily updates on work progress.

2.4 Quality Assurance (QA) Responsibilities

The QA Officer will have direct access to corporate executive staff as necessary, to resolve any QA dispute, and is responsible for auditing the implementation of the QA program in conformance with the demands of specific investigations and Impact policies, and NYSDEC requirements. The QA Officer has sufficient authority to stop work on the investigation as deemed necessary in the event of serious QA issues. The resume for the QA Officer is provided in **Appendix B**.

Impact Project QA Officer: Michael Bluight, PG

Specific function and duties include:

- Performing QA audits on various phases of the field operations.
- Reviewing and approving QA plans and procedures.
- Providing QA technical assistance to project staff.
- Reporting on the adequacy, status, and effectiveness of the QA program on a regular basis to the Project Manager for technical operations.
- Responsible for assuring third party data review of all sample results from the analytical laboratory.

2.5 Field Responsibilities

Impact field staff for this project is drawn from a pool of qualified resources. The Project Manager will use staff to gather and analyze data, and to prepare various task reports and support materials. The designated technical team members are experienced professionals who possess the degree of specialization and technical competence required to effectively and efficiently perform the required work. The resumes for field personnel are provided in **Appendix C**.

3 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall objectives and criteria for assuring quality for this effort are discussed below. This QAPP addresses how the acquisition and handling of samples and the review and reporting of data will be documented. The objectives of this QAPP are to address the following:

- The procedures to be used to collect, preserve, package, and transport groundwater samples.
- Field data collection.
- Record keeping.
- Data management
- Chain-of-custody procedures.
- Precision, accuracy, completeness, representativeness, decision rules, comparability and level of quality control effort conformance for sample analysis and data management by Alpha Analytical under EPA analytical methods.

3.1 Level of QC Effort for Sample Parameters

Method blank, field duplicate, laboratory duplicate, laboratory control, standard reference materials (SRM) and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs. QC samples are discussed below.

- Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures.
- Duplicate samples are analyzed to check for sampling and analytical reproducibility.
- MS/MSD and MS/Duplicate samples provide information about the effect of the sample matrix on the digestion and measurement methodology. Depending on site-specific circumstances, one MS/MSD or MS/Duplicate should be collected for every 20 or fewer investigative samples to be analyzed for organic and inorganic chemicals of a given matrix.
- Equipment field blank samples are used to determine if specific materials utilized in sample collection can cross contaminate the sample.

The general level of QC effort will be one field (blind) duplicate and one equipment field blank (when non-dedicated equipment is used) for every 20 or fewer investigative samples of a given matrix. Additional sample volume will also be provided to the laboratory to allow site-specific MS/MSD or MS/Duplicate for every 20 or fewer investigative samples of a given matrix. One trip blank consisting of distilled, deionized water will be included along with each sample delivery group of aqueous VOC samples. Equipment field blanks will be collected at a frequency of 1 per day for all PFAS and 1,4-dioxane sampling for each matrix. Number of all QA samples are included in Table 1.

4 SAMPLING AND ANALYSIS PLAN

Methods and protocols to be used for collection of environmental samples (i.e., soil, groundwater and soil vapor) for this investigation are described in the Impact Field Operating Procedures (FOPs) presented in **Appendix D**. The overall investigative planning process pursues to target specific matrices in locations of potential concern based on current/historical uses and/or site conditions. Once a sample group meets data quality objectives, analysis is considered valid and used to determined if values exceed state designated guidance values. Based on data evaluation the generated conceptual site model can inform the remedial strategy to better develop site-specific remedial action objectives.

Sample parameter lists, holding times and sample container requirements are summarized on **Table 1.** The sampling program and related site activities are discussed below. To the extent allowed by existing physical conditions at the facility, sample collection efforts will adhere to the specific methods presented herein. If alternative sampling locations or procedures are implemented in response to facility specific constraints, each will be selected on the basis of meeting data quality objectives. Such alternatives will be approved by NYSDEC before implementation and subsequently documented for inclusion in the project file.

4.1 Custody Procedures

Sample custody is controlled and maintained through the chain-of-custody procedures. Chain of custody is the means by which the possession and handling of samples will be tracked from the source (field) to their final disposition, the laboratory. A sample is considered to be in a person's custody if it is in the person's possession or it is in the person's view after being in his or her possession or it was in that person's possession and that person has locked it in a vehicle or room. Sample containers will be cleaned and preserved at the laboratory before shipment to the Site. The following section and FOPs for Sampling, Labeling, Storage, and Shipment, located in **Appendix B**, describe procedures for maintaining sample custody from the time samples are collected to the time they are received by the analytical laboratory.

4.2 Sample Storage

Samples are stored in secure limited-access areas. Walk-in coolers or refrigerators are maintained at 4 degrees Celsius (°C), or as required by the applicable regulatory program. The temperatures of all refrigerated storage areas are monitored and recorded a minimum of once per day. Deviations of temperature from the applicable range require corrective action, including moving samples to another storage location if necessary.

4.3 Sample Custody

Sample custody is defined by this document as when any of the following occur:

- It is in someone's actual possession.
- It is in someone's view after being in his or her physical possession.
- It was in someone's possession and then locked, sealed or secured in a manner that prevents unsuspected tampering.
- It is placed in a designated and secured area.

Samples are removed from storage areas by the sample custodian or analysts and transported to secure laboratory areas for analysis. Access to the laboratory and sample storage areas is restricted to laboratory personnel and escorted visitors only; all areas of the laboratory are therefore considered secure. If required by the applicable regulatory program, internal chain-of-custody is documented in a log by the person moving the samples between laboratory and storage areas.

Laboratory documentation used to establish COC and sample identification may include the following:

- Field COC forms or other paperwork that arrives with the sample.
- The laboratory COC.
- Sample labels or tags are attached to each sample container.
- Sample custody seals.
- Sample preparation logs (i.e., extraction and digestion information) recorded in hardbound laboratory books that are filled out in legible handwriting, and signed and dated by the chemist.
- Sample analysis logs (e.g., metals, GC/MS, etc.) information recorded in hardbound laboratory books that are filled out in legible handwriting, and signed and dated by the chemist.
- Sample storage log (same as the laboratory COC).
- Sample disposition log, which documents sample disposal by a contracted waste disposal company.

4.4 Sample Tracking

All samples are maintained in the appropriate coolers prior to and after analysis. The analysts remove and return their samples as needed. Samples that require internal COC are relinquished to the analysts by the sample custodians. The analyst and sample custodian must sign the original COC relinquishing custody of the samples from the sample custodian to the analyst. When the samples are returned, the analyst will sign the original COC returning sample custody to the sample custodian. Sample extracts are relinquished to the instrumentation analysts by the preparatory analysts. Each preparation department tracks internal COC through their logbooks/spreadsheets. Any change in the sample during the time of custody will be noted on the COC (e.g., sample breakage or depletion).

4.5 Field Instrument Calibration

This section describes the calibration procedures and the frequency at which these procedures will be performed for instruments.

4.5.1 Instrument Calibration and Tuning

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and the concentration of calibration standards is determined by the manufacturer's guidelines, the analytical method, and/or laboratory's internal Quality Assurance Plan.

4.5.2 Field Instrument Calibration

Calibration of the field instruments will be completed prior to each day's use in accordance with the manufacturer's instructions. The field equipment will be maintained, calibrated and operated in a manner consistent with the manufacturer's guidelines and standard use methods. Quantitative field measurements will be limited to organic vapor readings (Photoionization Detector). Records of calibration, repair or replacement will be filed and maintained by the Field Team Leader.

4.6 Analytical Procedures

A single laboratory will be utilized for analysis of the soil, groundwater and soil vapor samples collected during the RI field sampling activities. The selected analytical laboratory for this project is Alpha Analytical of Westborough, Massachusetts. Alpha is certified by the NYSDOH Environmental Laboratory Approval Program (ELAP) Number 11148. The laboratory analyses will be in accordance with the most recent version of the NYSDEC Analytical Services Protocol (ASP) and the laboratory's internal Quality Assurance Plan. The lab will provide a Category B data deliverable.

The analytical methods Alpha will use for samples collected to delineate contaminants during this RI include:

Analytical Methods for Soil Samples	
USEPA Method 8260C/5035	Target Compound List (TCL) Volatile Organic Compounds (VOCs) + Tentatively Identified Compounds (TICs)
USEPA Method 8270D	TCL Semi Volatile Organic Compounds (SVOCs)+ TICs
USEPA Method 537.1 (M) LC-MS/MS	NY Per- and Polyfluoroalkyl Substances (PFAS) Analyte List
USEPA 8270D-SIM	1,4-Dioxane
USEPA 8082A	TCL Polychlorinated biphenyls (PCBs)
USEPA 8081B	TCL Pesticides
7196A	Hexavalent Chromium
9010C/9012B	Total Cyanide
6010D	TAL Metals
7471B	Total Mercury

Analytical Methods for Groundwater Samples	
USEPA Method 8260C	TCL VOCs + TICs
USEPA Method 8270D SIM LVI	TCL SVOCs + TICs
USEPA Method 537.1 (M) LC-MS/MS	NY PFAS Analyte List
USEPA 8270 -SIM	1,4-Dioxane
USEPA 8082A (LVI)	TCL PCBs
USEPA 8081B	TCL Pesticides
7196A	Hexavalent Chromium
9010C/9012B	Total Cyanide
6020B	TAL Metals
7470A	Total Mercury

Sim – Selective Ion Monitoring
LVI - Large Volume GC Injection Port

Analytical Methods for Soil Vapor/Air Samples	
USEPA Method TO-15	VOCs

The analytical methods Alpha will use for samples collected to define a suitable remedial injection agent during the IRM evaluation events include:

Analytical Methods for IRM Groundwater Samples	
3500Fe-B/ 6020B	Iron, Ferrous
USEPA 9030B	Sulfide
4500NO3-F	Nitrogen, Nitrite
4500NO3-F	Nitrogen, Nitrate
Lab Specific Method	Phenol Hydroxylase (PHE)
Lab Specific Method	Benzyl Succinate Synthase (bssA)
Lab Specific Method / CENSUS qPCR	Iron Reducing Bacteria (IRB)

All other reporting and deliverables (i.e. waste characterization samples, geochemistry data for remedial action evaluation) will be in accordance with Standard Laboratory Procedure.

Alpha has provided a series of tables that contain the analytical parameters for soil and soil vapor with the applicable reporting limits, method detection limits, containers and hold times. The Alpha tables are provided in **Appendix E**. Alpha has also provided the SOP for the PFAS analysis which is provided in **Appendix F**.

4.7 Data Validation/ Usability Evaluation

The analytical laboratory data package will be validated by Sherif Mina with Meridian Consultant Group, Inc. of Annapolis, MD (MCG, Inc.), an independent/third-party data validator subcontractor, in accordance with the NYSDEC Division of Environmental Remediation DER-10, Appendix 2B(b) DEC Analytical Services Protocol Category B Data Deliverable. Refer to **Appendix G** for resume of the third-party data validator.

4.7.1 Procedures Used to Evaluate Data Usability

The sample analytical data for each sample matrix shall be evaluated and include, but are not limited to:

- Lab Report Narrative Review
- Data Package Completeness and COC records

- Sample Preservation and Holding Times
- Initial and Continuing Calibration
- QC Blanks
- Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)
- Matrix Spike/Matrix Spike Duplicates (MS/MSD)
- Surrogate Spikes
- Internal Standard Response and Retention Times
- Laboratory Duplicates
- Field Duplicates
- Raw Data (chromatograms), Calculation Checks and Transcription Verifications
- Reporting Limits

4.7.2 Data Usability Summary Report (DUSR)

The DUSR will provide an evaluation of the analytical data to determine whether the data meets the criteria of a NYSDEC ASP Category B data deliverable and meets the data quality objectives for the project.

4.7.3 Data Submissions/ Electronic Data Deliverables

The Analytical Services Protocol (ASP) Category B data packages and an electronic data deliverable (EDD) will be provided by the laboratory after receipt of a complete sample delivery group. The Project Manager will immediately arrange for archiving the results and preparation of result tables. These tables will form the database for assessment of the site contamination condition. Each EDD deliverable must be formatted using a Microsoft Windows operating system and the NYSDEC data deliverable format for EQuIS. To avoid transcription errors, data will be loaded directly into the ASCII format from the laboratory information management system. If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion. The Project Manager or Task Manager will maintain close contact with the QA reviewer to ensure all non-conformance issues are acted upon prior to data manipulation and assessment routines. Once the QA review has been completed, the Project Manager may direct the Team Leaders or others to initiate and finalize the analytical data assessment.

Table 1: Summary of Sample Parameters, Holding Times and Sample Container Requirements

Table 1. Summary of Sample Parameters, Holding Times and Sample Container Requirements
46-70 McLean Avenue, Yonkers, New York

Sample Matrix	Test Method	Parameters	Containers	Preservation	Holding Times
Soil - Gas (air) Analysis	USEPA Compendium TO-15	VOCs	6-Liter Summa Canister	Summa - NA	15 Days
Soil	USEPA SW846 Method 5035A/8260C	TCL VOC+TICs	Terra Core	Water, 4 °C	48 Hours/14 Days*
	USEPA SW846 Method 5035A/8260C	CP-51 List VOCs	Terra Core	Water, 4 °C	48 Hours/14 Days*
	USEPA SW846 Method 8270D	TCL SVOCs+TICs	4oz glass jar	4 °C	14 Days (extraction)
	USEPA SW846 Method 8270D	CP-51 List SVOCs	4oz glass jar	4 °C	14 Days (extraction)
	USEPA SW846 Method 8082A	TCL PCBs	4oz glass jar	4 °C	14 Days (extraction)
	USEPA SW846 Method 8081B	TCL Organochlorine Pesticides	4oz glass jar	4 °C	14 Days (to extraction)
	USEPA Method 6010D	TAL Metals	4oz glass jar	4 °C	180 Days
	USEPA Method 7471B	TAL Metal - Mercury	4oz glass jar	4 °C	28 Days
	USEPA Method 7196A	Hexavelent Chromium	4oz glass jar	4 °C	30 Days
	USEPA Method 9010C	Total Cyanide	4oz glass jar	4 °C	14 Days
	Modified USEPA Method 537.1	PFAS	8oz HDPE Container	4 °C	14 days to Extraction, and 40 days After Extraction
	USEPA Method 8270 SIM	1,4-Dioxane	4oz glass jar	4 °C	14 Days (extraction)

* The holding time for VOCs is soil is 48-hours, until the sample is aliquoted and extruded into two (2) sealed vials with DI water and frozen to -7°C and one (1) sealed vial with methanol, then the hole time is extended to 14 days.

Table 1. Summary of Sample Parameters, Holding Times and Sample Container Requirements
46-70 McLean Avenue, Yonkers, New York

Sample Matrix	Test Method	Parameters	Containers	Preservation	Holding Times
Groundwater	USEPA SW846 Method 8260C	TCL VOC+TICs	3 - 40ml VOA Vials	HCL, pH<2, 4 °C	14 days
	USEPA SW846 Method 8270D	TCL SVOCs+TICs	2 - 1000 ml glass	4 °C	7 Days (extraction)
	USEPA SW846 Method 8082A	TCL PCBs	2 - 1000 ml glass	4 °C	7 Days (extraction)
	USEPA SW846 Method 8081B	TCL Pesticides	2 - 500 ml glass	4 °C	7 Days (extraction)
	USEPA Method 6010D	Total TAL Metals	500 ml plastic	HNO3, pH<2, 4 °C	180 Days
	USEPA Method 7471B	TAL Metal - Total Mercury	500 ml plastic	HNO_3, pH<2, 4 °C	28 Days
	Lab Sample Filtration	TAL Dissolved Metals	-	-	Filtration in Lab within 24 hours
	USEPA Method 3015A	Acid Digestion for Filtered TAL Metals	-	-	After Filtration
	USEPA Method 6010D	Dissolved TAL Metals	500 ml plastic	4 °C	180 Days after digestion
	USEPA Method 7471B	TAL Metal - Dissolved Mercury	500 ml plastic	4 °C	28 Days after digestion
	USEPA Method 7196A	Hexavelent Chromium	500 ml plastic	4 °C	24 Hours
	USEPA Method 9010C	Total Cyanide	250 ml plastic	NaOH, pH>12, 4 °C	14 Days
	Modified USEPA Method 537.1	PFAS	2 - 250 ml HDPE	Trizma, 4 °C	14 Days (extraction)
	USEPA Method 8270D-SIM w/Isotope Dilution	1,4-Dioxane	2 - 1000 ml glass	4 °C	7 Days (extraction)

Table 1. Summary of Sample Parameters, Holding Times and Sample Container Requirements
46-70 McLean Avenue, Yonkers, New York

Sample Matrix	Test Method	Parameters	Containers	Preservation	Holding Times
Groundwater	*Lab Specific Method*	*Benzylsuccinate Synthase (bssA)*	*1,000 ml plastic*	*4 °C*	*24-48 Hours*
	Lab Specific Method	*Phenol Hydroxylase (PHE)*	*1,000 ml plastic*	*5 °C*	*24-48 Hours*
	USEPA Method 353.2 / SM 4500NO3-F	*Nitrite*	*250 ml plastic*	*4 °C*	*48 Hours*
	USEPA Method 353.2 / SM 4500NO3-F	*Nitrate*	*250 ml plastic*	*4 °C*	*48 Hours*
	USEPA Method 300.0 / SM4500SO4 -E	*Sulfate*	*250 ml plastic*	*4 °C*	*28 Days*
	USEPA Method 300.0 / SM4500SO4 -E	*Sulfite*	*250 ml plastic*	*4 °C*	*28 Days*
	Lab Specific Method	*Iron Reducing Bacteria (IRB)*	*1,000 ml plastic*	*5 °C*	*24-48 Hours*
	3500Fe-B/ 6020B	*Ferros Iron*	*500 ml plastic*	*HNO3, pH<2, 4 °C*	*180 Days*

Appendix A: Key Project Personnel Resumes

CHRISTOPHER CONNOLLY

PROJECT MANAGER

11 years EXPERIENCE

EDUCATION

Bachelor of Science, Music Technology and Studio Systems Design-, University of Rhode Island(2008)

EXPERIENCE

2015-Present **IMPACT ENVIRONMENTAL** Project Manager

- Conducts visual inspections and produces Phase I Environmental Site Assessments.
- Arranges, organizes, and oversees Phase II Environmental Site Assessments and Limited Subsurface Investigations.
- Arranges and oversees small, moderate and large-scale remediation projects, including communication with disposal facilities, subcontractors, Clients and regulatory agencies, as applicable.
- Produces Work Plans, Final Engineering Reports and other associated regulatory reports.
- Conducts various methods of soil and groundwater sampling, groundwater monitoring, well purging & sampling, and soil vapor sampling.

2010-2015 **Laurel Environmental Associates.** Environmental Scientist

- Conducts visual inspections of Phase I & II Environmental Site Assessments.
- Writes Transaction screen and Phase I, II, and III Environmental Site Assessments, Remedial Action Work Plans (RIWP), Environmental Assessment Statements (EAS) and Supplemental Studies reports, as well as New York City Office of Environmental Remediation Voluntary Cleanup Program Reports.
- Assists in Phase II site operations.
- Organizes, arranges logistics, and oversees small to large scale remediation projects, with accurate communication with disposal facility, trucking, developer and regulatory agency required. Conducts associated CAMP monitoring and writes Daily Reports.
- Conducts various methods of soil and groundwater sampling, groundwater monitoring, well purging & sampling, and soil vapor sampling.
- Experience operating and assisting with truck-mounted, track-mounted and portable Geoprobe® machines and tooling.
- Conducts ground penetrating radar, magnetic and utility surveys.
- Completed OSHA 24-Hour HAZWOPER Training program.
- Conducts Nuisance Noise and Excessive Vibration monitoring assessments.
- Project manages numerous NYC OER Voluntary Cleanup Projects, dealing with the remediation and continuing use of Brownfields sites.

KEY PROJECTS

- KENSINGTON ROAD, Bronxville, NY.
    - 1.63-acre New York State Department of Environmental Conservation Brownfields Cleanup Program (BCP) Remediation: Oversight, Reporting, Agency, client and developer coordination.
- RCRA Closure projects, activities and reports.
- CEQR EAS Reports, OER Work Plans, OER Final Engineering Reports.
- Gasoline Station Portfolio Phase I and II ESAs

CERTIFICATIONS/ ACHIEVEMENTS

- OSHA – Health and Safety for Hazardous Waste Site Investigation Personnel Certification, 40 Hours
- OSHA – Construction Safety Curse, 10 Hours

Appendix B: Project QA Officer Resume

GREG MENDEZ-CHICAS

SENIOR PROJECT MANAGER

11 years EXPERIENCE

EDUCATION

Bachelor of Science, Environmental Science, SUNY at Plattsburgh (2007)

EXPERIENCE

IMPACT ENVIRONMENTAL, 2009-Present, *Senior Project Manager*

- Direct and supervise staff of geologists, hydrogeologists, and environmental engineers in development and implementation of environmental assessments, investigations, construction and remediation projects in commercial and industrial markets for lenders, real estate investment/development firms, construction firms and government agencies.
- Provide regulatory and technical guidance and strategy
- Manage Phase I and Phase II assessments, State Spill Investigation and Remediation, County and Federal Underground Injection Control Programs, State & City Voluntary/Brownfield Cleanup Programs, State & Federal Superfund Sites, Brownfield Environmental Restoration Programs, Federal RCRA Closure, City E-Designation Projects.
- Quality control of project budgets, efficiencies, and profitability
- Maintain key relationships with existing clients, and cultivate the development of new business and growth.

APEX COMPANIES, 2007-2009, *Environmental Scientist*

- Prepared Phase I Environmental Assessments (ESAs) in general conformation with ASTM Practice E-1527-05 and USEPA ALL Appropriate Inquiries (AAI).
- Performed various aspects of Phase II scopes of work for commercial and industrial properties.
- Conducted microbiological sampling/investigations at a medical equipment manufacturing facility
- Preparation and implementation of sub-slab soil vapor sampling plans at former utilized gasoline and/or dry cleaning operations.

KEY PROJECTS

- LIRR/MTA East Side Access (five contracts)
- Briarcliff Manor
- Saint Barnabas Hospital Expansion

CERTIFICATIONS/ ACHIEVEMENTS

- OSHA 40-hour HAZWOPER Training
- OSHA 8-hour Refresher (2007-to-present)
- OSHA 10-hour Construction Training (2016)
- New York State Licensed Asbestos Inspector (2007-to-present)
- NYSDEC Erosion & Sediment Control Training (2016)
- Amtrak (2016) & LIRR Roadway Safety Training (2017)
- New York City Office of Environmental Remediation – Certified Brownfield Professional (Silver Certification)

Appendix C: Project Personnel Resumes

KEVIN KLEAKA, P.G.

Executive Vice President/Senior Environmental Scientist

23 years EXPERIENCE

EDUCATION

State University of New York at Plattsburg,
Bachelor of Science in Environmental Science, 1995 Applied Environmental Science Program

EXPERIENCE

(1997-Present) **– IMPACT ENVIRONMENTAL CLOSURES Inc.,**
Executive Vice President, Senior Environmental Scientist

- Principally responsible for managing environmental assessment, investigation, construction and remediation projects in commercial and industrial markets for lenders, real estate investment/development firms, construction firms and government agencies.
- Manage Phase I and II Environmental Site Assessments, State Spill Investigation and Remediation, County and Federal Underground Injection Control Programs, State & City Voluntary/Brownfield Cleanup Programs, State & Federal Superfund Sites, Brownfield Environmental Restoration Programs, Federal RCRA Closure, City E-Designation Projects.
- Responsible for environmental compliance of construction projects for waste management.
- Quality control of work products and deliverables.
- Supervise staff of geologists, hydrogeologists, engineers, environmental scientists, and environmental technicians to develop and implement sampling and analysis plans, quality assurance programs, remedial action plans.
- Provide expert witness testimony/fact statements and support in litigation cases involving soil, air and/or groundwater pollution.

(1995-1997) – **WYETH AYERST LABORATORIES**, Chemist worked in chromatographic separations division performing quality assurance analysis.

- Performed laboratory procedures and analyses in accordance with USFDA analytical test methods by liquid, gas, and thin layer chromatography.

KEY PROJECTS

- East Side Access MTA LIRR
- Melody Cleaners
- ExxonMobil Spill- Valley Stream, NY
- Spartan Petroleum
- JFK 1020, Runway 13R-31L
- Rheingold Brewery Redevelopment Project
- WTC Greenwich Street Corridor Reconstruction
- Yankee Stadium Macomb's Park

ORGANIZATIONS

- New York City Brownfield Partnership
- New Partners for Community Revitalization
- ASTM Committee
- National Groundwater Association
- Environmental Bankers Association
- Vapor Intrusion Network
- Long Island Geologist Association
- Environmental Consulting Professionals
- Environmental Insurance Professionals

CERTIFICATIONS/ ACHIEVEMENTS

- Licensed Profession Geologist (NYS# 000735)
- Gold Certified Brownfield Professional 2012
- Advanced Tools for In-Situ Remediation Workshop
- ASTM Technical & Professional Training for Assessment of Vapor Intrusion into Structures of Property & New York State Department of Health, Vapor Intrusion Training
- New York Precision Equipment Global Survey Positioning Training
- MTBE & TBA Comprehensive Site Assessment and Successful Groundwater Remediation
- Environmental Data Resources, Due Diligence Workshop
- Advanced Technologies for Accelerated Natural Attenuation
- Eophysical Survey Systems, Theory and Practice of Applying Subsurface Interface Radar in Engineering and Geophysical Investigation.
- 40-Hour Occupational Safety & Health Administration

DANIEL FRUHAUF

Associate Project Manager

8 years EXPERIENCE

EDUCATION

Bachelor of Arts, Ecosystems & Human Impact. SUNY at Stony Brook (2012)

EXPERIENCE

2014-Present **IMPACT ENVIRONMENTAL** *Associate Project Manager*

- Responsible for management and logistical coordination of investigative and remedial tasks, schedule and implementation quality on very large to small clean-up projects within NYC, Long Island, NY and East Chicago, Indiana
- Developed and prepared various environmental planning documents approved by regulators including, Remedial Action Work Plans, Corrective Measures Implementation Work Plan, Health and Safety Plans, Waste Characterization Work Plans, Community Air Monitoring Plans, Phase II ESA Work Plans, Underground Storage Tank Removal Work Plan, etc.
- Responsible for developing complex methods of tracking and incorporating innovative technology to measure remedial completion for adequate reporting purposes
- Assembled proposals, work orders, change orders and general contracts for multiple clients
- Performed complex Phase II Assessments and other Subsurface Investigations to detect and target specific contaminants for delineation purposes.
- Designed and constructed various remedial systems including sub-slab depressurization systems, soil vapor extraction systems.
- Conducted, presented and attended multiple regulator meetings with USEPA, NYSDEC, NYC OER.
- Provided a professional attitude of always learning, exploring new methods and teaching along the way

2013-2014 **SOVEREIGN CONSULTING Inc.** *Environmental Scientist*

- Collected field data, soil, groundwater samples from various NYSDEC regulated Spill Sites and other hazardous waste sites
- Assisted in construction and design of SVE, SSDS and product skim systems at multiple tri-state clean-up projects
- Prepared various reporting components specific to NYSDEC Quarterly Monitoring Reports, Phase I ESA, Phase II ESA and owner liability risk assessments
- Provided contractor oversight and split sampling with multiple environmental contractors on various clean-up and development projects
- Engaged in various meetings with regulators as to develop clean-up strategies for complex projects

KEY PROJECTS

- Former Du Pont East Chicago Facility – RCRA CA Clean-up Project, East Chicago, IN
- Independent Metal Strapping – NYSDEC/RCRA Closure, Roslyn, NY
- Multiple MTA/ LIRR Development Projects – NYC, LI NY
- Saint Barnabas Hospital Development Project – Bronx NY
- Multiple NYC OER regulated Commercial Development Projects - NYC

CERTIFICATIONS/ ACHIEVEMENTS

- HAZWOPER 40hr + 8hr Refreshers
- OSHA 10hr Construction Safety
- OSHA 30hr Construction Safety
- Transportation Worker Identification Card (TWIC)
- NYC Office of Environmental Remediation (OER) Trained
- MTA/Amtrak Track Safety
- MTA/NYC Transit Track Safety
- LIRR Safety Blue Card
- NYSDEC SWPPP Certified Inspector
- Certified NYSDOL Asbestos Inspector

XIN YUAN, P.E.

Quality Control Manager

EDUCATION

Masters of Science, Civil Engineering, UMass Amherst (2010)
Bachelor of Science, Environmental Engineering. Tsinghua University, Beijing, China (2008)

EXPERIENCE

2010-Present **IMPACT ENVIRONMENTAL** *Quality Control Manager/Environmental Analyst*

- Quality control of all waste management/brownfield redevelopment projects;
- Management of site remediation/waste management projects;
- Environmental compliance & permitting of waste management facilities
- Achieve and maintain appropriate and consistent application of environmental compliance for waste disposal/beneficial use facilities
- Achieve and maintain appropriate and consistent application of environmental compliance at the regional Levels for waste management projects
- Review & evaluate site investigation/waste characterization results for waste management projects and provide technical recommendations to project manager
- Authored a multitude of BUD petitions for various other solid waste related projects in NY,NJ &PA, including projects such as The East Side Access, The Air Rail Project and JFK International Jet Blue Terminal 5
- Design and perform waste characterization investigations for waste management projects

KEY PROJECTS

- Columbia University Manhattanville Development Project
- LIRR 3rd Track Expansion Project
- Atlas Quarry Reclamation Project
- Former New Jersey Zinc Company-West Plant Remediation Project
- Morris Blanchard Redevelopment Project
- Brooklyn Bridge Park Pier 1 Redevelopment Project
- Southwest Brooklyn Marine Transfer Station Redevelopment Project
- Doremus Avenue Redevelopment Project

CERTIFICATIONS/ ACHIEVEMENTS

- Long Island Association of Professional Geologists
- American Chinese Real Estate Society

CERTIFICATIONS/ ACHIEVEMENTS

- US EPA 40hr Hazardous Materials Response for First Responders Training
- Professional Engineer in MA, PA, NJ & NY

Appendix D: Field Operating Procedures

FIELD OPERATING PROCEDURES

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B.1 FIELD SAMPLING PROCEDURES

B.1.1 Sampling Personnel

The activities associated with the remedial investigation will be performed by or under the auspices of a Quality Assurance Officer. The sample staff (samplers) will possess a minimum of a BA Degree in the Earth, Space or Biological Sciences or a BS Degree in Engineering. Samplers will have a minimum of one (1) year experience in environmental/geological fieldwork. Additionally, all samplers will have received mandatory forty-hour Occupational Safety and Health Administration (OSHA) training on working with potentially hazardous materials and appropriate Hazard Communication Program and "Right-To-Know" training.

B.1.2 Geophysical Survey

A geophysical survey will be performed over target portions of the planimetric surface of the subject property utilizing a GSSI model SIR-2 ground penetrating radar (GPR) system equipped with a 400MHz antenna. The survey will be performed to identify the presence of any abandoned and/or active underground injection wells associated with the on-site sanitary systems on the Site.

A GPR system consists of a radar control unit, control cable and a transducer (antenna). The control unit transmits a trigger pulse at a normal repetition rate of 50 KHz. The trigger pulse is sent to the transmitter electronics in the transducer via the control cable. The transmitter electronics amplify the trigger pulses into bipolar pulses that are radiated to the subsurface. The transformed pulses vary in shape and frequency according to the transducer used. In the subsurface, variations of the signal occur at boundaries where there is a dielectric contrast (void, steel, soil type, etc.). Signal reflections travel back to the control unit represented as color graphic images for interpolation. This system is capable of transmitting electromagnetic energy in the frequency range of 16MHz to 2000MHz.

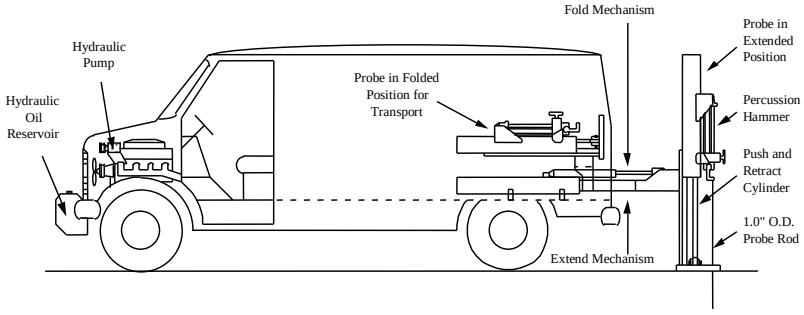
A qualified Impact Environmental Consulting, Inc. technician will specify a coordinate system on the planimetric surface of the site to map any subsurface dielectric anomalies detected on the premises. The operator will use knowledge of the subsurface soil composition to calibrate the SIR-2 system to site-specific conditions. Factor settings such as range, gain, number of gain points, and scans per unit, may be modified to yield the most accurate data to describe the subsurface conditions.

Upon finding a dielectric anomaly, a more spatially specific coordinate system may be designed over the area to determine size, shape and orientation. The data collected during the survey will be reviewed by the operator and compared against past experience, technical judgment and prior site knowledge to classify any detected anomalies.

B.1.3 Subsurface Vapor Probe and Soil Boring Installation/Soil Sampling

Subsurface probes will be installed using a *Geoprobe* hydraulically powered probing tool. Mechanized, vehicle mounted probe systems apply both static force and hydraulically powered percussion hammers for tool placement (static down forces up to 18,000 pounds combined with percussion hammers of eight horsepower continuous output). Recovery of large sample volumes will be facilitated with a probe-driven sampler. The probe-driven sampler consists of a hollow probe, which opens via a remote-control mechanism at the selected sampling depth in the soil profile to allow soil to enter as it was advanced. Discrete media samples will be secured at the desired depths and contained within a non-reactive transparent plastic sleeve that lined the hollow probe. The plastic sleeves will be removed for subsequent inspection and sample aliquot acquisition.

Geoprobe Operating System



B.1.4 Sample Characterization

A visual inspection of all soil samples recovered for the hydrogeological study will be conducted to classify the sample media. Color classifications will be made in accordance with the Munsell Classification System. Gradation classifications will be made in accordance with the Unified Soil Classification System.

B.1.5 Field Headspace Analysis

Headspace analysis will be performed on each of the acquired soil samples utilizing a portable photo ionization detection meter to measure what, if any, hydrocarbon concentrations were present in isolated portions of the secured samples. Calibration of the PID will be conducted prior to sampling using a span gas of known concentration. Headspace analysis will be conducted by partially filling a wide-mouth glass container with sample aliquot and sealing the top with aluminum foil, thereby creating a void. This void is referred to as the sample headspace. To facilitate the detection of any hydrocarbons contained within the headspace, the container will be agitated for a period of thirty (30) seconds. The probe of the vapor analyzer will then be injected through the foil into the headspace to measure the hydrocarbon concentrations present. A Photovac Micro-Tip, photo ionization detection meter (PID) will be the organic vapor analyzer selected for the headspace analysis. A PID utilizes the principle of photo ionization for detection and measurement of hydrocarbon compounds. A PID does not respond to all compounds similarly; rather, each compound has its own response factor relative to its calibration. For this investigation, the PID will be calibrated to isobutylene. Hydrocarbon relative response factors for a PID calibrated to isobutylene are published by the manufacturer.

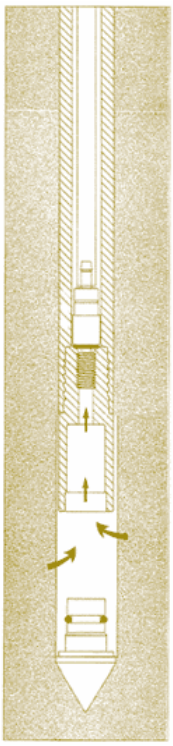
B.1.6 Soil Gas Survey – Photoionization Detector

The concrete slab will be cored at the sampling points using an electric powered core drill. Subsurface probes will be installed using *Geoprobe* manual probing tools. The probes will be equipped with retractable points that allow for soil gas to be measured at discrete depths. Each soil gas sample will be collected from the retractable point utilizing 3/8-inch in diameter disposable tubing. The soil gas will be drawn (purged) for approximately 15 seconds using a portable vacuum pump. The photo ionization detector will then be attached to the tubing to secure a soil gas reading.

B.1.7 Soil Gas Survey –Laboratory Analysis

Subsurface probes will be installed using a Geoprobe operating system. The probes will be equipped with a port run tubing system that allows for soil gas to be measured at discrete depths (see diagram below). This soil-gas sampling device uses a vacuum tight seal that isolates the sample acquisition to the specified depth. This device will assure quality control of the multi-depth soil-gas samples and eliminate the potential for inaccurate data. Each soil gas sample will be collected from the port run tubing system-utilizing 3/8-inch in diameter disposable Teflon tubing. The soil gas will be drawn (purged) for approximately 30 seconds using a portable vacuum pump. The soil gas will be pumped into a decontaminated portable pump and collected within a tedlar bag for preservation. Purging and sample collection flow rates will not exceed 0.2 liters per minute.

Geoprobe Port Run Tubing System



Tracer gas field testing, using helium gas, will be performed on all implants prior to sampling, to verify the integrity of each implant seal and to limit the possibility of sample dilution from surface air. The tracer gas field test will consist of sealing the area surrounding the implant with plastic sheeting and then introduce the tracer gas underneath the sheeting, so that the area where the probe intersects the ground is immersed in the tracer gas. A Model MGD-2002 Multi-Gas Leak Locator or equivalently approved helium detector will be connected to the soil vapor implant and sub-slab vapor implant, in accordance with Section 2.7.5 of the *October 2006, Guidance for Evaluating Soil Vapor Intrusion in the State of New York* NYSDOH guidance document, and tracer gas concentrations in the well will be recorded in the sampling log sheet. This procedure will be duplicated at each implant, prior to sample collection. The laboratory will confirm the field tracer gas tests by first analyzing approximately 85 to 90% of each sample canister for VOC's via USEPA method TO-15 and then use a helium detector to analyze the remaining contents in the Summa Canisters.

The sampling logs with the recorded field tracer gas test measurements and the tracer gas measurements reported by the laboratory will be submitted to NYSDEC with the initial sampling round report. NYSDEC will review the field and laboratory tracer gas test results to determine if the bentonite/cement grout seal

for each implant will require repairs and/or replacement to reduce the infiltration of ambient air and if additional tracer gas field/laboratory testing is required in the subsequent soil vapor sampling round.

B.1.8 Permanent Well Installation

Permanent monitoring wells are installed to provide repeated access to groundwater for collecting samples, as well as for obtaining water-level and other field data. Because monitoring wells are used to collect samples, it is important that construction materials not interfere with sample quality either by contributing contaminants or by sorbing contaminants already present. Further, construction materials must be compatible with (i.e., not degraded by) contaminants present in soils or groundwater.

Monitoring wells are potential contaminant migration routes between aquifers or from the surface to the subsurface. Construction procedures and standards must ensure that neither passive nor active introduction of contaminants can occur. Properly installed hydraulic seals and locking well covers reduce the potential for cross-contamination of monitoring wells.

Equipment needed:

- Drilling or auguring equipment appropriate to site conditions, drilling depth, and other project requirements.
- Drill bits appropriate for the expected soil and rock type(s) to be encountered.
- Sufficient threaded flush-joint riser pipe of an approved material [stainless steel, polyvinyl chloride (PVC)] in convenient lengths. *(NOTE: No glues are permitted.)*
- Sufficient threaded flush-joint slotted screen of an approved material (stainless steel, PVC) to meet design criteria. *(NOTE: No glues are permitted.)*
- Properly sized and washed filter pack material (quartz sand) in sufficient volume to meet well design criteria.
- Powdered bentonite.
- Photoionization detector.
- Steel surface casing (if required).
- Steel protective casing with locking cap.
- Tremie pump and pipe.
- Protective clothing, as required.
- Weighted measuring tape.

The following steps will be followed when installing monitor wells:

1. Advance the borehole to the required depth using a bit or auger flight of a diameter sufficient to allow for insertion of the tremie pipe when the casing is centered. It is preferred that the borehole be at least 2 inches in diameter larger than the casing diameter. The borehole should be drilled slightly deeper than required for the combined length of casing and screen. The final completion depth should be sounded with a decontaminated, weighted tape before continuance of well placement.

2. Make up the screen for installation. The casing and screen must be decontaminated. Tighten joints.
3. Withdraw the drill rods and bit through the auger flights. Check the borehole depth with a weighted surveyor's tape.
4. Lower the casing string into the drill casing.
5. Install the filter pack. Six inches or more of filter pack material should be spotted at the bottom of the hole, under the screen. Filter pack will be installed to 2 - 3 feet above the top of the screen.
6. Check the depth to the top of the filter pack with a weighted tape.
7. Tremie, or for shallow wells (<35 feet), gravity feed bentonite onto the top of the filter pack.
8. Pure bentonite grout (or equivalent) will be used as the annular seal, grout will be mechanically mixed with the appropriate amount of water. For shallow wells (<35 feet) granular bentonite may be substituted for grout.
9. Tremie the grout into the annulus using a tremie. Slowly withdraw the tremie pipe as the annulus fills. Grout the well to within 1 foot of the surface. Compare actual volume of grout placed with calculated volume. Both should be annotated in the field logbook.
10. After installing grout, dismantle and clean tremie equipment.
11. Finish the concrete pad so that it slopes away from the wellhead in all directions with a minimum thickness of 4 inches. If weather conditions warrant, cover the concrete until cured. Lock the well cover.
12. If the well design specified guard posts, dig the holes and set the guard posts in concrete separate from the concrete pad. Posts and concrete must extend to a depth of 2 feet.
13. Record the appropriate construction/completion information in the field logbook and on the appropriate monitoring well installation.
14. If a form was used for the concrete pad, return to the well site after the concrete has cured for at least 24 hours and remove the form. Backfill around the pad with native soil. Drill a weep hole for protective casing and just above the concrete pad.
15. The well identification should be marked on the protective casing and PVC cap. Paint the well cover and posts, if required.

B.1.9 Well Development

Monitor wells are developed to remove fines from the filter pack. Wells should not be developed for 24 hours after completion when a bentonite grout is used to seal the annular space. However, wells may be developed before grouting if conditions warrant. Wells are purged immediately before groundwater sampling to remove stagnant water and a sample representative of groundwater conditions. Wells should be sampled within 3 hours of purging (optimum) to 24 hours after purging (maximum, for low recharge conditions).

Equipment needed:

- Pump, pump tubing, or bailer and rope or wire line
- Water-level meter
- Temperature, conductivity and pH meters
- Personnel protective equipment as specified in the site-specific HASP
- Decontamination supplies
- Disposal drums, if required
- Photoionization Detector

Procedures.

The following steps will be followed when developing wells:

1. Put on personnel protective clothing and equipment as specified in the site-specific HASP.
2. Open and check the condition of the wellhead, including the condition of the surveyed reference mark, if any. Use photoionization detector at wellhead to determine the presence of VOCs (if applicable).
3. Determine the depth to static water level and depth to bottom of the casing.
4. Prepare the necessary equipment for developing the well. There are a number of techniques that can be used to develop a well. Some of the more common methods are bailing, surging and purge, and over pumping.
5. Continue well development until produced water is clear and free of suspended solids.
6. Remove the pump assembly or bailers from the well, decontaminate, and cleanup the site.
7. Lock the well cover before leaving. Dispose of produced water as required by the project work plan.

B.1.10 Monitoring Well Sampling

Monitoring well sampling is conducted with the goal of collecting data representative of groundwater conditions in the subsurface. The data obtained from a sampling event is typically very important for decision making, as it may be used to identify the presence of constituents of concern in groundwater, monitor the performance of a remedial measure, or evaluate the risks to potential receptors.

A written site specific monitoring or sampling plan is typically available that identifies the frequency of sampling, the wells to be monitored, equipment to be used, required laboratory analytical methods and parameters, sampling procedures, equipment decontamination procedures, sample quality

assurance/quality control (QA/QC) measures and data reporting requirements. Each monitoring or sampling plan will vary from one site to the next and should be reviewed when planning for a monitoring well sampling event.

Equipment:

The following is a list of standard equipment needed to conduct monitoring well sampling. Additional equipment may be required based on the sampling techniques and site conditions.

- Health and Safety Plan (HASP)
- Field Book
- Personal Protective Equipment
- Decontamination Equipment
- Traffic Control Devices
- Polyethylene Sheeting
- Bailers
- String
- Pumps
- Power Source to Operate Pumps
- Water Level Meter
- Tubing
- Buckets
- Sample Bottles
- Cooler
- Ice
- Bubble Wrap
- Calculator
- Disposable gloves

Procedures

Monitoring Well Gauging

Monitoring wells are typically gauged before sampling. Gauging includes measuring the depth to water (and/or non-aqueous phase liquids) and depth to bottom in the monitoring well with an electronic water level meter (WLM) or electronic interface probe (EIP). An EIP is used to gauge a well that contains non-aqueous phase liquids (NAPL-floating product). If wells do not contain NAPL, then a WLM is sufficient. The list of monitoring wells to be gauged should be provided in the monitoring or sampling plan and listed on the PTA. The entire network of monitoring wells should be gauged before sampling begins.

Sample Bottles

Groundwater samples are collected into laboratory supplied bottles. Bottles are typically ordered from the laboratory in advance of the sampling event. The size, bottle material (glass, plastic), and number of

bottles required for each sample will depend on the constituents being analyzed for and the analytical methods. Bottles delivered from the laboratory may contain a small amount of preservative. The preservative is to remain in the bottle. Overfilling the bottle may result in dilution of the preservative and should be avoided. When sampling for volatile compounds, no air (bubbles) may be present in the sample bottle.

Sampling Techniques

Many different techniques exist for sampling monitoring wells. The techniques vary depending on the constituents of concern, depth to groundwater, diameter of monitoring well and regulatory requirements. The technique appropriate for a specific site should be identified in the monitoring and sampling plan

Purging

Many of the sampling techniques include purging the monitoring well prior to sample collection. Purging is indented to remove stagnant water from the monitoring well after which a representative sample of the groundwater from the subsurface can be collected. During purging, three to five volumes of standing water in the well are removed. The volume of water in a monitoring can be calculated using the following equation:

Feet of standing water in well * Conversion factor = 1 well volume

Example:
10' * 0.65 = 6.5 gallons (1 well volume)

Well Diameter (in inches)	Conversion Factor
½	0.01
1	0.04
2	0.16
3	0.37
4	0.65
6	1.50

Purge water must be managed in accordance with the monitoring or sampling plan and local regulations.

Field Monitoring

Monitor indicator parameters (main indicator parameter for VOCs is DO) during purging, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, Eh and DO) at three to five-minute intervals. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:

1. 50 NTUs for turbidity

+/-0.1 for pH

2. +/-3% for conductance
3. +/-10 mv for redox potential
4. +/-10% for DO and turbidity

Sample Chain of Custody

The chain of custody (COC) form is used to record the inventory of samples to be delivered to the laboratory and document the transfer of custody from the sampler to the laboratory. All samples, including QA/QC samples, to be delivered to the laboratory must be listed on the COC along with requested analytical methods and parameters. The COC is to remain with the samples from the time of collection until receipt at the laboratory.

Sample Handling, Storage and Shipment Samples should be stored in laboratory-supplied coolers immediately after sampling. The cooler must contain ice in order to bring the temperature of the sample to 4 degrees Celsius. Samples must remain on ice until received by the laboratory. Care must be exercised to ensure that bottles do not break during handling of the cooler. Glass-on-glass contact often leads to breakage and should be avoided by wrapping each bottle in bubble wrap material.

Samples are to be delivered to the laboratory in coolers as soon as possible after collection. Each laboratory analytical method has a unique holding time, which is defined as the maximum time between sample collection and analysis by the laboratory. Samples analyzed after the hold time are usually considered invalid. Hold times may vary from one day to 6 months depending on the laboratory analytical methods. Holding time information can be obtained from the laboratory. It is the responsibility of the sampler to confirm that the delivery method will ensure receipt of the samples by the laboratory within the allotted holding time.

Sample delivery options include: shipment by common courier, personal delivery to the laboratory and delivery by the laboratory's courier service. Each laboratory may have a preferred sample delivery process. Coolers must be packed with sufficient amounts of ice and bubble wrap material to ensure the samples will be received by the laboratory intact and at an acceptable temperature. A custody seal, provided by the laboratory, should be placed over the opening between the lid and the base of the cooler, and the seal ID number recorded on the chain of custody form. The custody seal provides a means of alerting the laboratory if the cooler has been opened, and potentially tampered with, between the time it was sealed by the sampler and received by the laboratory. Guidance on cooler packing may be obtained from the laboratory.

Decontamination

Decontamination is necessary to avoid cross-contaminating samples. Sampling equipment that is not dedicated to a specific well must be decontaminated before sampling and after each sample is collected. Decontamination procedures may be specific to the site's monitoring or sampling plan. Typical equipment decontamination procedures may include rinses in the following sequence:

1) Tap water rinse
2) Alconox rinse
3) Tap Water Rinse
4) Deionized water rinse

When possible, samples should be collected from the least contaminated wells first and progress onto the more contaminated wells in order to reduce chances of sample cross-contamination.

Documenting a Monitoring Well Sampling Event

Information from the monitoring well sampling event must be documented on a field data form or recorded in the site-specific field book. Information to be recorded includes weather conditions, well integrity issues, well gauging information, purge volumes, sampling equipment and supplies used, sample identifications, sample collection times and the presence of any conditions that may compromise the integrity of the samples.

B.1.11 Low Flow Well Purging and Sampling

Purpose

The purpose of the low flow (low formation stress) purging and sampling procedure is to collect groundwater samples from monitoring wells that are representative of ground water conditions in a particular geological formation. This is accomplished by setting the intake velocity of the sampling pump to a flow rate, which limits drawdown inside the well casing. The placement of the intake of the sampling pump should be midway within the most permeable zone of the formation.

Equipment

- Pump system (adjustable rate, positive displacement groundwater sampling pump e.g., bladder or centrifugal pump)
- Control box (with or without a built-in compressor)
- Compressed Nitrogen tank (if necessary)
- Indicator parameter monitoring device(s)

- Flow measurement device (Flow cell)
- Personal Protection Equipment (PPE)
- Field Book
- Health and Safety Plan (HASP)
- Tools to access monitoring wells
- Disposable gloves
- Kevlar gloves
- Safety cones
- Sample containers (provided by laboratory)
- Chains of Custody (provided by laboratory)
- Blank or Pre-printed labels
- Glassware with appropriate preservative (provided by the laboratory)
- Ice
- Calculator
- Adsorbent pads
- Electronic interface probe
- Decontamination equipment
- String
- Appropriate size bailers
- Tubing (preferably Teflon for organics)

Procedure

Remove the gripper cap at all well locations and allow the water table to equilibrate, take care to secure all wells by closing the flush mount covers. Start sampling at the well-known or believed to have the least contamination and systematically to the most contaminated well, remembering to conduct proper decon procedure. During gauging and sampling activities equipment should not come into direct contact with the ground surface, plastic sheeting may be utilized as a clean and disposable working surface.

Slowly lower the pump to the depth specified for that well, the pump intake should never be set within two feet of the bottom of any well. This prevents disturbance and resuspension of any sediment. Record the depth of the pump intake. Re-measure the water level and begin purging, keeping the purge rate within 200-500 millimeters per minute (ml/min). Water level should be measured and recorded at three to five-minute intervals. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less is desired). Monitor indicator parameters (main indicator parameter for VOCs is DO) during purging, monitor and record the field indicator parameters (turbidity, temperature,

specific conductance, pH, Eh and DO) at three to five-minute intervals. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:

1. 50 NTUs for turbidity
2. +/-0.1 for pH
3. +/-3% for conductance
4. +/-10 mv for redox potential
5. +/-10% for DO

Collect sample from dedicated or disposable tubing. Remove any non-dedicated equipment from the well. Secure all wells. Fill out the chain of custody. At the end of the sampling day, coolers will be taped shut with the custodian's initials placed on custody seals at points of entry. Samples will be shipped via lab courier to the contract laboratory for morning delivery, picked up by courier or delivered directly to the laboratory by the field personnel at the end of the sampling day.

Contact with the laboratory will be made within 24 hours after each sampling event to ensure that samples arrived safely and with proper integrity preserved.

B.1.12 Grouting Bore Holes

Subsequent to the completion of each soil and groundwater probe installed during the remedial investigation, bottom-up grouting of the borehole will be conducted to grade. The grouting system was designed specifically for direct push applications. With powerful reciprocating (piston) pumps, the Geoprobe Grout Machines will deliver standard ASTM grout materials through 1.25-inch diameter Geoprobe probe rods or through 3/8-inch (1/4-inch inside diameter) polyethylene tubing. The pump is rated at 1000 psi with flow rates from 0.9 to 2.3 gpm.

B.1.13 Emerging Contaminant PFAS

The NYSDEC requires analysis for Per- and Polyfluoroalkyl Substances (PFAS) for new remedial program Sites as part of the investigation of potentially affected media, including soil, groundwater, surface water and sediment as an addition to the standard TAL/TCL sampling. Soil vapor sampling for PFAS is not required.

The following is the list of the 21 PFAS compounds identified by the NYSDEC for investigation:

- Perfluorobutanoic Acid
- Perfluoropentanoic acid
- Perfluorohexanoic acid
- Perfluoroheptanoic acid
- Perfluorooctanoic acid (PFOA)
- Perfluorononanoic acid
- Perfluorodecanoic acid
- Perfluoroundecanoic acid
- Perfluorododecanoic acid
- Perfluoro-n-tridecanoic acid
- Perfluorotetradecanoic acid
- Perfluorobutane sulfonic acid
- Perfluorohexane sulfonic acid
- Perfluoroheptane sulfonic acid
- Perfluorooctane sulfonic acid (PFOS)
- Perfluorodecane sulfonic acid
- 6:2 Fluorotelomersulfonic acid
- 8:2 Fluorotelomersulfonic acid
- Perfluorooctanesulfonamide
- N-methyl perfluoro-1-octanesulfonamidoacetic acid
- N-ethyl perfluoro-1-octanesulfonamidoacetic acid

PFAS Sampling Protocol:

Since the probability of false positives is relatively high during PFAS sample collection, due to the potential for many sources of cross-contamination combined with the low laboratory detection limits, guidance is needed for staff who will perform subsurface investigation activities (i.e., soil borings, monitoring well installation) and for staff collecting and/or handling PFAS environmental samples.

There are many products/materials/supplies that contain PFAS which pose a greater risk for introducing PFAS contamination into a sample during the sample collection process. These sources include the water used during drilling or decontamination, materials used within the sampling environment, sampling equipment, field clothing and personal protective equipment, sun and biological protection products, personal hygiene and personal care products, food packaging and the environment itself.

Field Clothing and Personal Protective Equipment (PPE)

Due to the extensive use of PFAS in many industries and products, clothing and PPE are likely to contain PFAS. Personnel completing field investigation work that will include the collection of samples for PFAS

analysis will need to address the physical, chemical and biological hazards associated with the Site. Field planning is essential to mitigate the potential for PFAS cross-contamination and to maintain personal safety.

- No clothing or boots with protective coatings can be worn (e.g., waterproof, water-repellent, fire-repellant or stain-resistant clothing or footwear). No Gore-Tex® or Tyvek material clothing/boots.
- Clothing worn during the collection of samples for PFAS analysis should be made of natural fibers (preferable cotton) and must have been previously washed a minimum of 5 times (i.e. no new clothing), without fabric softener and not with other clothing that may contain coatings.
- Use disposable, coating-free polyethylene coveralls and boot as applicable.
- Do not use personal care products on the day of sample collection:
    - Use PFAS-free soap and shampoo when scheduled for sample collection.
    - Limit toothpaste, mouthwash and dental floss to fluoride free options.
    - Do not use lotions, moisturizers, cosmetics, sunscreen or insect repellents prior to sampling.
- Use disposable, nitrile gloves.
- Do not use aluminum foil, prepackaged food, fast food wrappers or containers.

<u>Field Sampling Equipment/Materials</u>:

Because of the potential presence of PFAS in equipment typically used for drilling and to collect soil, groundwater, surface water, sediment, and drinking water samples, as well as the need for very low reporting limits, special handling and care must be taken when collecting samples for PFAS analysis to avoid sample contamination. The following guidance should be considered when using field sampling equipment.

- A screening of the equipment and materials that will be used during field sampling activities must be completed to identify equipment/materials that may be potential PFAS sources.
- Identify and use a PFAS free water source for drilling and decontamination of equipment.
- Use high density polyethylene [HDPE] water holding tanks.
- Use HDPE or silicone tubing materials.
- Use HDPE or polypropylene containers with HDPE or polypropylene caps.
- Use regular ice and Ziploc bags where there is no direct contact with the sample.
- Use loose plain paper, metal clipboard, ballpoint pens.
- When feasible, utilize single-use, disposable polyethylene or silicone materials (tubing, bailers, etc.) for monitoring well purging and sampling.

- Consumable core liners and catchers must be PVC.
- When using positive displacement/submersible pumps, familiarize yourself with the sampling pump/accessory equipment specifications to confirm that the device components do not contain Teflon® or Polytetrafluoroethylene (PTFE). Do not use pumps and tubing that contain Teflon™ and other fluoropolymer-containing materials.
- Do not use waterproof/treated paper or field books, plastic clipboards, water proof markers, Post-its and other adhesive paper products.
- Do not use passive diffusion bags for groundwater sampling.
- Do not use low density polyethylene (LDPE) sampling equipment/materials.
- Do not use drill casing thread lubricants that contain PFAS. Verify with supplier.
- Do not use LDPE or glass bottles with Teflon™-lined caps.
- Do not use chemical ice packs (i.e., Blue ice®).
- Do not handle any packaged food or drinks, aluminum foil, adhesive labels, etc. at or around sampling site.

Equipment Prep and Decontamination Procedures

The following procedure should be used to decontaminate HPDE, polypropylene or stainless-steel equipment used to collect samples for PFAS analysis. Because of the extremely low detection and reporting levels required for PFAS analysis, precaution should be taken to ensure decontamination materials (e.g., soap, tap water, deionized water) are not contaminated with PFAS prior to use. Traditional best practice techniques and procedures shall be subject to modification to prevent the introduction of non-site-derived contaminants including PFAS. Sample containers will be new and used only once for each sample and disposable equipment (e.g., gloves, tubing, etc.) will not be reused, therefore; these items will not require decontamination. All non-dedicated or non-disposable sampling equipment (i.e., the stainless-steel compositing vessel(s), flow-through cell, etc.) will be decontaminated between sample locations. The following guidance should be considered when preparing equipment and decontamination of equipment.

- An equipment decontamination area with a decon pad should be set up in the field to accommodate the sampling and drilling equipment.
- General Sampling Equipment Decon:
    - Rinse equipment with PFAS free – municipal PFAS free water to remove solids.
    - Use a polyethylene or poly vinyl chloride (PVC) brush and a low-phosphate lab detergent (i.e., Alconox) to scrub the equipment to remove residue and particulates.
    - Triple rinse clean equipment with PFAS Free deionized water and let air dry.

- Decontaminate sampling equipment after sampling at each location, or at the end of the field work day.
- The decontamination water should be changed between equipment cleanings.
- Clean, decontaminated equipment will be placed on clean polyethylene plastic or HPDE sheets to air dry. Direct contact with the ground will be avoided.

- Drilling Equipment Decon:
  - Drilling equipment, including rig, tooling, augers, bits, samplers, tremie pipes, etc. will be cleaned with a hot water pressure washer within a decon pad constructed of on clean polyethylene plastic or HPDE sheets and barriers to contain liquid generated.
  - The clean drilling equipment will be rinsed with PFAS Free deionized water and let air dry on clean polyethylene plastic or HPDE sheets.
  - Drilling equipment must be cleaned before beginning work (when applicable), in-between/following completion of borings, wells, and at the end of the field work day.
  - Tools, drill rods, and augers will be placed on polyethylene plastic or HPDE sheets following pressure washing. Direct contact with the ground will be avoided.
  - Decon water will be temporarily collected in 55-gallon drums and transported to a waste accumulation area for later disposal.
- Well Development Equipment Decon:
  - Prior to well development, non-dedicated equipment (e.g., bailers, PFOS-free pumps, etc.) will be washed with potable water and a PFC/phosphate-free detergent (i.e., Alconox®).
  - The sampling equipment will then be rinsed with potable water followed by a triple rinse with PFAS Free deionized water.
  - The clean/decontaminated equipment will be placed on polyethylene plastic or HPDE sheets to air dry. At no time, will washed equipment be placed directly on the ground.
  - Decon water will be temporarily collected in 55-gallon drums and transported to a waste accumulation area for later disposal.

Sample Collection

PFAS are ubiquitous in consumer products and the pervasive presence of these chemicals coupled with very sensitive analytical methods makes contamination of samples both in the lab and the field a significant concern from sources extraneous of the environmental media being sampled. The following guidance should be considered when undertaking collection of samples for PFAS analysis.

- Transport of sample collection supplies and equipment have the potential to come into contact with carpets and fabric in vehicles which have likely been treated with stain-resistant/water proofing containing PFAS. Steps should be taken to minimize this contact by packaging supplies

and equipment in the designated coolers and/or using polyethylene plastic or HPDE sheets as a barrier.

- Sample container labels should be prepared to the extent possible using a ball-point pen only before arrival at the sampling site and completed at the Site with a ball point pen; do not use sharpie or other permanent markers. No waterproof logbooks or plastic clipboards are to be used.
- Keep materials/equipment that may contain PFAS away from the sampling area and avoid physical contact with anything likely to contain PFAS (e.g., food, clothing, personal care products, etc.) during the sample collection process.
- Maintain an inventory of items used/maintained in the sampling area.
- If other sampling is to be performed, ALWAYS collect PFAS samples first. This avoids contact with any other type of sample container, bottles or package materials
- All sample containers use for PFAS sampling must come from the laboratory that will also be performing the PFAS analysis. Recommended sampling containers should be HDPE bottles fitted with unlined (no Teflon) polyethylene screw caps.
- Sample containers must be stored in a PFAS free container prior to sampling.
- For all environmental media, hands should be washed well before sampling.
- Wear disposable, powder free nitrile gloves to handle sampling equipment and sample containers. Clean nitrile gloves should be used when collecting the sample.
- Take precautions not to touch any surfaces prior to sample collection.
- As with all other samples, do not place the sample bottle cap on any surface when collecting the sample, and avoid all contact with the inside of the sample bottle or its cap.
- Sample directly into the provided HDPE bottle seal with cap. Place the bottles into individual sealed plastic bag (e.g. Ziploc®) separate from other samples in a clean, dedicated cooler for PFAS samples only.
- Use bagged ice (PFAS free) in the dedicated PFAS sample cooler; NO chemical ice packs in this cooler.
- No samples collected for other parameters can be stored with the PFAS samples.

PFAS Analysis and Reporting

The designated analytical laboratory must provide a full category B deliverable, and a DUSR will be prepared by an independent 3rd party data validator. QA/QC samples will be collected as required in DER-10, Section 2.3(c).

Modified EPA Method 537.1 is the preferred method to use for environmental samples due to its ability to achieve very low detection limits. Reporting limits for PFAS in groundwater and soil are to be 2 ng/L (ppt) and 0.5 ug/kg (ppb), respectively. If contract labs or work plans submitted by responsible parties indicate that they are not able to achieve these reporting limits for the entire list of 21 PFAS, site specific decisions will need to be made by the NYSDEC project manager in consultation with the NYSDEC remedial program chemist. Note: Reporting limits for PFOA and PFOS in groundwater should not exceed 2 ng/L.

The NYSDEC has developed a PFAS Analyte List for remedial programs. If lab and/or matrix specific issues are encountered for any compounds, the NYSDEC PM, in consul with the NYSDEC Remedial Program Chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each Site.

Summary of Prohibited and Acceptable Items for PFAS Sampling

Prohibited	Acceptable
Field Equipment	
Teflon/Silicone containing materials	HDPE, stainless steel, polypropylene materials
LDPE materials	Acetate liners
Waterproof field books/paper/bottle labels	Loose non-waterproof paper, and non-waterproof sample labels
Plastic Clipboards/binders/hard cover notebooks	Aluminum field clipboards or with Masonite
Waterproof markers/sharpies	Pens
Post-it-notes	Wet-ice
Chemical ice packs	
Field clothing and PPE	
New cotton clothing or synthetic water resistant, waterproof, or stain-treated clothing, clothing treated with Gore-Tex	Well laundered clothing made of natural fibers (preferably cotton)
Clothing laundered with fabric softener	No fabric softener
Boots containing Gore-Tex or treated with water resistant spray	Boots made with polyurethane and PVC
Tyvek	Laundered cotton clothing
Cosmetics, moisturizers, hand cream etc. as part of personal cleaning/showering routine, or non-natural toxic containing sunscreens and insecticides	Natural, non-toxic, and natural sunscreens/insect repellents.
Sample Containers	
LDPE or glass containers	HDPE or polypropylene
Teflon-lined caps	Unlined polypropylene caps
Rain events	
Waterproof or resistant rain gear	Wet weather gear made from polyurethane and PVC only
Equipment Decontamination	
Decon 90 Liquinox Water from onsite well	Alconox 7th Generation Free & Clear Dish Soap
Food considerations	
All food and drink with the exceptions of those noted on the right	Bottled water with hydration fluids (i.e. Gatorade and Powerade) to be brought and consumed only in staging areas
Vehicle Considerations	
Vehicle fabrics, carpets and mats may contain PFAAs	Avoid utilizing areas inside vehicles as sample/staging areas

B.1.14 Emerging Contaminant 1,4-Dioxane

The NYSDEC requires analysis for 1-4 Dioxane for new remedial program Sites as part of the investigation of potentially affected media, including soil, groundwater, surface water and sediment as an addition to the standard TAL/TCL sampling. Soil vapor sampling for 1,4-Dioxane is not required. 1,4-Dioxane is used as a stabilizer and inhibitor in chlorinated solvents, and used for a wide variety of other industrial processes. It is present in adhesives, sealants, cosmetics, pharmaceuticals, rubber chemicals and surface coatings.

The NYSDEC reporting limit for 1,4-dioxane in groundwater should be no higher than 0.35 µg/L (ppb) and no higher than 0.1 mg/kg (ppm) in soil. Materials used in environmental sampling can be a source of 1,4-dioxane contamination. 1,4-Dioxane also might be present in detergents used to decontaminate environmental sampling equipment.

Because of the potential presence of 1,4-dioxane in equipment typically used to collect environmental samples, as well as the need for very low reporting limits, special handling and care must be taken when collecting samples to avoid sample contamination. The best practice techniques and procedures provided in Section B.1.13 entitled *Emerging Contaminant PFAS* should be implemented when collecting samples for 1,4-dioxane analysis.

Although ELAP offers certification for both EPA Method 8260 SIM and EPA Method 8270 SIM in waters, the NYSDEC DER is advising the use of Method 8270 SIM because it provides a more robust extraction procedure, uses a larger sample volume, and is less vulnerable to interference from chlorinated solvents. The analysis currently performed for SVOCs in soil is adequate for evaluation of 1,4-dioxane in soil, which already has an established SCO.

B.2 QA/QC FIELD PROCEDURES

B.2.1 Decontamination Procedures

Prior to arrival on the Site and between sample locations, the probes will be decontaminated by steam cleaning, Alconox wash, and rinsing with distilled water. This will be followed by air drying as per project requirements. All sampling apparatus will be dedicated or disposable. A clean, new liner will be used for each sample. Parts will be inspected for wear and damage before each use.

B.2.2 Field Blanks

A field blank is a sample of analyte-free water transferred, at the project site, into an appropriate container for the purpose of distinguishing ambient air contamination from in-situ sample contamination. Field blanks are used to indicate potential cross contamination from sampling equipment as quality control of decontamination procedures. With regards to field sampling, one field blank will be collected for every work day. The procedures for obtaining a field blank sample are as follows:

- Collect two sets of sample vessels. One vessel shall contain analyte free water and the other is empty.
- Run the analyte free water through the decontaminated sampling equipment into the empty vessel. Analye the water of this collecting vessel for target analytes.

B.2.3 Trip Blanks

A trip blank is used to identify the presence of volatile compound contamination attributable to transfer across a sample container septum during shipping and storage of samples. A trip blank is a sample of analyte-free matrix that is transported from the laboratory to the sampling site with the sample containers. The trip blank is stored on-site with the sample containers and field samples and then transported back to the laboratory with the samples for analysis. The trip blank is received and processed as a sample by the laboratory. One trip blank shall be submitted per pickup from laboratory personnel.

B.2.4 Duplicate Samples

Duplicate sample collection will apply to groundwater, soil, soil vapor and ambient air samples collected at this Site. A duplicate (replicate) sample is collected to control the general sampling methodology that is being employed. This sample ensures that a representative sample is being collected. Duplicate samples may also be submitted to verify the accuracy of analytical results.

B.2.5 Matrix Spike/Matrix Spike Duplicate Samples

Matrix Spike/Matrix Spike Duplicate sample collection will apply to groundwater samples collected at this Site. A Matrix Spike and Spike Duplicate (MS/MSD) sample(s) are representative but randomly chosen client samples that have known concentrations of analytes of interest added to the samples prior to sample preparation and analysis. They are processed along with the same un-spiked sample. The purpose of the MS/MSD is to document the accuracy and precision of the method for that specific sample.

B.3 RECORD KEEPING AND DOCUMENTATION PROCEDURES

B.3.1 Sampling Documentation

The sample team or individual performing an activity shall be required to keep a weatherproof Site field notebook. The Site field notebook will be used on-site to record notes pertaining to the field sampling plan. Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during projects and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence. The field notebook entries should be factual, detailed, and objective. All entries are to be signed and dated. All members of the field investigation team are to use this notebook, which shall be kept as a permanent record. The field notebook shall be filled out at the location of sample collection immediately after sampling. It shall contain sample descriptions including: sample number, sample collection time, sample location, sample description, sampling method used, daily weather conditions, field measurements, name of sampler, and other site-specific observations. The field notebook shall contain any deviations from the protocol contained herein, visitor's names, and community contacts made during sampling, and geologic and other site-specific information that may be noteworthy.

B.3.2 Sample Containers and Analytical Requirements

All sample vessels will be "level A" certified decontaminated containers supplied by a New York State Certified Commercial Laboratory. Samples analyzed for hydrocarbons will be placed in containers with Teflon lined caps. All samples will be preserved by cooling them to a temperature of approximately four degrees Celsius. If glass bottles are used, extra glass bottles will be obtained from the laboratory to allow for accidental breakage that may occur. Necessary preservatives will be placed in the sample bottles by the laboratory. The sample bottles will be handled carefully so that preservatives and glassware are not inadvertently spilled. All liquid samples will be put into 40-ml glass vials with Teflon liners.

B.3.3 Sample Tracking System

In order to provide for proper identification in the field, and proper tracking in the laboratory, all samples must be labeled clear and in a consistent fashion using the procedures and protocols described below and with the following subsections.

Sample labels will be waterproof and have a pre-assigned, unique number that is indelible.

Field personnel must maintain a field notebook. This notebook must be water resistant with sequentially numbered pages. Field activities shall be sequentially recorded at a later time. The notebook, along with the chain of custody form, must contain sufficient information to allow reconstruction of the sample collection and handling procedure at a later time. Each sample shall have a corresponding notebook entry that includes:

- Sample ID number
- Well location and number
- Date and time
- Analysis for which sample was collected
- Additional comments as necessary
- Sampler's name

Each sample must have a corresponding notebook entry on a chain-of-custody form. The manifest entry for sampling at any one location is to be completed before sampling is initiated by the same sampling team at any other location. In cases where the samples leave the immediate control of the sampling team, the samples must be sealed.

B.3.4 Sample Identification System

Each sample collected shall be designated by an alphanumeric code that shall identify the type of sampling location, the specific location, the matrix sampled, and a specific sample designation. Site specific procedures are described below.

Sample identifications shall contain a sequential code consisting of three segments. The first segment shall designate the project number. The second segment shall identify the location type. Location types shall be identified by a two-letter code. For example, MW will be used for monitoring well and GP for geoprobe. The third segment shall identify the specific sample location. The specific sampling location shall be identified using a three-digit number.

The fourth segment shall identify the matrix type and sample designation or identifier that identifies the sample depth, the sample event number, or other designation depending on the sample type. The matrix type shall be designated by a two-letter code. For example: GW will be used for groundwater. The sample identifier shall be represented by a two digit numeric code. Sampling events or rounds, such as for groundwater sampling shall be numbered in sequence beginning with "01" that corresponds to the round of sampling.

The following shall be a general guide for sample identification:

First Segment	Second Segment	Third Segment	Fourth Segment
NNN	AA	NNN	AANN
Project #	Location Type	Specific Type	Matrix Sample Identifier
455	GP	1	GW01

Symbol Definitions:	Location Type:	Matrix Type:
A = Alphabetic	MW = Monitoring Well	S = Soil
N = Numeric	GP = Geoprobe	GW = Groundwater

B.3.5 Sample Transfer

Samples shall be containerized and immediately transferred within a cooler to the mobile laboratory with minimal disturbance. Chain-of-custody forms will be completed at the time of sample collection and will accompany the samples inside a cooler for transfer from sample team to mobile laboratory representatives.

B.3.6 Chain-of-Custody Protocol

The primary objective of the sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. Sample custody for samples collected during the investigation will be maintained by the field personnel collecting the samples. Field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are transferred to the mobile laboratory.

Appendix E: Alpha Analytical Parameter Summary Tables

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1,4 Dioxane via EPA 8270D-SIM (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,4-Dioxane	123-91-1	8	2.04	ug/kg	40-140	30	40-140	30	30			
1,4-Dioxane-d8	*17647-74-4*									*15-110*		
1,4-Dioxane-d8 (IS)	17647-74-4			ug/kg								

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
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METALS by 6010D (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Aluminum, Total	7429-90-5	4	1.08	mg/kg	48-151		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Antimony, Total	7440-36-0	2	0.152	mg/kg	1-208		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Arsenic, Total	7440-38-2	0.4	0.0832	mg/kg	79-121		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Barium, Total	7440-39-3	0.4	0.0696	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Beryllium, Total	7440-41-7	0.2	0.0132	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Cadmium, Total	7440-43-9	0.4	0.0392	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Calcium, Total	7440-70-2	4	1.4	mg/kg	81-119		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Chromium, Total	7440-47-3	0.4	0.0384	mg/kg	80-120		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Cobalt, Total	7440-48-4	0.8	0.0664	mg/kg	84-115		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Copper, Total	7440-50-8	0.4	0.1032	mg/kg	81-118		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Iron, Total	7439-89-6	2	0.3612	mg/kg	45-155		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Lead, Total	7439-92-1	2	0.1072	mg/kg	81-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Magnesium, Total	7439-95-4	4	0.616	mg/kg	76-124		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Manganese, Total	7439-96-5	0.4	0.0636	mg/kg	81-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Nickel, Total	7440-02-0	1	0.0968	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Potassium, Total	7440-09-7	100	5.76	mg/kg	71-129		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Selenium, Total	7782-49-2	0.8	0.1032	mg/kg	78-122		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Silver, Total	7440-22-4	0.4	0.1132	mg/kg	75-124		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Sodium, Total	7440-23-5	80	1.26	mg/kg	72-127		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Thallium, Total	7440-28-0	0.8	0.126	mg/kg	80-120		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Vanadium, Total	7440-62-2	0.4	0.0812	mg/kg	78-122		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Zinc, Total	7440-66-6	2	0.1172	mg/kg	82-118		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
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METALS by 7471B (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Mercury, Total	7439-97-6	0.08	0.016896	mg/kg	72-128		80-120	20	20		28 days	1 - Metals Only-Glass 60mL/2oz unpreserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
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TCL Pesticides - EPA 8081B (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Delta-BHC	319-86-8	0.0016008	0.00031349	mg/kg	30-150	30	30-150	50	50			
Lindane	58-89-9	0.000667	0.000298149	mg/kg	30-150	30	30-150	50	50			
Alpha-BHC	319-84-6	0.000667	0.000189428	mg/kg	30-150	30	30-150	50	50			
Beta-BHC	319-85-7	0.0016008	0.00060697	mg/kg	30-150	30	30-150	50	50			
Heptachlor	76-44-8	0.0008004	0.000358846	mg/kg	30-150	30	30-150	50	50			
Aldrin	309-00-2	0.0016008	0.000563615	mg/kg	30-150	30	30-150	50	50			
Heptachlor epoxide	1024-57-3	0.0030015	0.00090045	mg/kg	30-150	30	30-150	50	50			
Endrin	72-20-8	0.000667	0.00027347	mg/kg	30-150	30	30-150	50	50			
Endrin aldehyde	7421-93-4	0.002001	0.00070035	mg/kg	30-150	30	30-150	50	50			
Endrin ketone	53494-70-5	0.0016008	0.000412206	mg/kg	30-150	30	30-150	50	50			
Dieldrin	60-57-1	0.0010005	0.00050025	mg/kg	30-150	30	30-150	50	50			
4,4'-DDE	72-55-9	0.0016008	0.000370185	mg/kg	30-150	30	30-150	50	50			
4,4'-DDD	72-54-8	0.0016008	0.000570952	mg/kg	30-150	30	30-150	50	50			
4,4'-DDT	50-29-3	0.0030015	0.00128731	mg/kg	30-150	30	30-150	50	50			
Endosulfan I	959-98-8	0.0016008	0.000378189	mg/kg	30-150	30	30-150	50	50			
Endosulfan II	33213-65-9	0.0016008	0.000534934	mg/kg	30-150	30	30-150	50	50			
Endosulfan sulfate	1031-07-8	0.000667	0.000317492	mg/kg	30-150	30	30-150	50	50			
Methoxychlor	72-43-5	0.0030015	0.0009338	mg/kg	30-150	30	30-150	50	50			
Toxaphene	8001-35-2	0.030015	0.0084042	mg/kg	30-150	30	30-150	50	50			
cis-Chlordane	5103-71-9	0.002001	0.000557612	mg/kg	30-150	30	30-150	50	50			
trans-Chlordane	5103-74-2	0.002001	0.000528264	mg/kg	30-150	30	30-150	50	50			
Chlordane	57-74-9	0.0130065	0.00530265	mg/kg	30-150	30	30-150	50	50			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

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TCL Volatiles - EPA 8260C/5035 High&Low (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Methylene chloride	75-09-2	5	2.29	ug/kg	70-130	30	70-130	30	30			
1,1-Dichloroethane	75-34-3	1	0.145	ug/kg	70-130	30	70-130	30	30			
Chloroform	67-66-3	1.5	0.14	ug/kg	70-130	30	70-130	30	30			
Carbon tetrachloride	56-23-5	1	0.23	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloropropane	78-87-5	1	0.125	ug/kg	70-130	30	70-130	30	30			
Dibromochloromethane	124-48-1	1	0.14	ug/kg	70-130	30	70-130	30	30			
1,1,2-Trichloroethane	79-00-5	1	0.267	ug/kg	70-130	30	70-130	30	30			
Tetrachloroethene	127-18-4	0.5	0.196	ug/kg	70-130	30	70-130	30	30			
Chlorobenzene	108-90-7	0.5	0.127	ug/kg	70-130	30	70-130	30	30			
Trichlorofluoromethane	75-69-4	4	0.695	ug/kg	70-139	30	70-139	30	30			
1,2-Dichloroethane	107-06-2	1	0.257	ug/kg	70-130	30	70-130	30	30			
1,1,1-Trichloroethane	71-55-6	0.5	0.167	ug/kg	70-130	30	70-130	30	30			
Bromodichloromethane	75-27-4	0.5	0.109	ug/kg	70-130	30	70-130	30	30			
trans-1,3-Dichloropropene	10061-02-6	1	0.273	ug/kg	70-130	30	70-130	30	30			
cis-1,3-Dichloropropene	10061-01-5	0.5	0.158	ug/kg	70-130	30	70-130	30	30			
1,3-Dichloropropene, Total	542-75-6	0.5	0.158	ug/kg				30	30			
1,1-Dichloropropene	563-58-6	0.5	0.159	ug/kg	70-130	30	70-130	30	30			
Bromoform	75-25-2	4	0.246	ug/kg	70-130	30	70-130	30	30			
1,1,2,2-Tetrachloroethane	79-34-5	0.5	0.166	ug/kg	70-130	30	70-130	30	30			
Benzene	71-43-2	0.5	0.166	ug/kg	70-130	30	70-130	30	30			
Toluene	108-88-3	1	0.543	ug/kg	70-130	30	70-130	30	30			
Ethylbenzene	100-41-4	1	0.141	ug/kg	70-130	30	70-130	30	30			
Chloromethane	74-87-3	4	0.932	ug/kg	52-130	30	52-130	30	30			
Bromomethane	74-83-9	2	0.581	ug/kg	57-147	30	57-147	30	30			
Vinyl chloride	75-01-4	1	0.335	ug/kg	67-130	30	67-130	30	30			
Chloroethane	75-00-3	2	0.452	ug/kg	50-151	30	50-151	30	30			
1,1-Dichloroethene	75-35-4	1	0.238	ug/kg	65-135	30	65-135	30	30			
trans-1,2-Dichloroethene	156-60-5	1.5	0.137	ug/kg	70-130	30	70-130	30	30			
Trichloroethene	79-01-6	0.5	0.137	ug/kg	70-130	30	70-130	30	30			
1,2-Dichlorobenzene	95-50-1	2	0.144	ug/kg	70-130	30	70-130	30	30			
1,3-Dichlorobenzene	541-73-1	2	0.148	ug/kg	70-130	30	70-130	30	30			
1,4-Dichlorobenzene	106-46-7	2	0.171	ug/kg	70-130	30	70-130	30	30			
Methyl tert butyl ether	1634-04-4	2	0.201	ug/kg	66-130	30	66-130	30	30			
p/m-Xylene	179601-23-1	2	0.56	ug/kg	70-130	30	70-130	30	30			
o-Xylene	95-47-6	1	0.291	ug/kg	70-130	30	70-130	30	30			
Xylene (Total)	1330-20-7	1	0.291	ug/kg				30	30			
cis-1,2-Dichloroethene	156-59-2	1	0.175	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloroethene (total)	540-59-0	1	0.137	ug/kg				30	30			
Dibromomethane	74-95-3	2	0.238	ug/kg	70-130	30	70-130	30	30			
Styrene	100-42-5	1	0.196	ug/kg	70-130	30	70-130	30	30			
Dichlorodifluoromethane	75-71-8	10	0.915	ug/kg	30-146	30	30-146	30	30			
Acetone	67-64-1	10	4.811	ug/kg	54-140	30	54-140	30	30			

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TCL Volatiles - EPA 8260C/5035 High&Low (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Carbon disulfide	75-15-0	10	4.55	ug/kg	59-130	30	59-130	30	30			
2-Butanone	78-93-3	10	2.22	ug/kg	70-130	30	70-130	30	30			
Vinyl acetate	108-05-4	10	2.15	ug/kg	70-130	30	70-130	30	30			
4-Methyl-2-pentanone	108-10-1	10	1.28	ug/kg	70-130	30	70-130	30	30			
1,2,3-Trichloropropane	96-18-4	2	0.127	ug/kg	68-130	30	68-130	30	30			
2-Hexanone	591-78-6	10	1.18	ug/kg	70-130	30	70-130	30	30			
Bromochloromethane	74-97-5	2	0.205	ug/kg	70-130	30	70-130	30	30			
2,2-Dichloropropane	594-20-7	2	0.202	ug/kg	70-130	30	70-130	30	30			
1,2-Dibromoethane	106-93-4	1	0.279	ug/kg	70-130	30	70-130	30	30			
1,3-Dichloropropane	142-28-9	2	0.167	ug/kg	69-130	30	69-130	30	30			
1,1,1,2-Tetrachloroethane	630-20-6	0.5	0.132	ug/kg	70-130	30	70-130	30	30			
Bromobenzene	108-86-1	2	0.145	ug/kg	70-130	30	70-130	30	30			
n-Butylbenzene	104-51-8	1	0.167	ug/kg	70-130	30	70-130	30	30			
sec-Butylbenzene	135-98-8	1	0.146	ug/kg	70-130	30	70-130	30	30			
tert-Butylbenzene	98-06-6	2	0.118	ug/kg	70-130	30	70-130	30	30			
o-Chlorotoluene	95-49-8	2	0.191	ug/kg	70-130	30	70-130	30	30			
p-Chlorotoluene	106-43-4	2	0.108	ug/kg	70-130	30	70-130	30	30			
1,2-Dibromo-3-chloropropane	96-12-8	3	0.998	ug/kg	68-130	30	68-130	30	30			
Hexachlorobutadiene	87-68-3	4	0.169	ug/kg	67-130	30	67-130	30	30			
Isopropylbenzene	98-82-8	1	0.109	ug/kg	70-130	30	70-130	30	30			
p-Isopropyltoluene	99-87-6	1	0.109	ug/kg	70-130	30	70-130	30	30			
Naphthalene	91-20-3	4	0.65	ug/kg	70-130	30	70-130	30	30			
Acrylonitrile	107-13-1	4	1.15	ug/kg	70-130	30	70-130	30	30			
n-Propylbenzene	103-65-1	1	0.171	ug/kg	70-130	30	70-130	30	30			
1,2,3-Trichlorobenzene	87-61-6	2	0.322	ug/kg	70-130	30	70-130	30	30			
1,2,4-Trichlorobenzene	120-82-1	2	0.272	ug/kg	70-130	30	70-130	30	30			
1,3,5-Trimethylbenzene	108-67-8	2	0.193	ug/kg	70-130	30	70-130	30	30			
1,2,4-Trimethylbenzene	95-63-6	2	0.334	ug/kg	70-130	30	70-130	30	30			
1,4-Dioxane	123-91-1	80	35.1	ug/kg	65-136	30	65-136	30	30			
1,4-Diethylbenzene	105-05-5	2	0.177	ug/kg	70-130	30	70-130	30	30			
4-Ethyltoluene	622-96-8	2	0.384	ug/kg	70-130	30	70-130	30	30			
1,2,4,5-Tetramethylbenzene	95-93-2	2	0.191	ug/kg	70-130	30	70-130	30	30			
Ethyl ether	60-29-7	2	0.341	ug/kg	67-130	30	67-130	30	30			
trans-1,4-Dichloro-2-butene	110-57-6	5	1.42	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloroethane-d4	*17060-07-0*									*70-130*		
2-Chloroethoxyethane												
Toluene-d8	*2037-26-5*									*70-130*		
4-Bromofluorobenzene	*460-00-4*									*70-130*		
Dibromofluoromethane	*1868-53-7*									*70-130*		

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NYTCL Semivolatiles - EPA 8270D (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Acenaphthene	83-32-9	133.6	17.3012	ug/kg	31-137	50	31-137	50	50			
1,2,4-Trichlorobenzene	120-82-1	167	19.1048	ug/kg	38-107	50	38-107	50	50			
Hexachlorobenzene	118-74-1	100.2	18.704	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroethyl)ether	111-44-4	150.3	22.6452	ug/kg	40-140	50	40-140	50	50			
2-Chloronaphthalene	91-58-7	167	16.5664	ug/kg	40-140	50	40-140	50	50			
1,2-Dichlorobenzene	95-50-1	167	29.9932	ug/kg	40-140	50	40-140	50	50			
1,3-Dichlorobenzene	541-73-1	167	28.724	ug/kg	40-140	50	40-140	50	50			
1,4-Dichlorobenzene	106-46-7	167	29.1582	ug/kg	28-104	50	28-104	50	50			
3,3'-Dichlorobenzidine	91-94-1	167	44.422	ug/kg	40-140	50	40-140	50	50			
2,4-Dinitrotoluene	121-14-2	167	33.4	ug/kg	40-132	50	40-132	50	50			
2,6-Dinitrotoluene	606-20-2	167	28.6572	ug/kg	40-140	50	40-140	50	50			
Fluoranthene	206-44-0	100.2	19.1716	ug/kg	40-140	50	40-140	50	50			
4-Chlorophenyl phenyl ether	7005-72-3	167	17.869	ug/kg	40-140	50	40-140	50	50			
4-Bromophenyl phenyl ether	101-55-3	167	25.4842	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroisopropyl)ether	108-60-1	200.4	28.5236	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroethoxy)methane	111-91-1	180.36	16.7334	ug/kg	40-117	50	40-117	50	50			
Hexachlorobutadiene	87-68-3	167	24.4488	ug/kg	40-140	50	40-140	50	50			
Hexachlorocyclopentadiene	77-47-4	477.62	151.302	ug/kg	40-140	50	40-140	50	50			
Hexachloroethane	67-72-1	133.6	27.0206	ug/kg	40-140	50	40-140	50	50			
Isophorone	78-59-1	150.3	21.6766	ug/kg	40-140	50	40-140	50	50			
Naphthalene	91-20-3	167	20.3406	ug/kg	40-140	50	40-140	50	50			
Nitrobenzene	98-95-3	150.3	24.716	ug/kg	40-140	50	40-140	50	50			
NitrosoDiPhenylAmine(NDPA)/DPA	86-30-6	133.6	19.0046	ug/kg	36-157	50	36-157	50	50			
n-Nitrosodi-n-propylamine	621-64-7	167	25.7848	ug/kg	32-121	50	32-121	50	50			
Bis(2-Ethylhexyl)phthalate	117-81-7	167	57.782	ug/kg	40-140	50	40-140	50	50			
Butyl benzyl phthalate	85-68-7	167	42.084	ug/kg	40-140	50	40-140	50	50			
Di-n-butylphthalate	84-74-2	167	31.6632	ug/kg	40-140	50	40-140	50	50			
Di-n-octylphthalate	117-84-0	167	56.78	ug/kg	40-140	50	40-140	50	50			
Diethyl phthalate	84-66-2	167	15.4642	ug/kg	40-140	50	40-140	50	50			
Dimethyl phthalate	131-11-3	167	35.07	ug/kg	40-140	50	40-140	50	50			
Benzo(a)anthracene	56-55-3	100.2	18.8042	ug/kg	40-140	50	40-140	50	50			
Benzo(a)pyrene	50-32-8	133.6	40.748	ug/kg	40-140	50	40-140	50	50			
Benzo(b)fluoranthene	205-99-2	100.2	28.1228	ug/kg	40-140	50	40-140	50	50			
Benzo(k)fluoranthene	207-08-9	100.2	26.72	ug/kg	40-140	50	40-140	50	50			
Chrysene	218-01-9	100.2	17.368	ug/kg	40-140	50	40-140	50	50			
Acenaphthylene	208-96-8	133.6	25.7848	ug/kg	40-140	50	40-140	50	50			
Anthracene	120-12-7	100.2	32.565	ug/kg	40-140	50	40-140	50	50			
Benzo(ghi)perylene	191-24-2	133.6	19.6392	ug/kg	40-140	50	40-140	50	50			
Fluorene	86-73-7	167	16.2324	ug/kg	40-140	50	40-140	50	50			
Phenanthrene	85-01-8	100.2	20.3072	ug/kg	40-140	50	40-140	50	50			
Dibenzo(a,h)anthracene	53-70-3	100.2	19.3052	ug/kg	40-140	50	40-140	50	50			
Indeno(1,2,3-cd)Pyrene	193-39-5	133.6	23.2798	ug/kg	40-140	50	40-140	50	50			

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NYTCL Semivolatiles - EPA 8270D (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Pyrene	129-00-0	100.2	16.5998	ug/kg	35-142	50	35-142	50	50			
Biphenyl	92-52-4	380.76	38.744	ug/kg	54-104	50	54-104	50	50			
4-Chloroaniline	106-47-8	167	30.394	ug/kg	40-140	50	40-140	50	50			
2-Nitroaniline	88-74-4	167	32.1976	ug/kg	47-134	50	47-134	50	50			
3-Nitroaniline	99-09-2	167	31.4962	ug/kg	26-129	50	26-129	50	50			
4-Nitroaniline	100-01-6	167	69.138	ug/kg	41-125	50	41-125	50	50			
Dibenzofuran	132-64-9	167	15.7982	ug/kg	40-140	50	40-140	50	50			
2-Methylnaphthalene	91-57-6	200.4	20.1736	ug/kg	40-140	50	40-140	50	50			
Acetophenone	98-86-2	167	20.6746	ug/kg	14-144	50	14-144	50	50			
2,4,6-Trichlorophenol	88-06-2	100.2	31.6632	ug/kg	30-130	50	30-130	50	50			
P-Chloro-M-Cresol	59-50-7	167	24.883	ug/kg	26-103	50	26-103	50	50			
2-Chlorophenol	95-57-8	167	19.7394	ug/kg	25-102	50	25-102	50	50			
2,4-Dichlorophenol	120-83-2	150.3	26.8536	ug/kg	30-130	50	30-130	50	50			
2,4-Dimethylphenol	105-67-9	167	55.11	ug/kg	30-130	50	30-130	50	50			
2-Nitrophenol	88-75-5	360.72	62.792	ug/kg	30-130	50	30-130	50	50			
4-Nitrophenol	100-02-7	233.8	68.136	ug/kg	11-114	50	11-114	50	50			
2,4-Dinitrophenol	51-28-5	801.6	77.822	ug/kg	4-130	50	4-130	50	50			
4,6-Dinitro-o-cresol	534-52-1	434.2	80.16	ug/kg	10-130	50	10-130	50	50			
Pentachlorophenol	87-86-5	133.6	36.74	ug/kg	17-109	50	17-109	50	50			
Phenol	108-95-2	167	25.217	ug/kg	26-90	50	26-90	50	50			
2-Methylphenol	95-48-7	167	25.885	ug/kg	30-130.	50	30-130.	50	50			
3-Methylphenol/4-Methylphenol	108-39-4/106-44-5	240.48	26.1522	ug/kg	30-130	50	30-130	50	50			
2,4,5-Trichlorophenol	95-95-4	167	31.9972	ug/kg	30-130	50	30-130	50	50			
Benzoic Acid	65-85-0	541.08	169.004	ug/kg	10-110	50	10-110	50	50			
Benzyl Alcohol	100-51-6	167	51.102	ug/kg	40-140	50	40-140	50	50			
Carbazole	86-74-8	167	16.2324	ug/kg	54-128	50	54-128	50	50			
2-Fluorophenol	*367-12-4*									*25-120*		
Phenol-d6	*13127-88-3*									*10-120*		
Nitrobenzene-d5	*4165-60-0*									*23-120*		
2-Fluorobiphenyl	*321-60-8*									*30-120*		
2,4,6-Tribromophenol	*118-79-6*									*10-136*		
4-Terphenyl-d14	*1718-51-0*									*18-120*		

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NY PFAAs via EPA 537(M)-Isotope Dilution (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Plastic 8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluorobutanoic Acid (PFBA)	375-22-4	0.5	0.0227	ng/g	71-135	30	71-135	30	30			
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.5	0.046	ng/g	69-132	30	69-132	30	30			
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.25	0.039	ng/g	72-128	30	72-128	30	30			
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.5	0.0525	ng/g	70-132	30	70-132	30	30			
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.25	0.0451	ng/g	71-131	30	71-131	30	30			
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.25	0.0605	ng/g	67-130	30	67-130	30	30			
Perfluorooctanoic Acid (PFOA)	335-67-1	0.25	0.0419	ng/g	69-133	30	69-133	30	30			
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	0.5	0.1795	ng/g	64-140	30	64-140	30	30			
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.5	0.1365	ng/g	70-132	30	70-132	30	30			
Perfluorononanoic Acid (PFNA)	375-95-1	0.25	0.075	ng/g	72-129	30	72-129	30	30			
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.25	0.13	ng/g	68-136	30	68-136	30	30			
Perfluorodecanoic Acid (PFDA)	335-76-2	0.25	0.067	ng/g	69-133	30	69-133	30	30			
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	0.5	0.287	ng/g	65-137	30	65-137	30	30			
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSA	2355-31-9	0.5	0.2015	ng/g	63-144	30	63-144	30	30			
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.5	0.0468	ng/g	64-136	30	64-136	30	30			
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.5	0.153	ng/g	59-134	30	59-134	30	30			
Perfluorooctanesulfonamide (FOSA)	754-91-6	0.5	0.098	ng/g	67-137	30	67-137	30	30			
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	0.5	0.0845	ng/g	61-139	30	61-139	30	30			
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.5	0.07	ng/g	69-135	30	69-135	30	30			
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.5	0.2045	ng/g	66-139	30	66-139	30	30			
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.5	0.054	ng/g	69-133	30	69-133	30	30			
PFOA/PFOS, Total		0.25	0.0419	ng/g				30	30			
Perfluoro[13C4]Butanoic Acid (M4PFBA)	*NONE*									*61-135*		
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	*NONE*									*58-150*		
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	*NONE*									*74-139*		
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	*NONE*									*66-128*		
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	*NONE*									*71-129*		
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	*NONE*									*78-139*		
Perfluoro[13C8]Octanoic Acid (M8PFOA)	*NONE*									*75-130*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6	*NONE*									*20-154*		
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	*NONE*									*72-140*		
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	*NONE*									*79-136*		
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	*NONE*									*75-130*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8	*NONE*									*19-175*		
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid	*NONE*									*31-134*		
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	*NONE*									*61-155*		
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	*NONE*									*10-117*		
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d	*NONE*									*34-137*		
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	*NONE*									*54-150*		
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	*NONE*									*24-159*		

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TCL PCBs - EPA 8082A (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Aroclor 1016	12674-11-2	33.5	2.9748	ug/kg	40-140	50	40-140	50	50			
Aroclor 1221	11104-28-2	33.5	3.3567	ug/kg	40-140	50	40-140	50	50			
Aroclor 1232	11141-16-5	33.5	7.102	ug/kg	40-140	50	40-140	50	50			
Aroclor 1242	53469-21-9	33.5	4.5158	ug/kg	40-140	50	40-140	50	50			
Aroclor 1248	12672-29-6	33.5	5.025	ug/kg	40-140	50	40-140	50	50			
Aroclor 1254	11097-69-1	33.5	3.6649	ug/kg	40-140	50	40-140	50	50			
Aroclor 1260	11096-82-5	33.5	6.1908	ug/kg	40-140	50	40-140	50	50			
Aroclor 1262	37324-23-5	33.5	4.2545	ug/kg	40-140	50	40-140	50	50			
Aroclor 1268	11100-14-4	33.5	3.4706	ug/kg	40-140	50	40-140	50	50			
PCBs, Total	1336-36-3	33.5	2.9748	ug/kg				50	50			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

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WETCHEM (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Method	Holding Time	Container/Sample Preservation
Chromium, Hexavalent	18540-29-9	0.8	0.16	mg/kg	80-120	20	75-125	20	20	7196A	30 days	1 - Glass 120ml/4oz unpreserved
Cyanide, Total	57-12-5	1	0.212	mg/kg	80-120	35	75-125	35	35	9010C/9012B	14 days	1 - Glass 250ml/8oz unpreserved

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Volatile Organics in Air: TO-15 (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,1,1-Trichloroethane	71-55-6	0.2	0.0554	ppbV	70-130			25	25			
1,1,2,2-Tetrachloroethane	79-34-5	0.2	0.0611	ppbV	70-130			25	25			
1,1,2-Trichloroethane	79-00-5	0.2	0.0694	ppbV	70-130			25	25			
1,1-Dichloroethane	75-34-3	0.2	0.0628	ppbV	70-130			25	25			
1,1-Dichloroethene	75-35-4	0.2	0.0613	ppbV	70-130			25	25			
1,2,3-Trimethylbenzene	526-73-8	0.2	0.0636	ppbV	70-130			25	25			
1,2,4-Trichlorobenzene	120-82-1	0.2	0.0759	ppbV	70-130			25	25			
1,2,4-Trimethylbenzene	95-63-6	0.2	0.0416	ppbV	70-130			25	25			
1,2,4,5-Tetramethylbenzene	95-93-2	0.2	0.068	ppbV	70-130			25	25			
1,2-Dibromoethane	106-93-4	0.2	0.0577	ppbV	70-130			25	25			
1,2-Dichlorobenzene	95-50-1	0.2	0.0653	ppbV	70-130			25	25			
1,2-Dichloroethane	107-06-2	0.2	0.0634	ppbV	70-130			25	25			
1,2-Dichloropropane	78-87-5	0.2	0.062	ppbV	70-130			25	25			
1,3,5-Trimethylbenzene	108-67-8	0.2	0.0737	ppbV	70-130			25	25			
1,3-Butadiene	106-99-0	0.2	0.063	ppbV	70-130			25	25			
1,3-Dichlorobenzene	541-73-1	0.2	0.0658	ppbV	70-130			25	25			
1,4-Dichlorobenzene	106-46-7	0.2	0.0681	ppbV	70-130			25	25			
1,4-Dioxane	123-91-1	0.2	0.0903	ppbV	70-130			25	25			
2,2,4-Trimethylpentane	540-84-1	0.2	0.0391	ppbV	70-130			25	25			
2-Butanone	78-93-3	0.5	0.0476	ppbV	70-130			25	25			
2-Hexanone	591-78-6	0.2	0.0662	ppbV	70-130			25	25			
2-Methylthiophene	554-14-3	0.2	0.0577	ppbV	70-130			25	25			
3-Methylthiophene	616-44-4	0.2	0.0577	ppbV	70-130			25	25			
3-Chloropropene	107-05-1	0.2	0.0517	ppbV	70-130			25	25			
2-Ethylthiophene	872-55-9	0.2	0.0455	ppbV	70-130			25	25			
4-Ethyltoluene	622-96-8	0.2	0.041	ppbV	70-130			25	25			
Acetone	67-64-1	1	0.544	ppbV	40-160			25	25			
Benzene	71-43-2	0.2	0.0494	ppbV	70-130			25	25			
Benzyl chloride	100-44-7	0.2	0.0545	ppbV	70-130			25	25			
Benzothiophene	95-15-8	0.5	0.0863	ppbV	70-130			25	25			
Bromodichloromethane	75-27-4	0.2	0.0534	ppbV	70-130			25	25			
Bromoform	75-25-2	0.2	0.0711	ppbV	70-130			25	25			
Bromomethane	74-83-9	0.2	0.0713	ppbV	70-130			25	25			
Carbon disulfide	75-15-0	0.2	0.0552	ppbV	70-130			25	25			
Carbon tetrachloride	56-23-5	0.2	0.0561	ppbV	70-130			25	25			
Chlorobenzene	108-90-7	0.2	0.0634	ppbV	70-130			25	25			
Chloroethane	75-00-3	0.2	0.0785	ppbV	70-130			25	25			
Chloroform	67-66-3	0.2	0.0632	ppbV	70-130			25	25			
Chloromethane	74-87-3	0.2	0.0735	ppbV	70-130			25	25			
cis-1,2-Dichloroethene	156-59-2	0.2	0.12	ppbV	70-130			25	25			
cis-1,3-Dichloropropene	10061-01-5	0.2	0.0461	ppbV	70-130			25	25			
Cyclohexane	110-82-7	0.2	0.0389	ppbV	70-130			25	25			

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Volatile Organics in Air: TO-15 (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Dibromochloromethane	124-48-1	0.2	0.0671	ppbV	70-130			25	25			
Dichlorodifluoromethane	75-71-8	0.2	0.0599	ppbV	70-130			25	25			
Ethyl Alcohol	64-17-5	5	0.788	ppbV	40-160			25	25			
Ethyl Acetate	141-78-6	0.5	0.137	ppbV	70-130			25	25			
Ethylbenzene	100-41-4	0.2	0.0467	ppbV	70-130			25	25			
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	0.2	0.0649	ppbV	70-130			25	25			
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	0.2	0.0609	ppbV	70-130			25	25			
Hexachlorobutadiene	87-68-3	0.2	0.0555	ppbV	70-130			25	25			
iso-Propyl Alcohol	67-63-0	0.5	0.348	ppbV	40-160			25	25			
Methylene chloride	75-09-2	0.5	0.07	ppbV	70-130			25	25			
4-Methyl-2-pentanone	108-10-1	0.5	0.0464	ppbV	70-130			25	25			
Methyl tert butyl ether	1634-04-4	0.2	0.0571	ppbV	70-130			25	25			
Methyl Methacrylate	80-62-6	0.5	0.06	ppbV	40-160			25	25			
p/m-Xylene	179601-23-1	0.4	0.101	ppbV	70-130			25	25			
o-Xylene	95-47-6	0.2	0.051	ppbV	70-130			25	25			
Xylene (Total)	1330-20-7	0.2	0.051	ppbV				25	25			
Heptane	142-82-5	0.2	0.0529	ppbV	70-130			25	25			
n-Heptane	142-82-5	0.2	0.0529	ppbV	70-130			25	25			
n-Hexane	110-54-3	0.2	0.0364	ppbV	70-130			25	25			
Propylene	115-07-1	0.5	0.0669	ppbV	70-130			25	25			
Styrene	100-42-5	0.2	0.0476	ppbV	70-130			25	25			
Tetrachloroethene	127-18-4	0.2	0.0673	ppbV	70-130			25	25			
Thiophene	110-02-1	0.2	0.0428	ppbV	70-130			25	25			
Tetrahydrofuran	109-99-9	0.5	0.0634	ppbV	70-130			25	25			
Toluene	108-88-3	0.2	0.0545	ppbV	70-130			25	25			
trans-1,2-Dichloroethene	156-60-5	0.2	0.0645	ppbV	70-130			25	25			
1,2-Dichloroethene (total)	540-59-0	0.2	0.0645	ppbV				25	25			
trans-1,3-Dichloropropene	10061-02-6	0.2	0.0491	ppbV	70-130			25	25			
1,3-Dichloropropene, Total	542-75-6	0.2	0.0461	ppbV				25	25			
Trichloroethene	79-01-6	0.2	0.0512	ppbV	70-130			25	25			
Trichlorofluoromethane	75-69-4	0.2	0.0755	ppbV	70-130			25	25			
Vinyl acetate	108-05-4	1	0.0508	ppbV	70-130			25	25			
Vinyl bromide	593-60-2	0.2	0.0696	ppbV	70-130			25	25			
Vinyl chloride	75-01-4	0.2	0.0598	ppbV	70-130			25	25			
Naphthalene	91-20-3	0.2	0.0984	ppbV	70-130			25	25			
Total HC As Hexane	NONE	10	0.0364	ppbV	70-130			25	25			
Total VOCs As Toluene	NONE	10	0.0545	ppbV	70-130			25	25			
Propane	74-98-6	0.5	0.149	ppbV	70-130			25	25			
Acrylonitrile	107-13-1	0.5	0.0544	ppbV	70-130			25	25			
Acrolein	107-02-8	0.5	0.0545	ppbV	70-130			25	25			
1,1,1,2-Tetrachloroethane	630-20-6	0.2	0.0591	ppbV	70-130			25	25			
Isopropylbenzene	98-82-8	0.2	0.0516	ppbV	70-130			25	25			

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Volatile Organics in Air: TO-15 (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,2,3-Trichloropropane	96-18-4	0.2	0.0592	ppbV	70-130			25	25			
Acetonitrile	75-05-8	0.2	0.0745	ppbV	70-130			25	25			
Bromobenzene	108-86-1	0.2	0.064	ppbV	70-130			25	25			
Chlorodifluoromethane	75-45-6	0.2	0.0599	ppbV	70-130			25	25			
Dichlorofluoromethane	75-43-4	0.2	0.0835	ppbV	70-130			25	25			
Dibromomethane	74-95-3	0.2	0.0597	ppbV	70-130			25	25			
Pentane	109-66-0	0.2	0.0656	ppbV	70-130			25	25			
Octane	111-65-9	0.2	0.0495	ppbV	70-130			25	25			
Tertiary-Amyl Methyl Ether	994-05-8	0.2	0.0532	ppbV	70-130			25	25			
o-Chlorotoluene	95-49-8	0.2	0.0517	ppbV	70-130			25	25			
p-Chlorotoluene	106-43-4	0.2	0.0574	ppbV	70-130			25	25			
2,2-Dichloropropane	594-20-7	0.2	0.0514	ppbV	70-130			25	25			
1,1-Dichloropropene	563-58-6	0.2	0.0512	ppbV	70-130			25	25			
Isopropyl Ether	108-20-3	0.2	0.0978	ppbV	70-130			25	25			
Ethyl-Tert-Butyl-Ether	637-92-3	0.2	0.0656	ppbV	70-130			25	25			
1,2,3-Trichlorobenzene	87-61-6	0.2	0.0756	ppbV	70-130			25	25			
Ethyl ether	60-29-7	0.2	0.0795	ppbV	70-130			25	25			
n-Butylbenzene	104-51-8	0.2	0.049	ppbV	70-130			25	25			
sec-Butylbenzene	135-98-8	0.2	0.0469	ppbV	70-130			25	25			
tert-Butylbenzene	98-06-6	0.2	0.0464	ppbV	70-130			25	25			
1,2-Dibromo-3-chloropropane	96-12-8	0.2	0.0557	ppbV	70-130			25	25			
p-Isopropyltoluene	99-87-6	0.2	0.058	ppbV	70-130			25	25			
n-Propylbenzene	103-65-1	0.2	0.0462	ppbV	70-130			25	25			
1,3-Dichloropropane	142-28-9	0.2	0.0601	ppbV	70-130			25	25			
Methanol	67-56-1	5	0.616	ppbV	70-130			25	25			
Acetaldehyde	75-07-0	2.5	0.499	ppbV	70-130			25	25			
Butane	106-97-8	0.2	0.0659	ppbV	70-130			25	25			
Nonane (C9)	111-84-2	0.2	0.0523	ppbV	70-130			25	25			
Decane (C10)	124-18-5	0.2	0.0448	ppbV	70-130			25	25			
Undecane	1120-21-4	0.2	0.0478	ppbV	70-130			25	25			
Indane	496-11-7	0.2	0.0534	ppbV	70-130			25	25			
Indene	95-13-6	0.2	0.0474	ppbV	70-130			25	25			
1-Methylnaphthalene	90-12-0	1	0.518	ppbV	70-130			25	25			
Dodecane (C12)	112-40-3	0.2	0.0719	ppbV	70-130			25	25			
Butyl Acetate	123-86-4	0.5	0.127	ppbV	70-130			25	25			
tert-Butyl Alcohol	75-65-0	0.5	0.0446	ppbV	70-130			25	25			
2-Methylnaphthalene	91-57-6	1	0.428	ppbV	70-130			25	25			
1,2-Dichloroethane-d4	*17060-07-0*									*70-130*		
Toluene-d8	*2037-26-5*									*70-130*		
Bromofluorobenzene	*460-00-4*									*70-130*		

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TCL Volatiles - EPA 8260C (WATER)

Holding Time: 14 days
Container/Sample Preservation: 3 - Vial HCl preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Methylene chloride	75-09-2	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,1-Dichloroethane	75-34-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Chloroform	67-66-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Carbon tetrachloride	56-23-5	0.5	0.134	ug/l	63-132	20	63-132	20	20			
1,2-Dichloropropane	78-87-5	1	0.133	ug/l	70-130	20	70-130	20	20			
Dibromochloromethane	124-48-1	0.5	0.149	ug/l	63-130	20	63-130	20	20			
1,1,2-Trichloroethane	79-00-5	1.5	0.5	ug/l	70-130	20	70-130	20	20			
Tetrachloroethene	127-18-4	0.5	0.181	ug/l	70-130	20	70-130	20	20			
Chlorobenzene	108-90-7	2.5	0.7	ug/l	75-130	20	75-130	20	20			
Trichlorofluoromethane	75-69-4	2.5	0.7	ug/l	62-150	20	62-150	20	20			
1,2-Dichloroethane	107-06-2	0.5	0.132	ug/l	70-130	20	70-130	20	20			
1,1,1-Trichloroethane	71-55-6	2.5	0.7	ug/l	67-130	20	67-130	20	20			
Bromodichloromethane	75-27-4	0.5	0.192	ug/l	67-130	20	67-130	20	20			
trans-1,3-Dichloropropene	10061-02-6	0.5	0.164	ug/l	70-130	20	70-130	20	20			
cis-1,3-Dichloropropene	10061-01-5	0.5	0.144	ug/l	70-130	20	70-130	20	20			
1,3-Dichloropropene, Total	542-75-6	0.5	0.144	ug/l				20	20			
1,1-Dichloropropene	563-58-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Bromoform	75-25-2	2	0.65	ug/l	54-136	20	54-136	20	20			
1,1,2,2-Tetrachloroethane	79-34-5	0.5	0.144	ug/l	67-130	20	67-130	20	20			
Benzene	71-43-2	0.5	0.159	ug/l	70-130	20	70-130	20	20			
Toluene	108-88-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Ethylbenzene	100-41-4	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Chloromethane	74-87-3	2.5	0.7	ug/l	64-130	20	64-130	20	20			
Bromomethane	74-83-9	2.5	0.7	ug/l	39-139	20	39-139	20	20			
Vinyl chloride	75-01-4	1	0.0699	ug/l	55-140	20	55-140	20	20			
Chloroethane	75-00-3	2.5	0.7	ug/l	55-138	20	55-138	20	20			
1,1-Dichloroethene	75-35-4	0.5	0.142	ug/l	61-145	20	61-145	20	20			
trans-1,2-Dichloroethene	156-60-5	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Trichloroethene	79-01-6	0.5	0.175	ug/l	70-130	20	70-130	20	20			
1,2-Dichlorobenzene	95-50-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,3-Dichlorobenzene	541-73-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,4-Dichlorobenzene	106-46-7	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Methyl tert butyl ether	1634-04-4	2.5	0.7	ug/l	63-130	20	63-130	20	20			
p/m-Xylene	179601-23-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
o-Xylene	95-47-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Xylene (Total)	1330-20-7	2.5	0.7	ug/l				20	20			
cis-1,2-Dichloroethene	156-59-2	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2-Dichloroethene (total)	540-59-0	2.5	0.7	ug/l				20	20			
Dibromomethane	74-95-3	5	1	ug/l	70-130	20	70-130	20	20			
1,2,3-Trichloropropane	96-18-4	2.5	0.7	ug/l	64-130	20	64-130	20	20			
Acrylonitrile	107-13-1	5	1.5	ug/l	70-130	20	70-130	20	20			
Styrene	100-42-5	2.5	0.7	ug/l	70-130	20	70-130	20	20			

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TCL Volatiles - EPA 8260C (WATER)

Holding Time: 14 days
Container/Sample Preservation: 3 - Vial HCl preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Dichlorodifluoromethane	75-71-8	5	1	ug/l	36-147	20	36-147	20	20			
Acetone	67-64-1	5	1.46	ug/l	58-148	20	58-148	20	20			
Carbon disulfide	75-15-0	5	1	ug/l	51-130	20	51-130	20	20			
2-Butanone	78-93-3	5	1.94	ug/l	63-138	20	63-138	20	20			
Vinyl acetate	108-05-4	5	1	ug/l	70-130	20	70-130	20	20			
4-Methyl-2-pentanone	108-10-1	5	1	ug/l	59-130	20	59-130	20	20			
2-Hexanone	591-78-6	5	1	ug/l	57-130	20	57-130	20	20			
Bromochloromethane	74-97-5	2.5	0.7	ug/l	70-130	20	70-130	20	20			
2,2-Dichloropropane	594-20-7	2.5	0.7	ug/l	63-133	20	63-133	20	20			
1,2-Dibromoethane	106-93-4	2	0.65	ug/l	70-130	20	70-130	20	20			
1,3-Dichloropropane	142-28-9	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,1,1,2-Tetrachloroethane	630-20-6	2.5	0.7	ug/l	64-130	20	64-130	20	20			
Bromobenzene	108-86-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
n-Butylbenzene	104-51-8	2.5	0.7	ug/l	53-136	20	53-136	20	20			
sec-Butylbenzene	135-98-8	2.5	0.7	ug/l	70-130	20	70-130	20	20			
tert-Butylbenzene	98-06-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
o-Chlorotoluene	95-49-8	2.5	0.7	ug/l	70-130	20	70-130	20	20			
p-Chlorotoluene	106-43-4	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2-Dibromo-3-chloropropane	96-12-8	2.5	0.7	ug/l	41-144	20	41-144	20	20			
Hexachlorobutadiene	87-68-3	2.5	0.7	ug/l	63-130	20	63-130	20	20			
Isopropylbenzene	98-82-8	2.5	0.7	ug/l	70-130	20	70-130	20	20			
p-Isopropyltoluene	99-87-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Naphthalene	91-20-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
n-Propylbenzene	103-65-1	2.5	0.7	ug/l	69-130	20	69-130	20	20			
1,2,3-Trichlorobenzene	87-61-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2,4-Trichlorobenzene	120-82-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,3,5-Trimethylbenzene	108-67-8	2.5	0.7	ug/l	64-130	20	64-130	20	20			
1,2,4-Trimethylbenzene	95-63-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,4-Dioxane	123-91-1	250	41.1	ug/l	56-162	20	56-162	20	20			
1,4-Diethylbenzene	105-05-5	2	0.7	ug/l	70-130	20	70-130	20	20			
4-Ethyltoluene	622-96-8	2	0.7	ug/l	70-130	20	70-130	20	20			
1,2,4,5-Tetramethylbenzene	95-93-2	2	0.65	ug/l	70-130	20	70-130	20	20			
Ethyl ether	60-29-7	2.5	0.7	ug/l	59-134	20	59-134	20	20			
trans-1,4-Dichloro-2-butene	110-57-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2-Dichloroethane-d4	*17060-07-0*									*70-130*		
Toluene-d8	*2037-26-5*									*70-130*		
4-Bromofluorobenzene	*460-00-4*									*70-130*		
Dibromofluoromethane	*1868-53-7*									*70-130*		

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1,4 Dioxane via EPA 8270D-SIM (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 250ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,4-Dioxane	123-91-1	150	33.9	ng/l	40-140	30	40-140	30	30			
1,4-Dioxane-d8	*17647-74-4*									*15-110*		
1,4-Dioxane-d8 (IS)	17647-74-4			ng/l								

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TCL PCBs - EPA 8082A (LVI) (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 120ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Aroclor 1016	12674-11-2	0.082824	0.0344148	ug/l	40-140	50	40-140	50	50			
Aroclor 1221	11104-28-2	0.082824	0.0664734	ug/l	40-140	50	40-140	50	50			
Aroclor 1232	11141-16-5	0.082824	0.0455532	ug/l	40-140	50	40-140	50	50			
Aroclor 1242	53469-21-9	0.082824	0.0387702	ug/l	40-140	50	40-140	50	50			
Aroclor 1248	12672-29-6	0.082824	0.048909	ug/l	40-140	50	40-140	50	50			
Aroclor 1254	11097-69-1	0.082824	0.0390558	ug/l	40-140	50	40-140	50	50			
Aroclor 1260	11096-82-5	0.082824	0.0320586	ug/l	40-140	50	40-140	50	50			
Aroclor 1262	37324-23-5	0.082824	0.0347718	ug/l	40-140	50	40-140	50	50			
Aroclor 1268	11100-14-4	0.082824	0.0334866	ug/l	40-140	50	40-140	50	50			
PCBs, Total	1336-36-3	0.082824	0.0320586	ug/l				50	50			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

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METALS by 6020B (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Aluminum, Total	7429-90-5	0.01	0.00327	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Antimony, Total	7440-36-0	0.004	0.000429	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Arsenic, Total	7440-38-2	0.0005	0.000165	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Barium, Total	7440-39-3	0.0005	0.000173	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Beryllium, Total	7440-41-7	0.0005	0.000107	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Cadmium, Total	7440-43-9	0.0002	0.0000599	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Calcium, Total	7440-70-2	0.1	0.0394	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Chromium, Total	7440-47-3	0.001	0.000178	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Cobalt, Total	7440-48-4	0.0005	0.000163	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Copper, Total	7440-50-8	0.001	0.000384	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Iron, Total	7439-89-6	0.05	0.0191	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Lead, Total	7439-92-1	0.001	0.000343	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Magnesium, Total	7439-95-4	0.07	0.0242	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Manganese, Total	7439-96-5	0.001	0.00044	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Nickel, Total	7440-02-0	0.002	0.000556	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Potassium, Total	7440-09-7	0.1	0.0309	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Selenium, Total	7782-49-2	0.005	0.00173	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Silver, Total	7440-22-4	0.0004	0.000163	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Sodium, Total	7440-23-5	0.1	0.0293	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Thallium, Total	7440-28-0	0.0005	0.000143	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Vanadium, Total	7440-62-2	0.005	0.00157	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Zinc, Total	7440-66-6	0.01	0.00341	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved

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METALS by 7470A (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Mercury, Total	7439-97-6	0.0002	0.0000915	mg/l	80-120		75-125	20	20		28 days	1 - Plastic 500ml HNO3 preserved

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TCL Pesticides - EPA 8081B (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 120ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Delta-BHC	319-86-8	0.02	0.00467	ug/l	30-150	20	30-150	30	30			
Lindane	58-89-9	0.02	0.00434	ug/l	30-150	20	30-150	30	30			
Alpha-BHC	319-84-6	0.02	0.00439	ug/l	30-150	20	30-150	30	30			
Beta-BHC	319-85-7	0.02	0.0056	ug/l	30-150	20	30-150	30	30			
Heptachlor	76-44-8	0.02	0.0031	ug/l	30-150	20	30-150	30	30			
Aldrin	309-00-2	0.02	0.00216	ug/l	30-150	20	30-150	30	30			
Heptachlor epoxide	1024-57-3	0.02	0.00415	ug/l	30-150	20	30-150	30	30			
Endrin	72-20-8	0.04	0.00429	ug/l	30-150	20	30-150	30	30			
Endrin aldehyde	7421-93-4	0.04	0.0081	ug/l	30-150	20	30-150	30	30			
Endrin ketone	53494-70-5	0.04	0.00477	ug/l	30-150	20	30-150	30	30			
Dieldrin	60-57-1	0.04	0.00429	ug/l	30-150	20	30-150	30	30			
4,4'-DDE	72-55-9	0.04	0.00381	ug/l	30-150	20	30-150	30	30			
4,4'-DDD	72-54-8	0.04	0.00464	ug/l	30-150	20	30-150	30	30			
4,4'-DDT	50-29-3	0.04	0.00432	ug/l	30-150	20	30-150	30	30			
Endosulfan I	959-98-8	0.02	0.00345	ug/l	30-150	20	30-150	30	30			
Endosulfan II	33213-65-9	0.04	0.00519	ug/l	30-150	20	30-150	30	30			
Endosulfan sulfate	1031-07-8	0.04	0.00481	ug/l	30-150	20	30-150	30	30			
Methoxychlor	72-43-5	0.2	0.00684	ug/l	30-150	20	30-150	30	30			
Toxaphene	8001-35-2	0.2	0.0627	ug/l	30-150	20	30-150	30	30			
cis-Chlordane	5103-71-9	0.02	0.00666	ug/l	30-150	20	30-150	30	30			
trans-Chlordane	5103-74-2	0.02	0.00627	ug/l	30-150	20	30-150	30	30			
Chlordane	57-74-9	0.2	0.0463	ug/l	30-150	20	30-150	30	30			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

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NYTCL Semivolatiles -EPA 8270D-SIM (LVI) (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 250ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Acenaphthene	83-32-9	0.1001	0.01442168	ug/l	40-140	40	40-140	40	40			
2-Chloronaphthalene	91-58-7	0.2002	0.01804712	ug/l	40-140	40	40-140	40	40			
Fluoranthene	206-44-0	0.1001	0.02054052	ug/l	40-140	40	40-140	40	40			
Hexachlorobutadiene	87-68-3	0.5005	0.04674852	ug/l	40-140	40	40-140	40	40			
Naphthalene	91-20-3	0.1001	0.04882696	ug/l	40-140	40	40-140	40	40			
Benzo(a)anthracene	56-55-3	0.1001	0.0198198	ug/l	40-140	40	40-140	40	40			
Benzo(a)pyrene	50-32-8	0.1001	0.01493856	ug/l	40-140	40	40-140	40	40			
Benzo(b)fluoranthene	205-99-2	0.1001	0.01156792	ug/l	40-140	40	40-140	40	40			
Benzo(k)fluoranthene	207-08-9	0.1001	0.00889616	ug/l	40-140	40	40-140	40	40			
Chrysene	218-01-9	0.1001	0.01198288	ug/l	40-140	40	40-140	40	40			
Acenaphthylene	208-96-8	0.1001	0.01222676	ug/l	40-140	40	40-140	40	40			
Anthracene	120-12-7	0.1001	0.01450176	ug/l	40-140	40	40-140	40	40			
Benzo(ghi)perylene	191-24-2	0.1001	0.01365	ug/l	40-140	40	40-140	40	40			
Fluorene	86-73-7	0.1001	0.01456364	ug/l	40-140	40	40-140	40	40			
Phenanthrene	85-01-8	0.1001	0.02333604	ug/l	40-140	40	40-140	40	40			
Dibenzo(a,h)anthracene	53-70-3	0.1001	0.0127218	ug/l	40-140	40	40-140	40	40			
Indeno(1,2,3-cd)Pyrene	193-39-5	0.1001	0.01217216	ug/l	40-140	40	40-140	40	40			
Pyrene	129-00-0	0.1001	0.01902264	ug/l	40-140	40	40-140	40	40			
2-Methylnaphthalene	91-57-6	0.1001	0.02192372	ug/l	40-140	40	40-140	40	40			
Pentachlorophenol	87-86-5	0.8008	0.0143416	ug/l	40-140	40	40-140	40	40			
Hexachlorobenzene	118-74-1	0.8008	0.00938028	ug/l	40-140	40	40-140	40	40			
Hexachloroethane	67-72-1	0.8008	0.06320132	ug/l	40-140	40	40-140	40	40			
2-Fluorophenol	*367-12-4*									*21-120*		
Phenol-d6	*13127-88-3*									*10-120*		
Nitrobenzene-d5	*4165-60-0*									*23-120*		
2-Fluorobiphenyl	*321-60-8*									*15-120*		
2,4,6-Tribromophenol	*118-79-6*									*10-120*		
4-Terphenyl-d14	*1718-51-0*									*41-149*		

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NY PFAAs via EPA 537(M)-Isotope Dilution (WATER)

Holding Time: 14 days
Container/Sample Preservation: 1 - 2 Plastic/1 Plastic/1 H20 Plastic

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluorobutanoic Acid (PFBA)	375-22-4	2	0.3732	ng/l	67-148	30	67-148	30	30			
Perfluoropentanoic Acid (PFPeA)	2706-90-3	2	0.464	ng/l	63-161	30	63-161	30	30			
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	2	0.38	ng/l	65-157	30	65-157	30	30			
Perfluorohexanoic Acid (PFHxA)	307-24-4	2	0.492	ng/l	69-168	30	69-168	30	30			
Perfluoroheptanoic Acid (PFHpA)	375-85-9	2	0.372	ng/l	58-159	30	58-159	30	30			
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	2	0.436	ng/l	69-177	30	69-177	30	30			
Perfluorooctanoic Acid (PFOA)	335-67-1	2	0.46	ng/l	63-159	30	63-159	30	30			
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	2	0.194	ng/l	49-187	30	49-187	30	30			
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	2	0.52	ng/l	61-179	30	61-179	30	30			
Perfluorononanoic Acid (PFNA)	375-95-1	2	0.436	ng/l	68-171	30	68-171	30	30			
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	2	0.56	ng/l	52-151	30	52-151	30	30			
Perfluorodecanoic Acid (PFDA)	335-76-2	2	0.62	ng/l	63-171	30	63-171	30	30			
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	2	0.2908	ng/l	56-173	30	56-173	30	30			
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSA/	2355-31-9	2	0.2504	ng/l	60-166	30	60-166	30	30			
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	2	0.424	ng/l	60-153	30	60-153	30	30			
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	2	0.386	ng/l	38-156	30	38-156	30	30			
Perfluorooctanesulfonamide (FOSA)	754-91-6	2	0.556	ng/l	46-170	30	46-170	30	30			
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	2	0.3728	ng/l	45-170	30	45-170	30	30			
Perfluorododecanoic Acid (PFDoA)	307-55-1	2	0.592	ng/l	67-153	30	67-153	30	30			
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	2	0.314	ng/l	48-158	30	48-158	30	30			
Perfluorotetradecanoic Acid (PFTA)	376-06-7	2	0.988	ng/l	59-182	30	59-182	30	30			
PFOA/PFOS, Total		2	0.46	ng/l				30	30			
Perfluoro[13C4]Butanoic Acid (MPFBA)	*NONE*									*2-156*		
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	*NONE*									*16-173*		
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	*NONE*									*31-159*		
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	*NONE*									*21-145*		
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	*NONE*									*30-139*		
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	*NONE*									*47-153*		
Perfluoro[13C8]Octanoic Acid (M8PFOA)	*NONE*									*36-149*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6	*NONE*									*1-244*		
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	*NONE*									*34-146*		
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	*NONE*									*42-146*		
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	*NONE*									*38-144*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8	*NONE*									*7-170*		
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid	*NONE*									*1-181*		
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	*NONE*									*40-144*		
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	*NONE*									*1-87*		
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d	*NONE*									*23-146*		
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	*NONE*									*24-161*		
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	*NONE*									*33-143*		

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WETCHEM (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Method	Holding Time	Container/Sample Preservation
Chromium, Hexavalent	18540-29-9	0.01	0.003	mg/l	85-115	20	85-115	20	20	7196A	24 hours	1 - Plastic 500ml unpreserved
Cyanide, Total	57-12-5	0.005	0.0018	mg/l	85-115	20	80-120	20	20	9010C/9012B	14 days	1 - Plastic 250ml NaOH preserved

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NYTCL Semivolatiles - EPA 8270D (LVI) (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 250ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Acenaphthene	83-32-9	2.002	0.44408	ug/l	37-111	30	37-111	30	30			
1,2,4-Trichlorobenzene	120-82-1	5.0232	0.49868	ug/l	39-98	30	39-98	30	30			
Hexachlorobenzene	118-74-1	2.002	0.46592	ug/l	40-140	30	40-140	30	30			
Bis(2-chloroethyl)ether	111-44-4	2.002	0.50596	ug/l	40-140	30	40-140	30	30			
2-Chloronaphthalene	91-58-7	2.002	0.4368	ug/l	40-140	30	40-140	30	30			
1,2-Dichlorobenzene	95-50-1	2.002	0.455	ug/l	40-140	30	40-140	30	30			
1,3-Dichlorobenzene	541-73-1	2.002	0.40404	ug/l	40-140	30	40-140	30	30			
1,4-Dichlorobenzene	106-46-7	2.002	0.43316	ug/l	36-97	30	36-97	30	30			
3,3'-Dichlorobenzidine	91-94-1	5.0232	1.62344	ug/l	40-140	30	40-140	30	30			
2,4-Dinitrotoluene	121-14-2	5.0232	1.1648	ug/l	48-143	30	48-143	30	30			
2,6-Dinitrotoluene	606-20-2	5.0232	0.93184	ug/l	40-140	30	40-140	30	30			
Fluoranthene	206-44-0	2.002	0.257348	ug/l	40-140	30	40-140	30	30			
4-Chlorophenyl phenyl ether	7005-72-3	2.002	0.48776	ug/l	40-140	30	40-140	30	30			
4-Bromophenyl phenyl ether	101-55-3	2.002	0.37856	ug/l	40-140	30	40-140	30	30			
Bis(2-chloroisopropyl)ether	108-60-1	2.002	0.5278	ug/l	40-140	30	40-140	30	30			
Bis(2-chloroethoxy)methane	111-91-1	5.0232	0.50232	ug/l	40-140	30	40-140	30	30			
Hexachlorobutadiene	87-68-3	2.002	0.65884	ug/l	40-140	30	40-140	30	30			
Hexachlorocyclopentadiene	77-47-4	20.02	0.68796	ug/l	40-140	30	40-140	30	30			
Hexachloroethane	67-72-1	2.002	0.58604	ug/l	40-140	30	40-140	30	30			
Isophorone	78-59-1	5.0232	1.20484	ug/l	40-140	30	40-140	30	30			
Naphthalene	91-20-3	2.002	0.46592	ug/l	40-140	30	40-140	30	30			
Nitrobenzene	98-95-3	2.002	0.77168	ug/l	40-140	30	40-140	30	30			
NitrosoDiPhenylAmine(NDPA)/DPA	86-30-6	2.002	0.4186	ug/l	40-140	30	40-140	30	30			
n-Nitrosodi-n-propylamine	621-64-7	5.0232	0.64428	ug/l	29-132	30	29-132	30	30			
Bis(2-Ethylhexyl)phthalate	117-81-7	3.003	1.53608	ug/l	40-140	30	40-140	30	30			
Butyl benzyl phthalate	85-68-7	5.0232	1.17208	ug/l	40-140	30	40-140	30	30			
Di-n-butylphthalate	84-74-2	5.0232	0.38948	ug/l	40-140	30	40-140	30	30			
Di-n-octylphthalate	117-84-0	5.0232	1.274	ug/l	40-140	30	40-140	30	30			
Diethyl phthalate	84-66-2	5.0232	0.3822	ug/l	40-140	30	40-140	30	30			
Dimethyl phthalate	131-11-3	5.0232	1.82	ug/l	40-140	30	40-140	30	30			
Benzo(a)anthracene	56-55-3	2.002	0.32578	ug/l	40-140	30	40-140	30	30			
Benzo(a)pyrene	50-32-8	2.002	0.40768	ug/l	40-140	30	40-140	30	30			
Benzo(b)fluoranthene	205-99-2	2.002	0.355264	ug/l	40-140	30	40-140	30	30			
Benzo(k)fluoranthene	207-08-9	2.002	0.37492	ug/l	40-140	30	40-140	30	30			
Chrysene	218-01-9	2.002	0.341068	ug/l	40-140	30	40-140	30	30			
Acenaphthylene	208-96-8	2.002	0.46592	ug/l	45-123	30	45-123	30	30			
Anthracene	120-12-7	2.002	0.32942	ug/l	40-140	30	40-140	30	30			
Benzo(ghi)perylene	191-24-2	2.002	0.296296	ug/l	40-140	30	40-140	30	30			
Fluorene	86-73-7	2.002	0.41496	ug/l	40-140	30	40-140	30	30			
Phenanthrene	85-01-8	2.002	0.33124	ug/l	40-140	30	40-140	30	30			
Dibenzo(a,h)anthracene	53-70-3	2.002	0.323232	ug/l	40-140	30	40-140	30	30			
Indeno(1,2,3-cd)Pyrene	193-39-5	2.002	0.39676	ug/l	40-140	30	40-140	30	30			

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NYTCL Semivolatiles - EPA 8270D (LVI) (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 250ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Pyrene	129-00-0	2.002	0.279552	ug/l	26-127	30	26-127	30	30			
Biphenyl	92-52-4	2.002	0.45864	ug/l	40-140	30	40-140	30	30			
4-Chloroaniline	106-47-8	5.0232	1.07016	ug/l	40-140	30	40-140	30	30			
2-Nitroaniline	88-74-4	5.0232	0.49868	ug/l	52-143	30	52-143	30	30			
3-Nitroaniline	99-09-2	5.0232	0.81536	ug/l	25-145	30	25-145	30	30			
4-Nitroaniline	100-01-6	5.0232	0.8008	ug/l	51-143	30	51-143	30	30			
Dibenzofuran	132-64-9	2.002	0.49868	ug/l	40-140	30	40-140	30	30			
2-Methylnaphthalene	91-57-6	2.002	0.455	ug/l	40-140	30	40-140	30	30			
Acetophenone	98-86-2	5.0232	0.5278	ug/l	39-129	30	39-129	30	30			
2,4,6-Trichlorophenol	88-06-2	5.0232	0.61152	ug/l	30-130	30	30-130	30	30			
P-Chloro-M-Cresol	59-50-7	2.002	0.35126	ug/l	23-97	30	23-97	30	30			
2-Chlorophenol	95-57-8	2.002	0.48048	ug/l	27-123	30	27-123	30	30			
2,4-Dichlorophenol	120-83-2	5.0232	0.41132	ug/l	30-130	30	30-130	30	30			
2,4-Dimethylphenol	105-67-9	5.0232	1.77996	ug/l	30-130	30	30-130	30	30			
2-Nitrophenol	88-75-5	10.01	0.84812	ug/l	30-130	30	30-130	30	30			
4-Nitrophenol	100-02-7	10.01	0.6734	ug/l	10-80	30	10-80	30	30			
2,4-Dinitrophenol	51-28-5	20.02	6.6612	ug/l	20-130	30	20-130	30	30			
4,6-Dinitro-o-cresol	534-52-1	10.01	1.81636	ug/l	20-164	30	20-164	30	30			
Pentachlorophenol	87-86-5	10.01	1.79452	ug/l	9-103	30	9-103	30	30			
Phenol	108-95-2	5.0232	0.56784	ug/l	12-110	30	12-110	30	30			
2-Methylphenol	95-48-7	5.0232	0.4914	ug/l	30-130	30	30-130	30	30			
3-Methylphenol/4-Methylphenol	108-39-4/106-44-5	5.0232	0.48048	ug/l	30-130	30	30-130	30	30			
2,4,5-Trichlorophenol	95-95-4	5.0232	0.77532	ug/l	30-130	30	30-130	30	30			
Benzoic Acid	65-85-0	50.232	2.66084	ug/l	10-164	30	10-164	30	30			
Benzyl Alcohol	100-51-6	2.002	0.58968	ug/l	26-116	30	26-116	30	30			
Carbazole	86-74-8	2.002	0.4914	ug/l	55-144	30	55-144	30	30			
2-Fluorophenol	*367-12-4*									*21-120*		
Phenol-d6	*13127-88-3*									*10-120*		
Nitrobenzene-d5	*4165-60-0*									*23-120*		
2-Fluorobiphenyl	*321-60-8*									*15-120*		
2,4,6-Tribromophenol	*118-79-6*									*10-120*		
4-Terphenyl-d14	*1718-51-0*									*41-149*		

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METALS by 6020B (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Iron, Total	7439-89-6	0.05	0.0191	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
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WETCHEM (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Method	Holding Time	Container/Sample Preservation
Iron, Ferrous	7439-89-6	0.5	0.056	mg/l	90-110		80-120	20	20	3500Fe-B	24 hours	1 - Plastic 250ml unpreserved
Sulfide	18496-25-8	0.1	0.1	mg/l	75-125		70-130	20	20	9030B	7 days	Plastic 250ml Zn Acetate/NaOH preserv
Nitrogen, Nitrite	NONE	0.05	0.0132	mg/l	90-110		80-120	20	20	4500NO3-F	48 hours	1 - Plastic 250ml unpreserved
Nitrogen, Nitrate	14797-55-8	0.1	0.0228	mg/l	90-110		83-113	17	17	4500NO3-F	48 hours	1 - Plastic 250ml unpreserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
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Appendix F: Alpha Analytical SOP for PFAS Analysis

Determination of Selected Perfluorinated Alkyl Substances in Non-Potable Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)

Reference: EPA Method 537, Version 1.1, September 2009, EPA Document #: EPA/600/R-08/092

EPA Method 537.1, Version 1, November 2018, EPA Document #: EPA/600/R-18/352

Department of Defense, Quality Systems Manual for Environmental Laboratories, Version 5.2, 2018

1. Scope and Application

Matrices: Non-potable water

Definitions: Refer to Alpha Analytical Quality Manual.

1.1 This is a liquid chromatography/tandem mass spectrometry (LC/MS/MS) method for the determination of selected perfluorinated alkyl substances (PFASs) in Non-potable Water. Accuracy and precision data have been generated in reagent water, and finished ground and surface waters for the compounds listed in Table 1.

1.2 The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one or more of the following laboratory personnel before performing the modification: Area Supervisor, Department Supervisor, Laboratory Director, or Quality Assurance Officer.

1.3 This method is restricted to use by or under the supervision of analysts experienced in the operation of the LC/MS/MS and in the interpretation of LC/MS/MS data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

Table 1

Parameter	Acronym	CAS
Hexafluoropropylene oxide dimer acid [1]	HFPO-DA	13252-13-6
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorodecanoic acid	PFDA	335-76-2
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluorohexanoic acid	PFHxA	307-24-4

Table 1 (cont.)

Perfluorononanoic acid	PFNA	375-95-1
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorotetradecanoic acid	PFTA	376-06-7
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluoroundecanoic acid	PFUnA	2058-94-8
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4

2. Summary of Method

2.1 A 250-mL water sample is fortified with surrogates and passed through a solid phase extraction (SPE) cartridge containing polystyrenedivinylbenzene (SDVB) to extract the method analytes and surrogates. The compounds are eluted from the solid phase with a small amount of methanol. The extract is concentrated to dryness with nitrogen in a heated water bath, and then adjusted to a 1-mL volume with 96:4% (vol/vol) methanol: water after adding the IS(s). A 3µL injection is made into an LC equipped with a C18 column that is interfaced to an MS/MS. The analytes are separated and identified by comparing the acquired mass spectra and retention times to reference spectra and retention times for calibration standards acquired under identical LC/MS/MS conditions. The concentration of each analyte is determined by using the internal standard technique. Surrogate analytes are added to all Field and QC Samples to monitor the extraction efficiency of the method analytes.

2.2 Method Modifications from Reference

2.2.1 None.

3. Reporting Limits

3.1 The reporting limit for PFAS's is 2 ng/L (4ng/L for HFPO-DA).

4. Interferences

4.1 PFAS standards, extracts and samples should not come in contact with any glass containers or pipettes as these analytes can potentially adsorb to glass surfaces. PFAS analyte, IS and SUR standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers.

4.2 Method interferences may be caused by contaminants in solvents, reagents (including reagent water), sample bottles and caps, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the chromatograms. The method analytes in this method can also be found in many common laboratory supplies and equipment, such

as PTFE (polytetrafluoroethylene) products, LC solvent lines, methanol, aluminum foil, SPE sample transfer lines, etc. All items such as these must be routinely demonstrated to be free from interferences (less than 1/3 the RL for each method analyte) under the conditions of the analysis by analyzing laboratory reagent blanks as described in Section 9.2. **Subtracting blank values from sample results is not permitted.**

4.3 Matrix interferences may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the water. Humic and/or fulvic material can be co-extracted during SPE and high levels can cause enhancement and/or suppression in the electrospray ionization source or low recoveries on the SPE sorbent. Total organic carbon (TOC) is a good indicator of humic content of the sample. Under the LC conditions used during method development, matrix effects due to total organic carbon (TOC) were not observed.

4.4 Relatively large quantities of the preservative (Sect. 6.2.1) are added to sample bottles. The potential exists for trace-level organic contaminants in these reagents. Interferences from these sources should be monitored by analysis of laboratory reagent blanks (Sect. 9.2.1), particularly when new lots of reagents are acquired.

4.5 SPE cartridges can be a source of interferences. The analysis of field and laboratory reagent blanks can provide important information regarding the presence or absence of such interferences. Brands and lots of SPE devices should be tested to ensure that contamination does not preclude analyte identification and quantitation.

5. Health and Safety

5.1 The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material safety data sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

5.2 All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

5.3 PFOA has been described as “likely to be carcinogenic to humans.” Pure standard materials and stock standard solutions of these method analytes should be handled with suitable protection to skin and eyes, and care should be taken not to breathe the vapors or ingest the materials.

6. Sample Collection, Preservation, Shipping and Handling

6.1 Sample Collection

6.1.1 Samples must be collected in three (3) 250-mL high density polyethylene (HDPE) container with an unlined plastic screw cap.

6.1.2 The sample handler must wash their hands before sampling and wear nitrile gloves while filling and sealing the sample bottles. PFAS contamination during sampling can occur from a number of common sources, such as food packaging

and certain foods and beverages. Proper hand washing and wearing nitrile gloves will aid in minimizing this type of accidental contamination of the samples.

6.1.3 Open the tap and allow the system to flush until the water temperature has stabilized (approximately 3 to 5 min). Collect samples from the flowing system.

6.1.4 Fill sample bottles, taking care not to flush out the sample preservation reagent. Samples do not need to be collected headspace free.

6.1.5 After collecting the sample, cap the bottle and agitate by hand until preservative is dissolved. Keep the sample sealed from time of collection until extraction.

6.1.6 Field Reagent Blank (FRB)

6.1.6.1 A FRB must be handled along with each sample set. The sample set is composed of samples collected from the same sample site and at the same time. At the laboratory, fill the field blank sample bottle with reagent water and preservatives, seal, and ship to the sampling site along with the sample bottles. For each FRB shipped, an empty sample bottle (no preservatives) must also be shipped. At the sampling site, the sampler must open the shipped FRB and pour the preserved reagent water into the empty shipped sample bottle, seal and label this bottle as the FRB. The FRB is shipped back to the laboratory along with the samples and analyzed to ensure that PFASs were not introduced into the sample during sample collection/handling.

6.1.6.2 The same batch of preservative must be used for the FRBs as for the field samples.

6.1.6.3 The reagent water used for the FRBs must be initially analyzed for method analytes as a MB and must meet the MB criteria in Section 9.2.1 prior to use. This requirement will ensure samples are not being discarded due to contaminated reagent water rather than contamination during sampling.

6.2 Sample Preservation

6.2.1 The preservation reagent, listed in the table below, is added to each sample bottle as a solid prior to shipment to the field (or prior to sample collection).

Table 2

Compound	Amount	Purpose
Trizma	5.0 g/l	Buffering reagent and removes free chlorine

6.3 Sample Shipping

6.3.1 Samples must be chilled during shipment and must not exceed 10 °C during the first 48 hours after collection. Sample temperature must be confirmed to be at or below 10 °C when the samples are received at the laboratory. Samples stored in the lab must be held at or below 6 °C until extraction, but should not be frozen.

NOTE: Samples that are significantly above 10° C, at the time of collection, may need to be iced or refrigerated for a period of time, in order to chill them prior to shipping. This will allow them to be shipped with sufficient ice to meet the above requirements.

6.4 Sample Handling

6.4.1 Holding Times

6.4.1.1 Water samples should be extracted as soon as possible but must be extracted within 14 days. Extracts must be stored at room temperature and analyzed within 28 days after extraction.

7. Equipment and Supplies

7.1 SAMPLE CONTAINERS – 250-mL high density polyethylene (HDPE) bottles fitted with unlined screw caps. Sample bottles must be discarded after use.

7.2 POLYPROPYLENE BOTTLES – 4-mL narrow-mouth polypropylene bottles.

7.3 CENTRIFUGE TUBES – 15-mL conical polypropylene tubes with polypropylene screw caps for storing standard solutions and for collection of the extracts.

7.4 AUTOSAMPLER VIALS – Polypropylene 0.7-mL autosampler vials with polypropylene caps.

7.4.1 NOTE: Polypropylene vials and caps are necessary to prevent contamination of the sample from PTFE coated septa. However, polypropylene caps do not reseal, so evaporation occurs after injection. Thus, multiple injections from the same vial are not possible.

7.5 POLYPROPYLENE GRADUATED CYLINDERS – Suggested sizes include 25, 50, 100 and 1000-mL cylinders.

7.6 MICRO SYRINGES – Suggested sizes include 5, 10, 25, 50, 100, 250, 500 and 1000-µL syringes.

7.7 PLASTIC PIPETS – Polypropylene or polyethylene disposable pipets.

7.8 ANALYTICAL BALANCE – Capable of weighing to the nearest 0.0001 g.

7.9 SOLID PHASE EXTRACTION (SPE) APPARATUS FOR USING CARTRIDGES

7.9.1 SPE CARTRIDGES – 0.5 g, 6-mL SPE cartridges containing styrenedivinylbenzene (SDVB) sorbent phase.

7.9.2 VACUUM EXTRACTION MANIFOLD – A manual vacuum manifold with large volume sampler for cartridge extractions, or an automatic/robotic sample preparation system designed for use with SPE cartridges, may be used if all QC requirements discussed in Section 9 are met. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. Care must be taken with automated SPE systems to ensure the PTFE commonly used in these systems does not contribute to unacceptable analyte concentrations in the MB (Sect. 9.2.1).

7.9.3 SAMPLE DELIVERY SYSTEM – Use of a polypropylene transfer tube system, which transfers the sample directly from the sample container to the SPE cartridge, is recommended, but not mandatory. Standard extraction manifolds come equipped with PTFE transfer tube systems. These can be replaced with 1/8” O.D. x 1/16” I.D. polypropylene or polyethylene tubing cut to an appropriate length to ensure no sample contamination from the sample transfer lines. Other types of non-PTFE tubing may be used provided it meets the MB (Sect. 9.2.1)

and LCS (Sect. 9.3) QC requirements. The PTFE transfer tubes may be used, but an MB must be run on each PFTE transfer tube and the QC requirements in Section 13.2.2 must be met. In the case of automated SPE, the removal of PTFE lines may not be feasible; therefore, MBs will need to be rotated among the ports and must meet the QC requirements of Sections 13.2.2 and 9.2.1.

7.10 EXTRACT CONCENTRATION SYSTEM – Extracts are concentrated by evaporation with nitrogen using a water bath set no higher than 65 °C.

7.11 LABORATORY OR ASPIRATOR VACUUM SYSTEM – Sufficient capacity to maintain a vacuum of approximately 10 to 15 inches of mercury for extraction cartridges.

7.12 LIQUID CHROMATOGRAPHY (LC)/TANDEM MASS SPECTROMETER (MS/MS) WITH DATA SYSTEM

7.12.1 LC SYSTEM – Instrument capable of reproducibly injecting up to 10-µL aliquots, and performing binary linear gradients at a constant flow rate near the flow rate used for development of this method (0.3 mL/min). The LC must be capable of pumping the water/methanol mobile phase without the use of a degasser which pulls vacuum on the mobile phase bottle (other types of degassers are acceptable). Degassers which pull vacuum on the mobile phase bottle will volatilize the ammonium acetate mobile phase causing the analyte peaks to shift to earlier retention times over the course of the analysis batch. The usage of a column heater is optional.

NOTE: During the course of method development, it was discovered that while idle for more than one day, PFASs built up in the PTFE solvent transfer lines. To prevent long delays in purging high levels of PFASs from the LC solvent lines, they were replaced with PEEK tubing and the PTFE solvent frits were replaced with stainless steel frits. It is not possible to remove all PFAS background contamination, but these measures help to minimize their background levels.

7.12.2 LC/TANDEM MASS SPECTROMETER – The LC/MS/MS must be capable of negative ion electrospray ionization (ESI) near the suggested LC flow rate of 0.3 mL/min. The system must be capable of performing MS/MS to produce unique product ions for the method analytes within specified retention time segments. A minimum of 10 scans across the chromatographic peak is required to ensure adequate precision.

7.12.3 DATA SYSTEM – An interfaced data system is required to acquire, store, reduce, and output mass spectral data. The computer software should have the capability of processing stored LC/MS/MS data by recognizing an LC peak within any given retention time window. The software must allow integration of the ion abundance of any specific ion within specified time or scan number limits. The software must be able to calculate relative response factors, construct linear regressions or quadratic calibration curves, and calculate analyte concentrations.

7.12.4 ANALYTICAL COLUMN – An LC C_{18} column (2.1 x 150 mm) packed with 5 µm d_p C_{18} solid phase particles was used. Any column that provides adequate resolution, peak shape, capacity, accuracy, and precision (Sect. 9) may be used.

8. Reagents and Standards

8.1 GASES, REAGENTS, AND SOLVENTS – Reagent grade or better chemicals should be used.

8.1.1 REAGENT WATER – Purified water which does not contain any measurable quantities of any method analytes or interfering compounds greater than 1/3 the RL for each method analyte of interest. Prior to daily use, at least 3 L of reagent water should be flushed from the purification system to rinse out any build-up of analytes in the system's tubing.

8.1.2 METHANOL (CH_3OH, CAS#: 67-56-1) – High purity, demonstrated to be free of analytes and interferences.

8.1.3 AMMONIUM ACETATE ($NH_4C_2H_3O_2$, CAS#: 631-61-8) – High purity, demonstrated to be free of analytes and interferences.

8.1.4 2 mM AMMONIUM ACETATE/REAGENT WATER – To prepare 1 L, add .154 g ammonium acetate to 1 L of reagent water. This solution is prone to volatility losses and should be replaced at least every 48 hours.

8.1.5 TRIZMA PRESET CRYSTALS, pH 7.0 – Reagent grade. A premixed blend of Tris [Tris(hydroxymethyl)aminomethane] and Tris HCL [Tris(hydroxymethyl)aminomethane hydrochloride]. Alternatively, a mix of the two components with a weight ratio of 15.5/1 Tris HCL/Tris may be used. These blends are targeted to produce a pH near 7.0 at 25 °C in reagent water. Trizma functions as a buffer, and removes free chlorine in chlorinated finished waters (Sect. 6.2.1).

8.1.6 NITROGEN – Used for the following purposes: Nitrogen aids in aerosol generation of the ESI liquid spray and is used as collision gas in some MS/MS instruments. The nitrogen used should meet or exceed instrument manufacturer's specifications. In addition, Nitrogen is used to concentrate sample extracts (Ultra High Purity or equivalent).

8.1.7 ARGON – Used as collision gas in MS/MS instruments. Argon should meet or exceed instrument manufacturer's specifications. Nitrogen gas may be used as the collision gas provided sufficient sensitivity (product ion formation) is achieved.

8.2 STANDARD SOLUTIONS – When a compound purity is assayed to be 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard. PFAS analyte, IS and SUR standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers. Standards for sample fortification generally should be prepared in the smallest volume that can be accurately measured to minimize the addition of excess organic solvent to aqueous samples.

NOTE: Stock standards (Sect. 8.2.1, 8.2.3 and 8.2.5) are stored at ≤4 °C. Primary dilution standards (Sect. 8.2.2 and 8.2.4) are stored at room temperature to prevent adsorption of the method analytes onto the container surfaces that may occur when refrigerated. Storing the standards at room temperature will also minimize daily imprecision due to the potential of inadequate room temperature stabilization.

8.2.1 IS STOCK STANDARD SOLUTIONS - IS stock standard solutions are stable for at least 6 months when stored at 4 °C. The stock solution is purchased at a concentration range of 1-4 ng/µl.

8.2.2 INTERNAL STANDARD PRIMARY DILUTION (IS PDS) STANDARD (0.5-2 ng/µL) – Prepare the IS PDS at a concentration of 0.5-2 ng/µL. The IS PDS is prepared in 96:4% (vol/vol) methanol:water. The IS PDS is stable for at least two months when stored in polypropylene centrifuge tubes at room temperature.

Table 3

Internal Standard	Conc. of IS Stock (ng/uL)	Vol. of IS Stock (mL)	Final Vol. of IS PDS (mL)	Final Conc. of IS PDS (ng/µL)
^{13}C-PFOA	1	1.0	2.0	0.5
^{13}C-PFOS	3	1.0	2.0	1.5
d_3-NMeFOSAA	4	1.0	2.0	2.0

8.2.3 SUR STOCK STANDARD SOLUTIONS – SUR stock standard solutions are stable for at least 6 months when stored at 4 °C.

8.2.4 SURROGATE PRIMARY DILUTION STANDARD (SUR PDS) (0.5-2 ng/µL) – Prepare the SUR PDS at a concentration of 0.5-2 ng/µL. The SUR PDS is prepared in 96:4% (vol/vol) methanol:water. This solution is used to fortify all QC and Field Samples. The PDS is stable for one year when stored in polypropylene centrifuge tubes at room temperature.

Table 4

Surrogate	Conc. of SUR Stock (ng/µL)	Vol. of SUR Stock (mL)	Final Vol. of SUR PDS (,L)	Final Conc. of SUR PDS (ng/µL)
^{13}C-PFHxA	1.0	1.0	2.0	0.5
^{13}C-PFDA	1.0	1.0	2.0	0.5
d_5-NEtFOSAA	4.0	1.0	2.0	2.0
Tetrafluoro-2-heptafluoropropoxy-13C3-propanoic acid[1]	50	1.0	2.0	0.5

[1] EPA 537.1 Surrogate only

8.2.5 ANALYTE STOCK STANDARD SOLUTION – Analyte stock standards are stable for at least 6 months when stored at -15 °C. When using these stock standards to prepare a PDS, care must be taken to ensure that these standards are at room temperature and adequately vortexed.

Table 5

Analyte	Analyte Stock Solvent	Concentration (ug/mL)
PFHxA	100% methanol	1.0
PFHpA	100% methanol	1.0
PFOA	100% methanol	1.0
PFNA	100% methanol	1.0
PFDA	100% methanol	1.0
PFUnA	100% methanol	1.0
PFDoA	100% methanol	1.0
PFTrDA	100% methanol	1.0
PFTA	100% methanol	1.0
PFBS	100% methanol	1.0

Table 5 (cont.)

Analyte	Analyte Stock Solvent	Concentration (ug/mL)
PFHxS	100% methanol	1.0
PFOS	100% methanol	1.0
NEtFOSAA	100% methanol	1.0
NMeFOSAA	100% methanol	1.0
HFPO-DA	100% methanol	50.0
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	100% methanol	50.0
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	100% methanol	50.0
4,8-dioxa-3H-perfluorononanoic acid	100% methanol	50.0

8.2.6 LOW, MEDIUM AND HIGH LEVEL LCS – The LCS's will be prepared at the following concentrations and rotated per batch; 2 ng/L, 40 ng/L, 500 ng/l. The analyte PDS contains all the method analytes of interest at various concentrations in methanol containing 4% water. The analyte PDS has been shown to be stable for 6 months when stored at room temperature.

8.2.7 CALIBRATION STANDARDS (CAL) –

Current Concentrations (ng/mL): 0.5, 1.0, 5.0, 10.0, 50.0, 125 and 150 (optional)

Prepare the CAL standards over the concentration range of interest from dilutions of the analyte PDS in methanol containing 4% reagent water. The IS and SUR are added to the CAL standards at a constant concentration (10-40 ng/L). The lowest concentration CAL standard must be at or below the RL (2 ng/L), which may depend on system sensitivity. The CAL standards may also be used as CCVs (Sect. 9.9). The CAL standards are stable for at least two weeks when stored at room temperature. Longer storage times are acceptable provided appropriate QC measures are documented demonstrating the CAL standard stability.

9. Quality Control

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

9.1 REPORTING LIMIT (RL) CONFIRMATION

9.1.1 Fortify, extract, and analyze seven replicate LCSs at 2 ng/l. These LCSs must contain all method preservatives described in Section 6.2.1. Calculate the mean measured concentration (*Mean*) and standard deviation for these replicates. Determine the Half Range for the prediction interval of results (HR_{PIR}) using the equation below

$$HR_{PIR} = 3.963s$$

Where:

s = the standard deviation
3.963 = a constant value for seven replicates.

9.1.2 Confirm that the upper and lower limits for the Prediction Interval of Result (*PIR* = *Mean* ± HR_{PIR}) meet the upper and lower recovery limits as shown below

The Upper PIR Limit must be ≤150% recovery.

$$\frac{Mean + HR_{PIR}}{Fortified\ Concentration} \times 100\% \leq 150\%$$

The Lower PIR Limit must be ≥ 50% recovery.

$$\frac{Mean - HR_{PIR}}{Fortified\ Concentration} \times 100\% \geq 50\%$$

9.1.3 The RL is validated if both the Upper and Lower PIR Limits meet the criteria described above. If these criteria are not met, the RL has been set too low and must be determined again at a higher concentration.

9.2 Blank(s)

9.2.1 **METHOD BLANK (MB) -** A Method Blank (MB) is required with each extraction batch to confirm that potential background contaminants are not interfering with the identification or quantitation of method analytes. If more than 20 Field Samples are included in a batch, analyze an MB for every 20 samples. If the MB produces a peak within the retention time window of any analyte that would prevent the determination of that analyte, determine the source of contamination and eliminate the interference before processing samples. Background contamination must be reduced to an acceptable level before proceeding. Background from method analytes or other contaminants that interfere with the measurement of method analytes must be below 1/3 of the RL. Blank contamination is estimated by extrapolation, if the concentration is below the lowest CAL standard. This extrapolation procedure is not allowed for sample results as it may not meet data quality objectives. If the method analytes are detected in the MB at concentrations equal to or greater than this level, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch. Because background contamination is a significant problem for several method analytes, it is highly recommended that the analyst maintain a historical record of MB data.

9.2.2 **FIELD REAGENT BLANK (FRB)** - The purpose of the FRB is to ensure that PFASs measured in the Field Samples were not inadvertently introduced into the sample during sample collection/handling. Analysis of the FRB is required only if a Field Sample contains a method analyte or analytes at or above the RL. The FRB is processed, extracted and analyzed in exactly the same manner as a Field Sample. If the method analyte(s) found in the Field Sample is present in the FRB at a concentration greater than 1/3 the RL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed.

9.3 Laboratory Control Sample (LCS)

9.3.1 An LCS is required with each extraction batch. The fortified concentration of the LCS must be rotated between low, medium, and high concentrations from batch to batch.

9.3.2 The low concentration LCS must be as near as practical to, but no more than two times, the RL. Similarly, the high concentration LCS should be near the high end of the calibration range established during the initial calibration (Sect. 10.6).

9.3.3 Results of the low-level LCS analyses must be 50-150% of the true value. Results of the medium and high-level LCS analyses must be 70-130% of the true value. If the LCS results do not meet these criteria for method analytes, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch.

9.3.4 It is the responsibility of the extraction chemist to view the previous extraction batch to determine the next spiking concentration. (Low → Medium → High)

9.4 Internal Standards (IS)

The analyst must monitor the peak areas of the IS(s) in all injections during each analysis day. The IS responses (peak areas) in any chromatographic run must be within 70-140% of the response in the most recent CCV and must not deviate by more than 50% from the average area measured during initial analyte calibration. If the IS areas in a chromatographic run do not meet these criteria, inject a second aliquot of that extract aliquoted into a new capped autosampler vial. Random evaporation losses have been observed with the polypropylene caps causing high IS(s) areas.

9.4.1 If the reinjected aliquot produces an acceptable IS response, report results for that aliquot.

9.4.2 If the reinjected extract fails again, the analyst should check the calibration by reanalyzing the most recently acceptable CAL standard. If the CAL standard fails the criteria of Section 9.9, recalibration is in order per Section 10.6. If the CAL standard is acceptable, extraction of the sample may need to be repeated provided the sample is still within the holding time. Otherwise, report results obtained from the reinjected extract, but annotate as suspect. Alternatively, collect a new sample and re-analyze.

9.5 Surrogate Recovery

The SUR standard is fortified into all samples, CCVs, MBs, LCSs, MSs, MSDs, FD, and FRB prior to extraction. It is also added to the CAL standards. The SUR is a means of assessing method performance from extraction to final chromatographic measurement. Calculate the recovery (%R) for the SUR using the following equation

$$\%R = (A / B) \times 100$$

Where:

A = calculated SUR concentration for the QC or Field Sample
B = fortified concentration of the SUR.

9.5.1.1 SUR recovery must be in the range of 70-130%. When SUR recovery from a sample, blank, or CCV is less than 70% or greater than 130%, check 1) calculations to locate possible errors, 2) standard solutions for degradation, 3) contamination, and 4) instrument performance. Correct the problem and reanalyze the extract.

9.5.1.2 If the extract reanalysis meets the SUR recovery criterion, report only data for the reanalyzed extract.

9.5.1.3 If the extract reanalysis fails the 70-130% recovery criterion, the analyst should check the calibration by injecting the last CAL standard that passed. If the CAL standard fails the criteria of Section 10.7, recalibration is in order per Section 10.6. If the CAL standard is acceptable, extraction of the sample should be repeated provided the sample is still within the holding time. If the re-extracted sample also fails the recovery criterion, report all data for that sample as suspect/SUR recovery to inform the data user that the results are suspect due to SUR recovery. Alternatively, collect a new sample and re-analyze.

9.6 Matrix Spike (MS)

9.6.1 Analysis of an MS is required in each extraction batch and is used to determine that the sample matrix does not adversely affect method accuracy. Assessment of method precision is accomplished by analysis of a Field Duplicate (FD) (Sect. 9.7); however, infrequent occurrence of method analytes would hinder this assessment. If the occurrence of method analytes in the samples is infrequent, or if historical trends are unavailable, a second MS, or MSD, must be prepared, extracted, and analyzed from a duplicate of the Field Sample. Extraction batches that contain MSDs will not require the extraction of a field sample duplicate. If a variety of different sample matrices are analyzed regularly, for example, groundwater and surface water sources, method performance should be established for each. Over time, MS data should be documented by the laboratory for all routine sample sources.

9.6.2 Within each extraction batch, a minimum of one Field Sample is fortified as an MS for every 20 Field Samples analyzed. The MS is prepared by spiking a sample with an appropriate amount of the Analyte Stock Standard (Sect. 8.2.5). Use historical data and rotate through the low, mid and high concentrations when selecting a fortifying concentration. Calculate the percent recovery (%*R*) for each analyte using the equation

$$\%R = \frac{(A - B)}{C} \times 100$$

Where:

A = measured concentration in the fortified sample
B = measured concentration in the unfortified sample
C = fortification concentration.

9.6.3 Analyte recoveries may exhibit matrix bias. For samples fortified at or above their native concentration, recoveries should range between 70-130%, except for low-level fortification near or at the RL (within a factor of 2-times the RL concentration) where 50-150% recoveries are acceptable. If the accuracy of any analyte falls outside the designated range, and the laboratory performance for

that analyte is shown to be in control in the CCVs, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.7 Laboratory Duplicate

9.7.1 FIELD DUPLICATE OR LABORATORY FORTIFIED SAMPLE MATRIX DUPLICATE (FD or MSD) – Within each extraction batch (not to exceed 20 Field Samples), a minimum of one FD or MSD must be analyzed. Duplicates check the precision associated with sample collection, preservation, storage, and laboratory procedures. If method analytes are not routinely observed in Field Samples, an MSD should be analyzed rather than an FD.

9.7.2 Calculate the relative percent difference (*RPD*) for duplicate measurements (*FD1* and *FD2*) using the equation

$$RPD = \frac{|FD1 - FD2|}{(FD1 + FD2) / 2} \times 100$$

9.7.3 RPDs for FDs should be ≤30%. Greater variability may be observed when FDs have analyte concentrations that are within a factor of 2 of the RL. At these concentrations, FDs should have RPDs that are ≤50%. If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the CCV, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.7.4 If an MSD is analyzed instead of a FD, calculate the relative percent difference (RPD) for duplicate MSs (MS and MSD) using the equation

$$RPD = \frac{|MS - MSD|}{(MS + MSD) / 2} \times 100$$

9.7.5 RPDs for duplicate MSs should be ≤30% for samples fortified at or above their native concentration. Greater variability may be observed when MSs are fortified at analyte concentrations that are within a factor of 2 of the RL. MSs fortified at these concentrations should have RPDs that are ≤50% for samples fortified at or above their native concentration. If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the CCV, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.8 Initial Calibration Verification (ICV)

9.8.1 As part of the IDC (Sect. 13.2), each time a new Analyte Stock Standard solution (Sect. 8.2.5) is used, and at least quarterly, analyze a QCS sample from a source different from the source of the CAL standards. If a second vendor is not available, then a different lot of the standard should be used. The QCS should be prepared and analyzed just like a CCV. Acceptance criteria for the QCS are identical to the CCVs; the calculated amount for each analyte must be ± 30% of the expected value. If measured analyte concentrations are not of acceptable

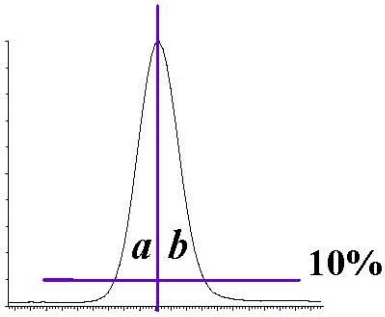
accuracy, check the entire analytical procedure to locate and correct the problem.

9.9 Continuing Calibration Verification (CCV)

9.9.1 CCV Standards are analyzed at the beginning of each analysis batch, after every 10 Field Samples, and at the end of the analysis batch. See Section 10.7 for concentration requirements and acceptance criteria.

9.10 Method-specific Quality Control Samples

9.10.1 PEAK ASYMMETRY FACTOR – A peak asymmetry factor must be calculated using the equation below during the IDL and every time a calibration curve is generated. The peak asymmetry factor for the first two eluting peaks in a midlevel CAL standard (if only two analytes are being analyzed, both must be evaluated) must fall in the range of 0.8 to 1.5. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted. See guidance in Section 10.6.4.1 if the calculated peak asymmetry factors do not meet the criteria.



$$A_s = b / a$$

Where:

A_s = peak asymmetry factor
b = width of the back half of the peak measured (at 10% peak height) from the trailing edge of the peak to a line dropped perpendicularly from the peak apex
a = the width of the front half of the peak measured (at 10% peak height) from the leading edge of the peak to a line dropped perpendicularly from the apex.

9.11 Method Sequence

ICV

CCV-LOW

MB

LCS

LCSD

MS

Duplicate or MSD

Field Samples (1-10)

CCV-MID

Field Samples (11-20)

CCV-HIGH

10. Procedure

10.1 Equipment Set-up

10.1.1 This procedure may be performed manually or in an automated mode using a robotic or automatic sample preparation device. If an automated system is used to prepare samples, follow the manufacturer's operating instructions, but all extraction and elution steps must be the same as in the manual procedure. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. If an automated system is used, the MBs should be rotated among the ports to ensure that all the valves and tubing meet the MB requirements (Sect. 9.2).

10.1.2 Some of the PFASs adsorb to surfaces, including polypropylene. Therefore, the aqueous sample bottles must be rinsed with the elution solvent (Sect 10.3.4) whether extractions are performed manually or by automation. The bottle rinse is passed through the cartridge to elute the method analytes and is then collected (Sect. 10.3.4).

10.1.3 **NOTE:** The SPE cartridges and sample bottles described in this section are designed as single use items and should be discarded after use. They may not be refurbished for reuse in subsequent analyses.

10.2 Sample Preparation

10.2.1 Samples are preserved, collected and stored as presented in Section 6. All Field and QC Samples, including the MB, LCS and FRB, must contain the dechlorinating agent listed in Section 6.2.1. Determine sample volume. An indirect measurement may be done in one of two ways: by marking the level of the sample on the bottle or by weighing the sample and bottle to the nearest 10 g. After extraction, proceed to Section 10.5 for final volume determination. Some of the PFASs adsorb to surfaces, thus the sample volume may **NOT** be transferred to a graduated cylinder for volume measurement. The MB, LCS and FRB may be prepared by measuring 250 mL of reagent water with a polypropylene graduated cylinder or filling a 250-mL sample bottle to near the top.

The entire sample that is received must be sent through the SPE cartridge. In addition, the bottle must be solvent rinsed and this rinse must be sent through the SPE cartridge as well. The method blank (MB) and laboratory control sample (LCS) must be extracted in exactly the same manner (i.e., must include the bottle solvent rinse). It should be noted that a water rinse alone is not sufficient. This does not apply to samples with high concentrations of PFAS that are prepared using serial dilution and not SPE.

10.2.2 Add 20 µL of the SUR PDS (Sect. 8.2.4) to each sample, cap and invert to mix for a final concentration of 10 ng/L for ^{13}C-PFHxA and ^{13}C-PFDA and 40 ng/L for d_5-NEtFOSAA.

10.2.3 In addition to the SUR(s) and dechlorination agent, if the sample is an LCS, MS, or MSD, add the necessary amount of analyte PDS (Sect. 8.2.5). Cap and invert each sample to mix.

10.3 Cartridge SPE Procedure

10.3.1 CARTRIDGE CLEAN-UP AND CONDITIONING – DO NOT allow cartridge packing material to go dry during any of the conditioning steps. Rinse each cartridge with 15 mL of methanol. Next, rinse each cartridge with 18 mL of reagent water, without allowing the water to drop below the top edge of the packing. If the cartridge goes dry during the conditioning phase, the conditioning must be started over. Add 4-5 mL of reagent water to each cartridge, attach the sample transfer tubes (Sect. 7.2.3), turn on the vacuum, and begin adding sample to the cartridge.

10.3.2 SAMPLE EXTRACTON – Adjust the vacuum so that the approximate flow rate is 10-15 mL/min. Do not allow the cartridge to go dry before all the sample has passed through.

10.3.3 SAMPLE BOTTLE AND CARTRIDGE RINSE – After the entire sample has passed through the cartridge, rinse the sample bottles with two 7.5-mL aliquots of reagent water and draw each aliquot through the sample transfer tubes and the cartridges. Draw air or nitrogen through the cartridge for 5 min at high vacuum (10-15 in. Hg).

NOTE: If empty plastic reservoirs are used in place of the sample transfer tubes to pass the samples through the cartridges, these reservoirs must be treated like the transfer tubes. After the entire sample has passed through the cartridge, the reservoirs must be rinsed to waste with reagent water.

10.3.4 SAMPLE BOTTLE AND CARTRIDGE ELUTION – Turn off and release the vacuum. Lift the extraction manifold top and insert a rack with collection tubes into the extraction tank to collect the extracts as they are eluted from the cartridges. Rinse the sample bottles with 4 mL of methanol and elute the analytes from the cartridges by pulling the 4 mL of methanol through the sample transfer tubes and the cartridges. Use a low vacuum such that the solvent exits the cartridge in a dropwise fashion. Repeat sample bottle rinse and cartridge elution with a second 4-mL aliquot of methanol.

NOTE: If empty plastic reservoirs are used in place of the sample transfer tubes to pass the samples through the cartridges, these reservoirs must be treated like the transfer tubes. After the reservoirs have been rinsed in Section 10.3.3, the elution solvent used to rinse the sample bottles must be swirled down the sides of the reservoirs while eluting the cartridge to ensure that any method analytes on the surface of the reservoirs are transferred to the extract.

10.4 Extract Concentration

10.4.1 Concentrate the extract to dryness under a gentle stream of nitrogen in a heated water bath (60-65 °C) to remove all the water/methanol mix. Add the appropriate amount of 96:4% (vol/vol) methanol:water solution and the IS PDS (Sect. 8.2.2) to the collection vial to bring the volume to 1 mL and vortex. Transfer a small aliquot with a plastic pipet (Sect. 7.6) to a polypropylene autosampler vial.

NOTE: It is recommend that the entire 1-mL aliquot not be transferred to the autosampler vial because the polypropylene autosampler caps do not reseal after injection. Therefore, do not store the extracts in the autosampler vials as evaporation losses can occur occasionally in these

autosampler vials. Extracts can be stored in 15-mL centrifuge tubes (Sect. 7.3).

10.5 Sample Volume Determination

10.5.1 If the level of the sample was marked on the sample bottle, use a graduated cylinder to measure the volume of water required to fill the original sample bottle to the mark made prior to extraction. Determine to the nearest 10 mL. If using weight to determine volume, weigh the empty bottle to the nearest 10 g and determine the sample weight by subtraction of the empty bottle weight from the original sample weight (Sect. 10.2.1). Assume a sample density of 1.0 g/mL. In either case, the sample volume will be used in the final calculations of the analyte concentration (Sect. 11.2).

10.6 Initial Calibration - Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed. After the initial calibration is successful, a CCV is required at the beginning and end of each period in which analyses are performed, and after every tenth Field Sample.

10.6.1 ESI-MS/MS TUNE

10.6.1.1 Calibrate the mass scale of the MS with the calibration compounds and procedures prescribed by the manufacturer.

10.6.1.2 Optimize the [M-H]- for each method analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (approximately 0.3 mL/min). This tune can be done on a mix of the method analytes. The MS parameters (voltages, temperatures, gas flows, etc.) are varied until optimal analyte responses are determined. The method analytes may have different optima requiring some compromise between the optima.

10.6.1.3 Optimize the product ion for each analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (approximately 0.4 mL/min). This tune can be done on a mix of the method analytes. The MS/MS parameters (collision gas pressure, collision energy, etc.) are varied until optimal analyte responses are determined. Typically, the carboxylic acids have very similar MS/MS conditions and the sulfonic acids have similar MS/MS conditions.

10.6.2 Establish LC operating parameters that optimize resolution and peak shape. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted.

Cautions: LC system components, as well as the mobile phase constituents, contain many of the method analytes in this method. Thus, these PFASs will build up on the head of the LC column during mobile phase equilibration. To minimize the background PFAS peaks and to keep background levels constant, the time the LC column sits at initial conditions must be kept constant and as short as possible (while ensuring reproducible retention times). In addition, prior to daily use, flush the column with 100% methanol for at least 20 min before initiating a sequence. It may be necessary on some systems to flush other LC components such as wash

syringes, sample needles or any other system components before daily use.

Mobile phase modifiers other than 20 mM ammonium acetate may be used at the discretion of the analyst, provided that the retention time stability criteria in Sect. 10.9.2 can be met over a period of two weeks. During method development, retention times shifted to shorter and shorter times as days progressed when mobile phases with less than 20 mM ammonium acetate were used.

10.6.3 Inject a mid-level CAL standard under LC/MS conditions to obtain the retention times of each method analyte. If analyzing for PFTA, ensure that the LC conditions are adequate to prevent co-elution of PFTA and the mobile phase interferants. These interferants have the same precursor and products ions as PFTA, and under faster LC conditions may co-elute with PFTA. Divide the chromatogram into retention time windows each of which contains one or more chromatographic peaks. During MS/MS analysis, fragment a small number of selected precursor ions ([M-H]-) for the analytes in each window and choose the most abundant product ion. For maximum sensitivity, small mass windows of ±0.5 daltons around the product ion mass were used for quantitation. If sufficient sensitivity exists to meet the RL, wider mass ranges may be used to obtain more confirmation ions.

10.6.3.1 As recommended by the EPA Advisory on September 2016, both linear and branched isomers should be included in the quantitation. NOTE: As the NOTE in Section 10.6.4.1 indicates, PFOS has linear and branched isomers. There have been reports that not all the products ions in the linear PFOS are produced in all the branched PFOS isomers. (This phenomenon probably exists for PFHxS and PFBS also, although it has not been studied to date.) Thus, in an attempt to reduce PFOS bias, it is required that the *m/z* 499 → *m/z* 80 transition be used as the quantitation transition. Some MS/MS instruments, such as conventional ion traps, may not be able to scan a product ion with such a wide mass difference from the precursor ion; therefore, they may not be used for this method if PFOS, PFBS, or PFHxS analysis is to be conducted. Literature reports indicate for the most abundant PFOS isomer, which is the linear isomer, that all the products ions obtained on an ion trap have less than 10% relative abundance. In addition, there is not a single ion trap MS/MS transition that encompasses the linear isomer and the majority of the branch isomers; thus, the bias would be unacceptably high.

10.6.4 Inject a mid-level CAL standard under optimized LC/MS/MS conditions to ensure that each method analyte is observed in its MS/MS window and that there are at least 10 scans across the peak for optimum precision.

10.6.4.1 If broad, split or fronting peaks are observed for the first two eluting chromatographic peaks (if only two analytes are being analyzed, both must be evaluated), change the initial mobile phase conditions to higher aqueous content until the peak asymmetry ratio for each peak is 0.8 – 1.5. The peak asymmetry factor is calculated as described in Section 9.10.1 on a mid-level CAL standard. The peak asymmetry factor must meet the above criteria for the first two eluting peaks during the IDL and every time a new calibration curve is generated. Modifying the standard

or extract composition to more aqueous content to prevent poor shape is not permitted.

NOTE: PFHxS, PFOS, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 5 due to chromatographic resolution of the linear and branched isomers of these compounds. According to the EPA Advisory, September 2016, the branched isomers are identified by analyzing a qualitative/semi-qualitative mixed PFOA standard and the quantitation of PFOA is accomplished by integration the total response which includes peaks identified as linear and branched isomers. Most PFASs are produced by two different processes. One process gives rise to linear PFASs only while the other process produces both linear and branched isomers. Thus, both branched and linear PFASs can potentially be found in the environment. For the aforementioned compounds that give rise to more than one peak, all the chromatographic peaks observed in the standard must be integrated and the areas totaled. Chromatographic peaks in a sample must be integrated in the same way as the CAL standard.

10.6.5 Prepare a set of CAL standards as described in Section 8.2.7. The lowest concentration CAL standard must be at or below the RL (2 ng/L), which may depend on system sensitivity. It is recommended that at least four of the CAL standards are at a concentration greater than or equal to the RL.

10.6.6 The LC/MS/MS system is calibrated using the IS technique. Use the LC/MS/MS data system software to generate a linear regression or quadratic calibration curve for each of the analytes. This curve **must always** be forced through zero and may be concentration weighted, if necessary. Forcing zero allows for a better estimate of the background levels of method analytes.

10.6.6.1 The isotopically labeled IS(s) in this method may undergo suppression in the ESI source if the concentration of the co-eluting unlabeled method analyte(s) is too high. The analyte concentration at which suppression may occur can vary depending on the instrument, LC conditions, ESI conditions, IS concentration, etc. To evaluate whether suppression is occurring during calibration, calculate the relative percent difference (*RPD*) between the high (H) and low (L) areas for each IS using the equation

$$RPD = \frac{(H - L)}{(H + L) / 2} \times 100$$

10.6.6.2 The RPD calculated above must be <20% for each IS during calibration. If the calculated RPD is >20% for any IS, the analyst must recalibrate at lower analyte concentrations until the IS RPDs are <20%.

10.6.7 CALIBRATION ACCEPTANCE CRITERIA – When quantitated using the initial calibration curve, each calibration point, except the lowest point, for each analyte should calculate to be within 70-130% of its true value. The lowest CAL point should calculate to be within 50-150% of its true value. If these criteria cannot be met, the analyst will have difficulty meeting ongoing QC criteria. It is recommended that corrective action is taken to reanalyze the CAL standards, restrict the range of calibration, or select an alternate method of calibration (forcing the curve through zero is still required).

10.6.7.1 CAUTION: When acquiring MS/MS data, LC operating conditions must be carefully reproduced for each analysis to provide reproducible retention times. If this is not done, the correct ions will not be monitored at the appropriate times. As a precautionary measure, the chromatographic peaks in each window must not elute too close to the edge of the segment time window.

10.7 CONTINUING CALIBRATION CHECK (CCV) – Minimum daily calibration verification is as follows. Verify the initial calibration at the beginning and end of each group of analyses, and after every tenth sample during analyses. In this context, a "sample" is considered to be a Field Sample. MBs, CCVs, LCSs, MSs, FDs FRBs and MSDs are not counted as samples. The beginning CCV of each analysis batch must be at or below the RL in order to verify instrument sensitivity prior to any analyses. If standards have been prepared such that all low CAL points are not in the same CAL solution, it may be necessary to analyze two CAL standards to meet this requirement. Alternatively, the analyte concentrations in the analyte PDS may be customized to meet this criterion. Subsequent CCVs should alternate between a medium and high concentration CAL standard.

10.7.1 Inject an aliquot of the appropriate concentration CAL standard and analyze with the same conditions used during the initial calibration.

10.7.2 Determine that the absolute areas of the quantitation ions of the IS(s) are within 70-140% of the areas measured in the most recent continuing calibration check, and within 50-150% from the average areas measured during initial calibration. If any of the IS areas has changed by more than these amounts, adjustments must be made to restore system sensitivity. These adjustments may include cleaning of the MS ion source, or other maintenance as indicated in Section 10.7.4. Major instrument maintenance requires recalibration (Sect 10.6) and verification of sensitivity by analyzing a CCV at or below the RL (Sect 10.7). Control charts are useful aids in documenting system sensitivity changes.

10.7.3 Calculate the concentration of each analyte and SUR in the CCV. The calculated amount for each analyte and SUR for medium and high level CCVs must be within ± 30% of the true value. The calculated amount for the lowest calibration point for each analyte must be within ± 50% and the SUR must be within ± 30% of the true value. If these conditions do not exist, then all data for the problem analyte must be considered invalid, and remedial action should be taken (Sect. 10.7.4) which may require recalibration. Any Field or QC Samples that have been analyzed since the last acceptable calibration verification should be reanalyzed after adequate calibration has been restored, with the following exception. **If the CCV fails because the calculated concentration is greater than 130% (150% for the low-level CCV) for a particular method analyte, and Field Sample extracts show no detection for that method analyte, non-detects may be reported without re-analysis.**

10.7.4 REMEDIAL ACTION – Failure to meet CCV QC performance criteria may require remedial action. Major maintenance, such as cleaning the electrospray probe, atmospheric pressure ionization source, cleaning the mass analyzer, replacing the LC column, etc., requires recalibration (Sect 10.6) and verification of sensitivity by analyzing a CCV at or below the RL (Sect 10.7).

10.8 EXTRACT ANALYSIS

10.8.1 Establish operating conditions equivalent to those summarized in Tables 5-8 of Section 16. Instrument conditions and columns should be optimized prior to the initiation of the IDC.

10.8.2 Establish an appropriate retention time window for each analyte. This should be based on measurements of actual retention time variation for each method analyte in CAL standard solutions analyzed on the LC over the course of time. A value of plus or minus three times the standard deviation of the retention time obtained for each method analyte while establishing the initial calibration and completing the IDC can be used to calculate a suggested window size. However, the experience of the analyst should weigh heavily on the determination of the appropriate retention window size.

10.8.3 Calibrate the system by either the analysis of a calibration curve (Sect. 10.6) or by confirming the initial calibration is still valid by analyzing a CCV as described in Section 10.7. If establishing an initial calibration, complete the IDC as described in Section 13.2.

10.8.4 Begin analyzing Field Samples, including QC samples, at their appropriate frequency by injecting the same size aliquots, under the same conditions used to analyze the CAL standards.

10.8.5 At the conclusion of data acquisition, use the same software that was used in the calibration procedure to identify peaks of interest in predetermined retention time windows. Use the data system software to examine the ion abundances of the peaks in the chromatogram. Identify an analyte by comparison of its retention time with that of the corresponding method analyte peak in a reference standard.

10.8.6 Comparison of the MS/MS mass spectra is not particularly useful given the limited ±0.5 dalton mass range around a single product ion for each method analyte.

10.8.7 The analyst must not extrapolate beyond the established calibration range. If an analyte peak area exceeds the range of the initial calibration curve, the extract may be diluted with 96%:4% vol/vol) methanol:water solution and the appropriate amount of IS added to match the original concentration. Re-inject the diluted extract. Incorporate the dilution factor into the final concentration calculations. Acceptable SUR performance (Sect. 9.5.1.1) should be determined from the undiluted sample extract. The resulting data should be documented as a dilution, with an increased RL.

11. Data Evaluation, Calculations and Reporting

11.1 Complete chromatographic resolution is not necessary for accurate and precise measurements of analyte concentrations using MS/MS. In validating this method, concentrations were calculated by measuring the product ions listed in Table 8. Other ions may be selected at the discretion of the analyst.

11.2 Calculate analyte and SUR concentrations using the multipoint calibration established in Section 10.6. Do not use daily calibration verification data to quantitate analytes in samples. Adjust final analyte concentrations to reflect the actual sample volume determined in Section 10.5.

11.3 Prior to reporting the data, the chromatogram should be reviewed for any incorrect peak identification or poor integration.

11.4 PFHxS, PFOS, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 5 due to the linear and branch isomers of these compounds (Sect. 10.6.4.1). The areas of all the linear and branched isomer peaks observed in the CAL standards for each of these analytes must be summed and the concentrations reported as a total for each of these analytes.

11.5 Calculations must utilize all available digits of precision, but final reported concentrations should be rounded to an appropriate number of significant figures (one digit of uncertainty), typically two, and not more than three significant figures.

12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

12.1 Section 9.0 outlines sample batch QC acceptance criteria. If non-compliant organic compound results are to be reported, the Organic Section Head and/or the Laboratory Director, and the Operations Manager must approve the reporting of these results. The laboratory Project Manager shall be notified, and may choose to relay the non-compliance to the client, for approval, or other corrective action, such as re-sampling and re-analysis. The analyst, Data Reviewer, or Department Supervisor performing the secondary review initiates the project narrative, and the narrative must clearly document the non-compliance and provide a reason for acceptance of these results.

12.2 All results for the organic compounds of interest are reportable without qualification if extraction and analytical holding times are met, preservation requirements (including cooler temperatures) are met, all QC criteria defined in the table below are met, and matrix interference is not suspected during extraction or analysis of the samples. If any of the below QC parameters are not met, all associated samples must be evaluated for re-extraction and/or re-analysis.

13. Method Performance

13.1 Detection Limit Study (DL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

13.1.1 The laboratory follows the procedure to determine the DL, LOD, and/or LOQ as outlined in Alpha SOP ID 1732. These studies performed by the laboratory are maintained on file for review.

13.2 Demonstration of Capability Studies

13.2.1 The IDC must be successfully performed prior to analyzing any Field Samples. Prior to conducting the IDC, the analyst must first generate an acceptable Initial Calibration following the procedure outlined in Section 10.6.

13.2.2 INITIAL DEMONSTRATION OF LOW SYSTEM BACKGROUND – Any time a new lot of SPE cartridges, solvents, centrifuge tubes, disposable pipets, and autosampler vials are used, it must be demonstrated that an MB is reasonably free of contamination and that the criteria in Section 9.2.1 are met. If an automated extraction system is used, an MB should be extracted on each port to ensure that all the valves and tubing are free from potential PFAS contamination.

13.2.3 INITIAL DEMONSTRATION OF PRECISION (IDP) – Prepare, extract, and analyze four to seven replicate LCSs fortified near the midrange of the initial calibration curve according to the procedure described in Section 10. Sample preservatives as described in Section 6.2.1 must be added to these samples. The relative standard deviation (RSD) of the results of the replicate analyses must be less than 20%.

13.2.4 INITIAL DEMONSTRATION OF ACCURACY (IDA) – Using the same set of replicate data generated for Section 13.2.3, calculate average recovery. The average recovery of the replicate values must be within ± 30% of the true value.

13.2.5 INITIAL DEMONSTRATION OF PEAK ASYMMETRY FACTOR – Peak asymmetry factors must be calculated using the equation in Section 9.10.1 for the first two eluting peaks (if only two analytes are being analyzed, both must be evaluated) in a mid-level CAL standard. The peak asymmetry factors must fall in the range of 0.8 to 1.5. See guidance in Section 10.6.4.1 if the calculated peak asymmetry factors do not meet the criteria.

13.2.6 Refer to Alpha SOP ID 1739 for further information regarding IDC/DOC Generation.

13.2.7 The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

14. Pollution Prevention and Waste Management

14.1 Refer to Alpha's Chemical Hygiene Plan and Hazardous Waste Management and Disposal SOP for further pollution prevention and waste management information.

14.2 This method utilizes SPE to extract analytes from water. It requires the use of very small volumes of organic solvent and very small quantities of pure analytes, thereby minimizing the potential hazards to both the analyst and the environment as compared to the use of large volumes of organic solvents in conventional liquid-liquid extractions.

14.3 The analytical procedures described in this method generate relatively small amounts of waste since only small amounts of reagents and solvents are used. However, laboratory waste management practices must be conducted consistent with all applicable rules and regulations, and that laboratories protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. Also, compliance is required with any sewage discharge permits and regulations, particularly the hazardous waste identification rules and land disposal restrictions.

15. Referenced Documents

15.1 Chemical Hygiene Plan – ID 2124

15.2 SOP ID 1732 Detection Limit (DL), Limit of Detection (LOD) & Limit of Quantitation (LOQ) SOP

15.3 SOP ID 1739 Demonstration of Capability (DOC) Generation SOP

15.4 SOP ID 1728 Hazardous Waste Management and Disposal SOP

16. Attachments

Table 6: LC Method Conditions

Time (min)	2 mM Ammonium Acetate (5:95 MeOH/H_2O)	2 mM Ammonium Acetate (100% Methanol)
Initial	100.0	0.0
1.0	100.0	0.0
2.2	85.0	15.0
11	20.0	80.0
11.4	0.0	100.0
12.4	100.0	0.0
14.0	100.0	0.0
Waters Aquity UPLC ® BEHC_{18} 2.1 x 50 mm packed with 1.7 µm BEH C_{18} stationary phase Flow rate of 0.4 mL/min 2-5 µL injection		

Table 7: ESI-MS Method Conditions

ESI Conditions	
Polarity	Negative ion
Capillary needle voltage	.5 kV
Cone Gas Flow	20 L/hr
Nitrogen desolvation gas	1100 L/hr
Desolvation gas temp.	500 ºC

Table 8: Method Analyte Source, Retention Times (RTs), and IS References

Analyte	Peak #	IS# Ref
PFBS	1	2
PFHxA	3	1
HFPO-DA	5	1
PFHpA	6	1
PFHxS	7	2
ADONA	8	1
PFOA	10	1
PFNA	11	1
PFOS	12	2
PFDA	14	1
9CL-PF3ONS	15	1
NMeFOSAA	17	3
PFUnA	18	3
NEtFOSAA	20	1
PFDoA	21	1
11CL-PFOUdS	22	1
PFTrDA	23	1
PFTA	24	1
^{13}C-PFHxA	2	1
^{13}C-HFPO-DA	4	1
^{13}C-PFDA	13	1
d_5-NEtFOSAA	19	3
^{13}C-PFOA-IS#1	9	-
^{13}C-PFOS-IS#2	10	-
d_3-NMeFOSAA-IS#3	16	-

Table 9: MS/MS Method Conditions

Segment[a]	Analyte	Precursor Ion [b] (m/z)	Product Ion [b,c] (m/z)
1	PFBS	299	80
2	PFHxA	313	269
4	HFPO-DA	285	169
5	PFHpA	363	319
6	PFHxS [e]	399	80
7	ADONA	377	251
9	PFOA	413	369
10	PFNA	463	419
11	9CL-PF3ONS	531	351
13	PFOS [e]	499	80
15	PFDA	513	469
17	NMeFOSAA [e]	570	419
19	NEtFOSAA [e]	584	419
20	11CL-PFOUdS	631	451
21	PFUnA	563	519
22	PFDoA	613	569
23	PFTrDA	663	619
24	PFTA	713	669
2	^{13}C-PFHxA	315	270
3	^{13}C-HFPO-DA	287	169
14	^{13}C-PFDA	515	470
16	d_5-NEtFOSAA	589	419
8	^{13}C-PFOA	415	370
12	^{13}C-PFOS	503	80
18	d_3-NMeFOSAA	573	419

[a] Segments are time durations in which single scan events occur; segments overlap where R.T. dictate.
[b] Precursor and product ions listed in this table are nominal masses. During MS and MS/MS optimization, the analyst should determine the precursor and product ion masses to one decimal place by locating the apex of the mass spectral peak place. These precursor and product ion masses (with one decimal place) should be used in the MS/MS method for all analyses.
[c] Ions used for quantitation purposes.
[d] Argon used as collision gas at a flow rate of 0.4 mL/min
[e] Analyte has multiple resolved chromatographic peaks due to linear and branched isomers. All peaks summed for quantitation purposes.

Determination of Selected Perfluorinated Alkyl Substances by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry Isotope Dilution (LC/MS/MS)

References: EPA Method 537.1, Version 2, March 2020, EPA Document #: EPA/600/R-20/006

Department of Defense, Quality Systems Manual for Environmental Laboratories, Version 5.3, 2019

1. Scope and Application

Matrices: Drinking water, Non-potable Water, , Tissues, Biosolids and Soil Matrices (Drinking water is applicable for specific state regulatory requirements for this method)

Definitions: Refer to Alpha Analytical Quality Manual.

1.1 This is a liquid chromatography/tandem mass spectrometry (LC/MS/MS) method for the determination of selected perfluorinated alkyl substances (PFAS) in Non-Drinking Water and soil Matrices. Accuracy and precision data have been generated in reagent water, and finished ground and surface waters and soils for the compounds listed in Table 1.

1.2 The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one or more of the following laboratory personnel before performing the modification: Area Supervisor, Department Supervisor, Laboratory Director, or Quality Assurance Officer.

1.3 This method is restricted to use by or under the supervision of analysts experienced in the operation of the LC/MS/MS and in the interpretation of LC/MS/MS data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

2. Summary of Method

2.1 A 250-mL water sample is fortified with extracted internal standards (EIS) and passed through a solid phase extraction (WAX) cartridge containing a mixed mode, Weak Anion Exchange, reversed phase, water-wettable polymer to extract the method analytes and isotopically-labeled compounds. The compounds are eluted from the solid phase in two fractions with methanol followed by a small amount of 2% ammonium hydroxide in methanol solution. The extract is concentrated with nitrogen in a heated water bath, and then adjusted to a 1-mL volume with 80:20% (vol/vol) methanol:water.

A 2-4 gram soil, solid, tissue or biosolid sample is is fortified with extracted internal standards (EIS), diluted in methanol and agitated rigorously. An aliquot of the methanol is passed across an SPE based clean-up cartridge and the eluate collected. The extract is concentrated with nitrogen in a heated water bath, and then adjusted to a 1-mL volume with 80:20% (vol/vol) methanol:water.

2.2 A 3 µl injection is made into an LC equipped with a C18 column that is interfaced to an MS/MS. The analytes are separated and identified by comparing the acquired mass spectra and retention times to reference spectra and retention times for calibration standards acquired under identical LC/MS/MS conditions. The concentration of each analyte is

determined by using the isotope dilution technique. Extracted Internal Standards (EIS) analytes are used to monitor the extraction efficiency of the method analytes.

2.3 Method Modifications from Reference

None.

Table 1

Parameter	Acronym	CAS
PERFLUOROALKYL ETHER CARBOXYLIC ACIDS (PFECAs)		
Tetrafluoro-2-(heptafluoropropoxy)propanoic acid	HFPO-DA	13252-13-6
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
PERFLUOROALKYLCARBOXILIC ACIDS (PFCAs)		
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA *	307-24-4
Perfluoroheptanoic acid	PFHpA *	375-85-9
Perfluorooctanoic acid	PFOA *	335-67-1
Perfluorononanoic acid	PFNA *	375-95-1
Perfluorodecanoic acid	PFDA *	335-76-2
Perfluoroundecanoic acid	PFUnA *	2058-94-8
Perfluorododecanoic acid	PFDoA *	307-55-1
Perfluorotridecanoic acid	PFTrDA *	72629-94-8
Perfluorotetradecanoic acid	PFTA *	376-06-7
Perfluorohexadecanoic acid	PFHxDA	67905-19-5
Perfluorooctadecanoic acid	PFODA	16517-11-6
PERFLUOROALKYLSULFONATES (PFASs)		
Perfluorobutanesulfonic acid	PFBS *	375-73-5
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorohexanesulfonic acid	PFHxS *	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS *	1763-23-1
Perfluorononanesulfonic acid	PFNS	68259-12-1
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorododecanesulfonic acid	PFDoS	79780-39-5

*** also reportable via the standard 537 method**

Table 1 Cont.

Parameter	Acronym	CAS
CHLORO-PERFLUOROALKYLSULFONATE		
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
PERFLUOROOCTANESULFONAMIDES (FOSAs)		
Perfluorooctanesulfonamide	PFOSA	754-91-6
N-methylperfluoro-1-octanesulfonamide	NMeFOSA	31506-32-8
N-ethylperfluoro-1-octanesulfonamide	NEtFOSA	4151-50-2
TELOMER SULFONATES		
1H,1H,2H,2H-perfluorohexane sulfonate (4:2)	4:2FTS	27619-93-8
1H,1H,2H,2H-perfluorooctane sulfonate (6:2)	6:2FTS	27619-97-2
1H,1H,2H,2H-perfluorodecane sulfonate (8:2)	8:2FTS	39108-34-4
1H,1H,2H,2H-perfluorododecane sulfonate (10:2)	10:2FTS	120226-60-0
PERFLUOROOCTANESULFONAMIDOACETIC ACIDS		
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA *	2355-31-9
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA *	2991-50-6
NATIVE PERFLUOROOCTANESULFONAMIDOETHANOLS (FOSEs)		
2-(N-methylperfluoro-1-octanesulfonamido)-ethanol	NMeFOSE	24448-09-7
2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol	NEtFOSE	1691-99-2

*** also reportable via the standard 537 method**

3. Reporting Limits

The reporting limit for PFAS's is 2 ng/L for aqueous samples (20 ng/L for HFPO-DA) and 1 ng/g (10 ng/g for HFPO-DA) for soil samples.

4. Interferences

4.1 PFAS standards, extracts and samples should not come in contact with any glass containers or pipettes as these analytes can potentially adsorb to glass surfaces. PFAS analyte and EIS standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers.

4.2 Method interferences may be caused by contaminants in solvents, reagents (including reagent water), sample bottles and caps, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the chromatograms. The method analytes in this method can also be found in many common laboratory supplies and equipment, such as PTFE (polytetrafluoroethylene) products, LC solvent lines, methanol, aluminum foil, SPE sample transfer lines, etc. All items such as these must be routinely demonstrated to be free from interferences (less than 1/3 the RL for each method analyte) under the conditions of the analysis by analyzing laboratory reagent blanks as described in Section 9.2. **Subtracting blank values from sample results is not permitted.**

4.3 Matrix interferences may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the water. Humic and/or fulvic material can be co-extracted during SPE and high levels can cause enhancement and/or suppression in the electrospray ionization source or low recoveries on the SPE sorbent. Total organic carbon (TOC) is a good indicator of humic content of the sample.

4.4 SPE cartridges can be a source of interferences. The analysis of field and laboratory reagent blanks can provide important information regarding the presence or absence of such interferences. Brands and lots of SPE devices should be tested to ensure that contamination does not preclude analyte identification and quantitation.

5. Health and Safety

5.1 The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material safety data sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

5.2 All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

5.3 PFOA has been described as “likely to be carcinogenic to humans.” Pure standard materials and stock standard solutions of these method analytes should be handled with suitable protection to skin and eyes, and care should be taken not to breathe the vapors or ingest the materials.

6. Sample Collection, Preservation, Shipping and Handling

6.1 Sample Collection for Aqueous Samples

6.1.1 Samples must be collected in two (2) 250-mL high density polyethylene (HDPE) container with an unlined plastic screw cap.

6.1.2 The sample handler must wash their hands before sampling and wear nitrile gloves while filling and sealing the sample bottles. PFAS contamination during sampling can occur from a number of common sources, such as food packaging and certain foods and beverages. Proper hand washing and wearing nitrile gloves will aid in minimizing this type of accidental contamination of the samples.

6.1.3 Open the tap and allow the system to flush until the water temperature has stabilized (approximately 3 to 5 min). Collect samples from the flowing system.

6.1.4 Fill sample bottles. Samples do not need to be collected headspace free.

6.1.5 After collecting the sample and cap the bottle. Keep the sample sealed from time of collection until extraction.

6.1.6 Field Reagent Blank (FRB)

6.1.6.1 A FRB must be handled along with each sample set. The sample set is composed of samples collected from the same sample site and at the same time. At the laboratory, fill the field blank sample bottle with reagent water and preservatives, seal, and ship to the sampling site along with the sample bottles. For each FRB shipped, an empty sample bottle (no preservatives) must also be shipped. At the sampling site, the sampler must open the shipped FRB and pour the reagent water into the empty shipped sample bottle, seal and label this bottle as the FRB. The FRB is shipped back to the laboratory along with the samples and analyzed to ensure that PFAS's were not introduced into the sample during sample collection/handling.

The reagent water used for the FRBs must be initially analyzed for method analytes as a MB and must meet the MB criteria in Section 9.2.1 prior to use. This requirement will ensure samples are not being discarded due to contaminated reagent water rather than contamination during sampling.

6.2 Sample Collection for Soil and Sediment samples.

Grab samples are collected in polypropylene containers. Sample containers and contact surfaces containing PTFE shall be avoided.

6.3 Sample Preservation

Not applicable.

6.4 Sample Shipping

Samples must be chilled during shipment and must not exceed 10 °C during the first 48 hours after collection. Sample temperature must be confirmed to be at or below 10 °C when the samples are received at the laboratory. Samples stored in the lab must be held at or below 6 °C until extraction, but should not be frozen.

NOTE: Samples that are significantly above 10° C, at the time of collection, may need to be iced or refrigerated for a period of time, in order to chill them prior to shipping. This will allow them to be shipped with sufficient ice to meet the above requirements.

6.5 Sample Handling

6.5.1 Holding Times

6.5.1.1 Water samples should be extracted as soon as possible but must be extracted within 14 days. Soil samples should be extracted within 14 days. Extracts are stored at < 10 ° C and analyzed within 28 days after extraction.

7. Equipment and Supplies

7.1 SAMPLE CONTAINERS – 250-mL high density polyethylene (HDPE) bottles fitted with unlined screw caps. Sample bottles must be discarded after use.

7.2 SAMPLE JARS – 8 ounce wide mouth high density polyethylene (HDPE) bottles fitted with unlined screw caps. Sample bottles must be discarded after use.

7.3 POLYPROPYLENE BOTTLES – 4-mL narrow-mouth polypropylene bottles.

7.4 CENTRIFUGE TUBES – 50-mL conical polypropylene tubes with polypropylene screw caps for storing standard solutions and for collection of the extracts.

7.5 AUTOSAMPLER VIALS – Polypropylene 0.7-mL autosampler vials with polypropylene caps.

7.5.1 NOTE: Polypropylene vials and caps are necessary to prevent contamination of the sample from PTFE coated septa. However, polypropylene caps do not reseal, so evaporation occurs after injection. Thus, multiple injections from the same vial are not possible.

7.6 POLYPROPYLENE GRADUATED CYLINDERS – Suggested sizes include 25, 50, 100 and 1000-mL cylinders.

7.7 Auto Pipets – Suggested sizes include 5, 10, 25, 50, 100, 250, 500, 1000, 5000 and 10,000-µls.

7.8 PLASTIC PIPETS – Polypropylene or polyethylene disposable pipets.

7.9 ANALYTICAL BALANCE – Capable of weighing to the nearest 0.0001 g.

7.10 ANALYTICAL BALANCE – Capable of weighing to the nearest 0.1 g.

7.11 SOLID PHASE EXTRACTION (SPE) APPARATUS FOR USING CARTRIDGES

7.11.1 SPE CARTRIDGES – 0.5 g SPE cartridges containing a reverse phase copolymer characterized by a weak anion exchanger (WAX) sorbent phase.

7.11.2 VACUUM EXTRACTION MANIFOLD – A manual vacuum manifold with large volume sampler for cartridge extractions, or an automatic/robotic sample preparation system designed for use with SPE cartridges, may be used if all QC requirements discussed in Section 9 are met. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. Care must be taken with automated SPE systems to ensure the PTFE commonly used in these systems does not contribute to unacceptable analyte concentrations in the MB (Sect. 9.2.1).

7.11.3 SAMPLE DELIVERY SYSTEM – Use of a polypropylene transfer tube system, which transfers the sample directly from the sample container to the SPE cartridge, is recommended, but not mandatory. Standard extraction manifolds come equipped with PTFE transfer tube systems. These can be replaced with 1/8” O.D. x 1/16” I.D. polypropylene or polyethylene tubing cut to an appropriate length to ensure no sample contamination from the sample transfer lines. Other types of non-PTFE tubing may be used provided it meets the MB (Sect. 9.2.1) and LCS (Sect. 9.3) QC requirements. The PTFE transfer tubes may be used, but an MB must be run on each PFTE transfer tube and the QC requirements in Section 13.2.2 must be met. In the case of automated SPE, the removal of PTFE lines may not be feasible; therefore, MBs will need to be rotated among the ports and must meet the QC requirements of Sections 13.2.2 and 9.2.1.

7.12 Extract Clean-up Cartridge – 250 mg 6ml SPE Cartridge containing graphitized polymer carbon

7.13 EXTRACT CONCENTRATION SYSTEM – Extracts are concentrated by evaporation with nitrogen using a water bath set no higher than 65 °C.

7.14 LABORATORY OR ASPIRATOR VACUUM SYSTEM – Sufficient capacity to maintain a vacuum of approximately 10 to 15 inches of mercury for extraction cartridges.

7.15 LIQUID CHROMATOGRAPHY (LC)/TANDEM MASS SPECTROMETER (MS/MS) WITH DATA SYSTEM

7.15.1 LC SYSTEM – Instrument capable of reproducibly injecting up to 10-µL aliquots, and performing binary linear gradients at a constant flow rate near the flow rate used for development of this method (0.4 mL/min). The LC must be capable of pumping the water/methanol mobile phase without the use of a degasser which pulls vacuum on the mobile phase bottle (other types of degassers are acceptable). Degassers which pull vacuum on the mobile phase bottle will volatilize the ammonium acetate mobile phase causing the analyte peaks to shift to earlier retention times over the course of the analysis batch. The usage of a column heater is optional.

7.15.2 LC/TANDEM MASS SPECTROMETER – The LC/MS/MS must be capable of negative ion electrospray ionization (ESI) near the suggested LC flow rate of 0.4 mL/min. The system must be capable of performing MS/MS to produce unique product ions for the method analytes within specified retention time segments. A minimum of 10 scans across the chromatographic peak is required to ensure adequate precision.

7.15.3 DATA SYSTEM – An interfaced data system is required to acquire, store, reduce, and output mass spectral data. The computer software should have the capability of processing stored LC/MS/MS data by recognizing an LC peak within any given retention time window. The software must allow integration of the ion abundance of any specific ion within specified time or scan number limits. The software must be able to calculate relative response factors, construct linear regressions or quadratic calibration curves, and calculate analyte concentrations.

7.15.4 ANALYTICAL COLUMN – An LC BEH C_{18} column (2.1 x 50 mm) packed with 1.7 µm d_p C_{18} solid phase particles was used. Any column that provides adequate resolution, peak shape, capacity, accuracy, and precision (Sect. 9) may be used.

8. Reagents and Standards

8.1 GASES, REAGENTS, AND SOLVENTS – Reagent grade or better chemicals must be used.

8.1.1 REAGENT WATER – Purified water which does not contain any measurable quantities of any method analytes or interfering compounds greater than 1/3 the RL for each method analyte of interest. Prior to daily use, at least 3 L of reagent water should be flushed from the purification system to rinse out any build-up of analytes in the system's tubing.

8.1.2 METHANOL (CH_3OH, CAS#: 67-56-1) – High purity, demonstrated to be free of analytes and interferences.

8.1.3 AMMONIUM ACETATE ($NH_4C_2H_3O_2$, CAS#: 631-61-8) – High purity, demonstrated to be free of analytes and interferences.

8.1.4 ACETIC ACID (H_3CCOOH, CAS#: 64-19-7) - High purity, demonstrated to be free of analytes and interferences.

8.1.5 1M AMMONIUM ACETATE/REAGENT WATER – High purity, demonstrated to be free of analytes and interferences.

8.1.6 2mM AMMONIUM ACETATE/METHANOL:WATER (5:95) – To prepare, mix 2 ml of 1M AMMONIUM ACETATE,1 ml ACETIC ACID and 50 ml METHANOL into I Liter of REAGENT WATER.

8.1.7 Methanol/Water (80:20) – To prepare a 1 Liter bottle, mix 200 ml of REAGENT WATER with 800 ml of METHANOL.

8.1.8 AMMONIUM HYDROXIDE (NH_3, CAS#: 1336-21-6) – High purity, demonstrated to be free of analytes and interferences.

8.1.9 Sodium Acetate ($NaOOCCH_3$, CAS#: 127-09-3) – High purity, demonstrated to be free of analytes and interferences.

8.1.10 25 mM Sodium Acetate Buffer – To prepare 250mls, dissolve .625 grams of sodium acetate into 100 mls of reagent water. Add 4 mls Acetic Acid and adjust the final volume to 250 mls with reagent water.

8.1.11 NITROGEN – Used for the following purposes: Nitrogen aids in aerosol generation of the ESI liquid spray and is used as collision gas in some MS/MS instruments. The nitrogen used should meet or exceed instrument manufacturer's specifications. In addition, Nitrogen is used to concentrate sample extracts (Ultra High Purity or equivalent).

8.1.12 ARGON – Used as collision gas in MS/MS instruments. Argon should meet or exceed instrument manufacturer's specifications. Nitrogen gas may be used as the collision gas provided sufficient sensitivity (product ion formation) is achieved.

8.2 STANDARD SOLUTIONS – When a compound purity is assayed to be 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard. PFAS analyte and IS standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers. Standards for sample fortification generally should be prepared in the smallest volume that can be accurately measured to minimize the addition of excess organic solvent to aqueous samples.

NOTE: Stock standards and diluted stock standards are stored at ≤4 °C.

8.2.1 ISOTOPE DILUTION Extracted Internal Standard (ID EIS) STOCK SOLUTIONS - ID EIS stock standard solutions are stable for at least 6 months when stored at 4 °C. The stock solution is purchased at a concentration of 1000 ng/mL.

8.2.2 ISOTOPE DILUTION Extracted Internal Standard PRIMARY DILUTION STANDARD (ID EIS PDS) – Prepare the ID EIS PDS at a concentration of 500 ng/mL. The ID PDS is prepared in 80:20% (vol/vol) methanol:water. The ID PDS is stable for 6 months when stored at ≤4 °C.

Table 2

Isotope Labeled Standard	Conc. of EIS Stock (ng/mL)	Vol. of EIS Stock (mL)	Final Vol. of EIS PDS (mL)	Final Conc. of EIS PDS (ng/mL)
M4PFBA	1000	1.0	2.0	500
M5PFPeA	1000	1.0	2.0	500
M5PFHxA	1000	1.0	2.0	500
M4PFHpA	1000	1.0	2.0	500
M8PFOA	1000	1.0	2.0	500
M9PFNA	1000	1.0	2.0	500
M6PFDA	1000	1.0	2.0	500
M7PFUdA	1000	1.0	2.0	500
MPFDoA	1000	1.0	2.0	500
M2PFTeDA	1000	1.0	2.0	500
M2PFHxDA	50,000	.02	2.0	500
d3-N-MeFOSA	50,000	.02	2.0	500
d5-N-EtFOSA	50,000	.02	2.0	500
d7-N-MeFOSE	50,000	.02	2.0	500
d9-N-EtFOSE	50,000	.02	2.0	500
M8FOSA	1000	1.0	2.0	500
d3-N-MeFOSAA	1000	1.0	2.0	500
d5-N-EtFOSAA	1000	1.0	2.0	500
M3PFBS	929	1.0	2.0	464.5
M3PFHxS	946	1.0	2.0	473
M8PFOS	957	1.0	2.0	478.5
M2-4:2FTS	935	1.0	2.0	467.5
M2-6:2FTS	949	1.0	2.0	474.5
M2-8:2FTS	958	1.0	2.0	479
M3HFPO-DA	50,000	.4	2.0	10,000

8.2.3 ANALYTE STOCK STANDARD SOLUTION – Analyte stock standards are stable for at least 6 months when stored at 4 °C. When using these stock standards to prepare a PDS, care must be taken to ensure that these standards are at room temperature and adequately vortexed.

8.2.4 Analyte Secondary Spiking Standard Prepare the spiking solution of additional add on components for project specific requirements only. ANALYTE PRIMARY SPIKING STANDARD – Prepare the spiking standard at a concentration of 500 ng/mL in methanol. The spiking standard is stable for at least two months when stored in polypropylene centrifuge tubes at room temperature.

Table 3

Analyte	Conc. of Stock (ng/mL)	Vol. of Stock (mL)	Final Vol. of PDS (mL)	Final Conc. of PDS (ng/mL)
PFBA	2000	1	4	500
PFPeA	2000	1	4	500
PFHxA	2000	1	4	500
PFHpA	2000	1	4	500
PFOA	2000	1	4	500
PFNA	2000	1	4	500
PFDA	2000	1	4	500
PFUdA	2000	1	4	500
PFDoA	2000	1	4	500
PFTrDA	2000	1	4	500
PFTeDA	2000	1	4	500
FOSA	2000	1	4	500
N-MeFOSAA	2000	1	4	500
N-EtFOSAA	2000	1	4	500
L-PFBS	1770	1	4	442.5
L-PFPeS	1880	1	4	470
L-PFHxSK	1480	1	4	370
Br-PFHxSK	344	1	4	86
L-PFHpS	1900	1	4	475
L-PFOSK	1460	1	4	365
Br-PFOSK	391	1	4	97.75
L-PFNS	1920	1	4	480
L-PFDS	1930	1	4	482.5
4:2FTS	1870	1	4	467.5
6:2FTS	1900	1	4	475
8:2FTS	1920	1	4	480

8.2.5 Analyte Secondary Spiking Standard Prepare the spiking solution of additional add on components for project specific requirements only.

Table 4

Analyte	Conc. of IS Stock (ng/mL)	Vol. of IS Stock (mL)	Final Vol. of IS PDS (mL)	Final Conc. of IS PDS (ng/mL)
ADONA	2000	1	4	500
PFHxDA	2000	1	4	500
PFODA	2000	1	4	500
HFPO-DA	100,000	.4	4	10,000
9ClPF3ONS	50,000	0.04	4	500
11ClPF3OUdS	50,000	0.04	4	500

8.2.6 LOW, MEDIUM AND HIGH LEVEL LCS – The LCS's will be prepared at the following concentrations and rotated per batch; 2 ng/L, 40 ng/L, 500 ng/l for drinking waters. The analyte PDS contains all the method analytes of interest at

various concentrations in methanol. The analyte PDS has been shown to be stable for six months when stored at ≤4 °C.

8.2.7 Isotope Dilution Labeled Recovery Stock Solutions (ID REC) – ID REC Stock solutions are stable for at least 6 months when stored at 4 °C. The stock solution is purchased at a concentration of 1000 ng/mL.

8.2.8 Isotope Dilution Labeled Recovery Primary Dilution Standard (ID REC PDS) - Prepare the ID REC PDS at a concentration of 500 ng/mL. The ID REC PDS is prepared in 80:20% (vol/vol) methanol:water. The ID REC PDS is stable for at least six months when stored in polypropylene centrifuge tubes at ≤4 °C.

Table 5

Analyte	Conc. of REC Stock (ng/mL)	Vol. of REC Stock (mL)	Final Vol. of REC PDS (mL)	Final Conc. of REC PDS (ng/mL)
M2PFOA	2000	1	4	500
M2PFDA	2000	1	4	500
M3PFBA	2000	1	4	500
M4PFOS	2000	1	4	500

8.2.9 CALIBRATION STANDARDS (CAL) –

Current Concentrations (ng/mL): 0.5, 1.0, 5.0, 10.0, 50.0, 125, 150, 250, 500

Prepare the CAL standards over the concentration range of interest from dilutions of the analyte PDS in methanol containing 20% reagent water. 20 µl of the EIS PDS and REC PDS are added to the CAL standards to give a constant concentration of 10 ng/ml. The lowest concentration CAL standard must be at or below the RL (2 ng/L), which may depend on system sensitivity. The CAL standards may also be used as CCVs (Sect. 9.8). To make calibration stock standards:

Table 6

Calibration Standard Concentration	Final Aqueous Cal STD Level Concentration	Final Soil Cal STD Level Concentration	24 compound stock added (ul)	PFHxDA Stock added (ul)	500 ng/ml PFHxDA dilution added (ul)	PFODA Stock added (ul)	500 ng/ml PFODA dilution added (ul)	ADONA, HFPO-DA, 11Cl-PF3OUdS, 9Cl-PF3ONS Stock added (ul)	500 ng/ml ADONA dilution added (ul)	Final Volume in MeOH/H_2O (82:20)
.5 ng/ml	2 ng/L	.25 ng/g	6.25		25		25		25	25 mls
1 ng/ml	4 ng/L	.5 ng/g	5		20		20		20	10 mls
5 ng/ml	20 ng/L	1 ng/g	25		100		100		100	10 mls
10 ng/ml	40 ng/L	5 ng/g	125	5		5		5		25 mls
50 ng/ml	200 ng/L	25 ng/g	250	10		10		10		10 mls
125 ng/ml	500 ng/L	62.5 ng/g	625	25		25		25		10 mls
150 ng/ml	600 ng/L	75 ng/g	750	30		30		30		10 mls
250 ng/ml	1000 ng/L	125 ng/g	625							5 mls
500 ng/ml	2000 ng/L	250 ng/g	1250							5 mls

9. Quality Control

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

9.1 MINIMUM REPORTING LIMIT (MRL) CONFIRMATION

9.1.1 Fortify, extract, and analyze seven replicate LCSs at 2 ng/l. Calculate the mean measured concentration (*Mean*) and standard deviation for these replicates. Determine the Half Range for the prediction interval of results (HR_{PIR}) using the equation below

$$HR_{PIR} = 3.963s$$

Where:

s = the standard deviation
3.963 = a constant value for seven replicates.

9.1.2 Confirm that the upper and lower limits for the Prediction Interval of Result ($PIR = Mean \pm HR_{PIR}$) meet the upper and lower recovery limits as shown below

The Upper PIR Limit must be ≤150% recovery.

$$\frac{Mean + HR_{PIR}}{Fortified\ Concentration} \times 100\% \leq 150\%$$

The Lower PIR Limit must be ≥ 50% recovery.

$$\frac{Mean - HR_{PIR}}{Fortified\ Concentration} \times 100\% \geq 50\%$$

9.1.3 The RL is validated if both the Upper and Lower PIR Limits meet the criteria described above. If these criteria are not met, the RL has been set too low and must be determined again at a higher concentration.

9.2 Blank(s)

9.2.1 **METHOD BLANK (MB) -** A Method Blank (MB) is required with each extraction batch to confirm that potential background contaminants are not interfering with the identification or quantitation of method analytes. Prep and analyze a MB for every 20 samples. If the MB produces a peak within the retention time window of any analyte that would prevent the determination of that analyte, determine the source of contamination and eliminate the interference before processing samples. Background contamination must be reduced to an acceptable level before proceeding. Background from method analytes or other contaminants that interfere with the measurement of method analytes must be below the RL. If the method analytes are detected in the MB at concentrations equal to or greater than this level, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch. Because background contamination is a significant problem for several method analytes, it is highly recommended that the analyst maintain a historical record of MB data.

9.2.2 **FIELD REAGENT BLANK (FRB)** - The purpose of the FRB is to ensure that PFAS's measured in the Field Samples were not inadvertently introduced into the sample during sample collection/handling. Analysis of the FRB is required only if a Field Sample contains a method analyte or analytes at or above the RL. The FRB is processed, extracted and analyzed in exactly the same manner as a Field Sample.

9.3 Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicates (LCSD)

9.3.1 An LCS is required with each extraction batch. The fortified concentration of the LCS may be rotated between low, medium, and high concentrations from batch to batch. Default limits of 50-150% of the true value may be used for analytes until sufficient replicates have been analyzed to generate proper control limits. Calculate the percent recovery (%*R*) for each analyte using the equation

$$\%R = \frac{A \times 100}{B}$$

Where:

A = measured concentration in the fortified sample
B =fortification concentration.

9.3.2 Where applicable, LCSD's are to be extracted and analyzed. The concentration and analyte recovery criteria for the LCSD must be the same as the batch LCS The RSD's must fall within ≤30% of the true value for medium and high level replicates, and ≤50% for low level replicates. Calculate the relative percent difference (RPD) for duplicate MSs (MS and MSD) using the equation

$$RPD = \frac{|LCS - LCSD|}{(LCS + LCSD) / 2} \times 100$$

9.3.3 If the LCS and or LCSD results do not meet these criteria for method analytes, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch.

9.4 Labeled Recovery Standards (REC)

The analyst must monitor the peak areas of the REC(s) in all injections during each analysis day.

9.5 Extracted Internal Standards (EIS)

9.5.1 The EIS standard is fortified into all samples, CCVs, MBs, LCSs, MSs, MSDs, FD, and FRB prior to extraction. It is also added to the CAL standards. The EIS is a means of assessing method performance from extraction to final chromatographic measurement. Calculate the recovery (%R) for the EIS using the following equation:

$$\%R = (A / B) \times 100$$

Where:

A = calculated EIS concentration for the QC or Field Sample
B = fortified concentration of the EIS.

9.5.2 Default limits of 50-150% may be used for analytes until sufficient replicates have been analyzed to generate proper control limits. A low or high percent recovery for a sample, blank, or CCV does not require discarding the analytical data but it may indicate a potential problem with future analytical data. When EIS recovery from a sample, blank, or CCV are outside control limits, check 1) calculations to locate possible errors, 2) standard solutions for degradation, 3) contamination, and 4) instrument performance. For CCVs and QC elements spiked with all target analytes, if the recovery of the corresponding target analytes meet the acceptance criteria for the EIS in question, the data can be used but all potential biases in the recovery of the EIS must be documented in the sample report. If the associated target analytes do not meet the acceptance criteria,the data must be reanalyzed.

9.6 Matrix Spike (MS)

9.6.1 Analysis of an MS is required in each extraction batch and is used to determine that the sample matrix does not adversely affect method accuracy. Assessment of method precision is accomplished by analysis of a Field Duplicate (FD) (Sect. 9.6); however, infrequent occurrence of method analytes would hinder this assessment. If the occurrence of method analytes in the samples is infrequent, or if historical trends are unavailable, a second MS, or MSD, must be prepared, extracted, and analyzed from a duplicate of the Field Sample. Extraction batches that contain MSDs will not require the extraction of a field sample duplicate. If a variety of different sample matrices are analyzed regularly, for example, drinking water from groundwater and surface water sources, method performance should be established for each. Over time, MS data should be documented by the laboratory for all routine sample sources.

9.6.2 Within each extraction batch, a minimum of one Field Sample is fortified as an MS for every 20 Field Samples analyzed. The MS is prepared by spiking a sample with an appropriate amount of the Analyte Stock Standard (Sect. 8.2.3). Use historical data and rotate through the low, mid and high concentrations when selecting a fortifying concentration. Calculate the percent recovery (%*R*) for each analyte using the equation

$$\%R = \frac{(A - B)}{C} \times 100$$

Where:

A = measured concentration in the fortified sample
B = measured concentration in the unfortified sample
C = fortification concentration.

9.6.3 Analyte recoveries may exhibit matrix bias. For samples fortified at or above their native concentration, recoveries should range between 50-150%. If the accuracy of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the LCS, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.7 Laboratory Duplicate

9.7.1 FIELD DUPLICATE OR LABORATORY FORTIFIED SAMPLE MATRIX DUPLICATE (FD or MSD) – Within each extraction batch (not to exceed 20 Field Samples), a minimum of one FD or MSD must be analyzed. Duplicates check the precision associated with sample collection, preservation, storage, and laboratory procedures. If method analytes are not routinely observed in Field Samples, an MSD should be analyzed rather than an FD.

9.7.2 Calculate the relative percent difference (*RPD*) for duplicate measurements (*FD1* and *FD2*) using the equation

$$RPD = \frac{|FD1 - FD2|}{(FD1 + FD2) / 2} \times 100$$

9.7.3 RPDs for FDs should be ≤30%. Greater variability may be observed when FDs have analyte concentrations that are within a factor of 2 of the RL. At these concentrations, FDs should have RPDs that are ≤50%. If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the CCV, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.7.4 If an MSD is analyzed instead of a FD, calculate the relative percent difference (RPD) for duplicate MSs (MS and MSD) using the equation

$$RPD = \frac{|MS - MSD|}{(MS + MSD) / 2} \times 100$$

9.7.5 RPDs for duplicate MSs should be ≤30% for samples fortified at or above their native concentration. Greater variability may be observed when MSs are fortified at analyte concentrations that are within a factor of 2 of the RL. MSs fortified at these concentrations should have RPDs that are ≤50% for samples fortified at or above their native concentration. If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the LCSD where applicable, the result is judged to be matrix biased. If no LCSD is present, the associated MS and MSD are to be re-analyzed to determine if any analytical has occurred. If the resulting RPDs are still outside control limits, the result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.8 Initial Calibration Verification (ICV)

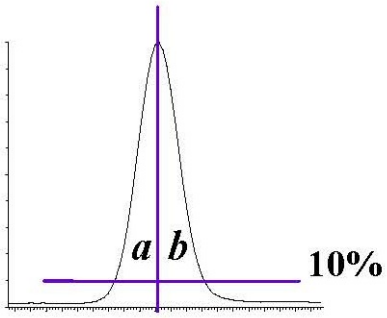
9.8.1 As part of the IDC (Sect. 13.2), and after each ICAL, analyze a QCS sample from a source different from the source of the CAL standards. If a second vendor is not available, then a different lot of the standard should be used. The QCS should be prepared and analyzed just like a CCV. Acceptance criteria for the QCS are identical to the CCVs; the calculated amount for each analyte must be ± 30% of the expected value. If measured analyte concentrations are not of acceptable accuracy, check the entire analytical procedure to locate and correct the problem.

9.9 Continuing Calibration Verification (CCV)

9.9.1 CCV Standards are analyzed at the beginning of each analysis batch, after every 10 Field Samples, and at the end of the analysis batch. See Section 10.7 for concentration requirements and acceptance criteria.

9.10 Method-specific Quality Control Samples

9.10.1 PEAK ASYMMETRY FACTOR – A peak asymmetry factor must be calculated using the equation below during the IDL and every time a calibration curve is generated. The peak asymmetry factor for the first two eluting peaks in a midlevel CAL standard (if only two analytes are being analyzed, both must be evaluated) must fall in the range of 0.8 to 1.5. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted. See guidance in Section 10.6.4.1 if the calculated peak asymmetry factors do not meet the criteria.



$$A_s = b / a$$

Where:

A_s = peak asymmetry factor
b = width of the back half of the peak measured (at 10% peak height) from the trailing edge of the peak to a line dropped perpendicularly from the peak apex
a = the width of the front half of the peak measured (at 10% peak height) from the leading edge of the peak to a line dropped perpendicularly from the apex.

9.11 Method Sequence

- CCV-LOW
- MB
- LCS
- LCSD
- MS
- Duplicate or MSD
- Field Samples (1-10)
- CCV-MID
- Field Samples (11-20)
- CCV-LOW

10. Procedure

10.1 Equipment Set-up

10.1.1 This procedure may be performed manually or in an automated mode using a robotic or automatic sample preparation device. If an automated system is used to prepare samples, follow the manufacturer's operating instructions, but all extraction and elution steps must be the same as in the manual procedure. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. If an automated system is used, the MBs should be rotated among the ports to ensure that all the valves and tubing meet the MB requirements (Sect. 9.2).

10.1.2 Some of the PFAS's adsorb to surfaces, including polypropylene. Therefore, the aqueous sample bottles must be rinsed with the elution solvent (Sect 10.3.4) whether extractions are performed manually or by automation. The bottle rinse is passed through the cartridge to elute the method analytes and is then collected (Sect. 10.3.4).

10.1.3 **NOTE:** The SPE cartridges and sample bottles described in this section are designed as single use items and should be discarded after use. They may not be refurbished for reuse in subsequent analyses.

10.2 Sample Preparation and Extraction of Aqueous Samples

10.2.1 Samples are preserved, collected and stored as presented in Section 6.

The entire sample that is received must be sent through the SPE cartridge. In addition, the bottle must be solvent rinsed and this rinse must be sent through the SPE cartridge as well. The method blank (MB) and laboratory control sample (LCS) must be extracted in exactly the same manner (i.e., must include the bottle solvent rinse). It should be noted that a water rinse alone is not sufficient. This does not apply to samples with high concentrations of PFAS that are prepared using serial dilution and not SPE.

10.2.2 Determine sample volume. Weigh all samples to the nearest 1g. If visible sediment is present, centrifuge and decant into a new 250mL HDPE bottle and record the weight of the new container.

NOTE: Some of the PFAS's adsorb to surfaces, thus the sample volume may **NOT** be transferred to a graduated cylinder for volume measurement.

10.2.3 The MB, LCS and FRB may be prepared by measuring 250 mL of reagent water with a polypropylene graduated cylinder or filling a 250-mL sample bottle to near the top.

10.2.4 Adjust the QC and sample pH to 3 by adding acetic acid in water dropwise

10.2.5 Add 20 µL of the EIS PDS (Sect. 8.2.2) to each sample and QC, cap and invert to mix.

10.2.6 If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS (Sect. 8.2.3). Cap and invert each sample to mix.

10.3 Cartridge SPE Procedure

10.3.1 CARTRIDGE CLEAN-UP AND CONDITIONING – DO NOT allow cartridge packing material to go dry during any of the conditioning steps. Rinse each cartridge with 3 X 5 mL of 2% ammonium hydroxide in methanol, followed by 5mls of methanol. Next, rinse each cartridge with 5 mls of the 25 mM acetate buffer, followed by 15 mL of reagent water, without allowing the water to drop below the top edge of the packing. If the cartridge goes dry during the conditioning phase, the conditioning must be started over. Add 4-5 mL of reagent water to each cartridge, attach the sample transfer tubes (Sect. 7.9.3), turn on the vacuum, and begin adding sample to the cartridge.

10.3.2 SAMPLE EXTRACTON – Adjust the vacuum so that the approximate flow rate is approximately 4 mL/min. Do not allow the cartridge to go dry before all the sample has passed through.

10.3.3 SAMPLE BOTTLE AND CARTRIDGE RINSE – After the entire sample has passed through the cartridge, rinse the sample bottles with 4 ml reagent water followed by 4 ml 25 mM acetate buffer at pH 4 and draw the aliquot through the sample transfer tubes and the cartridges. Draw air or nitrogen through the cartridge for 5-10 min at high vacuum (10-15 in. Hg). NOTE: If empty plastic reservoirs are used in place of the sample transfer tubes to pass the samples through the cartridges, these reservoirs must be treated like the transfer tubes. After the entire sample has passed through the cartridge, the reservoirs must be rinsed to waste with reagent water.

10.3.4 SAMPLE BOTTLE AND CARTRIDGE ELUTION, Fraction 1 – Turn off and release the vacuum. Lift the extraction manifold top and insert a rack with collection tubes into the extraction tank to collect the extracts as they are eluted from the cartridges. Rinse the sample bottles with 12 mls of methanol and draw the aliquot through the sample transfer tubes and cartridges. Use a low vacuum such that the solvent exits the cartridge in a dropwise fashion.

SAMPLE BOTTLE AND CARTRIDGE ELUTION, Fraction 2 In a separate collection vial, rinse the sample bottles with 12 mL of 2% ammonium hydroxide in methanol and elute the analytes from the cartridges by pulling the 4 mL of methanol through the sample transfer tubes and the cartridges. Use a low vacuum such that the solvent exits the cartridge in a dropwise fashion.

NOTE: If empty plastic reservoirs are used in place of the sample transfer tubes to pass the samples through the cartridges, these reservoirs must be treated like the transfer tubes. After the reservoirs have been rinsed in Section 10.3.3, the elution solvent used to rinse the sample bottles must be swirled down the sides of the reservoirs while eluting the cartridge to ensure that any method analytes on the surface of the reservoirs are transferred to the extract.

CLEAN-UP CARTRIDGE ELUTION, Elute the clean-up cartridge with 8 additional mls of methanol and draw the aliquot through the cartridge. Use a low vacuum such that the solvent exits the cartridge in a dropwise fashion.

10.3.5 Fractions 1 and 2 are to be combined during the concentration stage (section10.6).

10.4 Sample Prep and Extraction Protocol for Soils, Solids and Sediments.

10.4.1 Homogenize and weigh 4 grams of sample (measured to the nearest hundredth of a gram) into a 50 ml polypropylene centrifuge tube. For laboratory control blanks and spikes, 4 grams of clean sand is used.

10.4.2 Add 40 µL of the EIS PDS (Sect. 8.2.2) to each sample and QC.

10.4.3 If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS (Sect. 8.2.3). Cap and invert each sample to mix.

10.4.4 To all samples, add 10 mls of methanol, cap, vortex for 25 seconds at 2500 RPM.

10.4.5 Following mixing, sonicate each sample for 30 minutes and let samples sit overnight (at least 2 hours is required for RUSH samples).

10.4.6 Centrifuge each sample at 3500RPM for 10 minutes.

10.4.7 Remove 5ml of supernatant, and reserve for clean-up.

10.5 Sample Prep and Extraction Protocol for Tissues, Oils and Biosolids.

10.5.1 Homogenize and weigh 2-8 grams of sample (measured to the nearest hundredth of a gram) into a 50 ml polypropylene centrifuge tube. For laboratory control blanks and spikes, 4 grams of clean sand is used.

10.5.2 Add 40 µL of the EIS PDS (Sect. 8.2.2) to each sample and QC.

10.5.3 If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS (Sect. 8.2.3). Cap and invert each sample to mix.

10.5.4 Add 100 ul of Ammonium Hydroxide.

10.5.5 To all samples, add 10 mls of methanol, cap, vortex for 25-30 seconds at 2500 RPM.

10.5.6 Following mixing, sonicate each sample for 30 minutes and let samples sit for 2 hours.

10.5.7 Centrifuge each sample at 3500RPM for 10 minutes.

10.5.8 Remove 5 mls of the supernatant, and reserve for clean-up.

10.6 Extract Clean-up: Soils, Solids and Aqueous Matrices

10.6.1 CARTRIDGE CLEAN-UP AND CONDITIONING –. Rinse each cartridge with 15 mL of methanol and discard. If the cartridge goes dry during the conditioning phase, the conditioning must be started over. Attach the sample transfer tubes (Sect. 7.9.3), turn on the vacuum, and begin adding sample to the cartridge. For Soils extracts, transfer 5 mls of the MeOH eluate to the cartridge. Samples should be allowed to pass through the cartridge by gravity feed at a dropwise rate to ensure adequate contact time with the cartridge sorbent. Vacuum is only to applied if the flow of solvent through the cartridge stops.

10.6.2 Adjust the vacuum so that the approximate flow rate is 1-2 mL/min. Do not allow the cartridge to go dry before all the sample has passed through.

10.6.3 SAMPLE BOTTLE AND CARTRIDGE RINSE – After the entire sample has passed through the cartridge, rinse the sample collection vial with two 4-mL aliquots of methanol and draw each aliquot through the cartridges. Draw air or nitrogen through the cartridge for 5 min at high vacuum (10-15 in. Hg).

10.6.4 If extracts are not to be immediately evaporated, cover collection tubes and store at ambient temperature till concentration.

10.7 Extract Clean-up: Tissues, Oils and Biosolids

10.7.1 CARTRIDGE CLEAN-UP AND CONDITIONING –. Stack a 500 mg WAX cartridge onto a 250 mg GCB cartridge. Rinse each cartridge set with 10 mL of 2% NH_4OH and discard. Immediately rinse each cartridge stack with 15 mls MeOH and discard, If the cartridge goes dry during the conditioning phase, the conditioning must be started over. Attach the sample transfer tubes (Sect. 7.9.3), turn on the vacuum.

10.7.2 Adjust the vacuum so that the approximate flow rate is 1-2 mL/min. Do not allow the cartridge to go dry before all the sample has passed through.

10.7.3 SAMPLE elution AND CARTRIDGE RINSE – Load 5 mls of the MeOH sample extract to the cartridge. After the entire sample has passed through the cartridge, rinse the cartridges with 5-mLs of methanol and draw through the cartridges. Immediately add and elute 2 5ml aliquots of 2% NH_4OH to the cartridges, collecting the eluate with the MeOH eluate.

If extracts are not to be immediately evaporated, cover collection tubes and store at ambient temperature till concentration.

10.8 Extract Concentration

10.8.1 Concentrate the extract to dryness under a gentle stream of nitrogen in a heated water bath (60-65 °C) to remove all the water/methanol mix. Add the appropriate amount of 80:20% (vol/vol) methanol:water solution and 20 µl of the ID REC PDS (Sect. 8.2.7) to the collection vial to bring the volume to 1 mL and vortex. Transfer two aliquots with a plastic pipet (Sect. 7.6) into 2 polypropylene autosampler vials.

NOTE: It is recommended that the entire 1-mL aliquot not be transferred to the autosampler vial because the polypropylene autosampler caps do not reseal after injection. Therefore, do not store the extracts in the autosampler vials as evaporation losses can occur occasionally in these autosampler vials. Extracts can be split between 2 X 700 µl vials (Sect. 7.4).

10.9 Sample Volume Determination

10.9.1 If the level of the sample was marked on the sample bottle, use a graduated cylinder to measure the volume of water required to fill the original sample bottle to the mark made prior to extraction. Determine to the nearest 10 mL.

10.9.2 If using weight to determine volume, weigh the empty bottle to the nearest 10 g and determine the sample weight by subtraction of the empty bottle weight from the original sample weight (Sect. 10.2.2). Assume a sample density of 1.0 g/mL. In either case, the sample volume will be used in the final calculations of the analyte concentration (Sect. 11.2).

10.10 Initial Calibration - Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed. After the initial calibration is successful, a CCV is required at the beginning and end of each period in which analyses are performed, and after every tenth Field Sample.

10.10.1 ESI-MS/MS TUNE

10.10.1.1 Calibrate the mass scale of the MS with the calibration compounds and procedures prescribed by the manufacturer.

10.10.1.2 Optimize the [M-H]- for each method analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (approximately 0.4 mL/min). This tune can be done on a mix of the method analytes. The MS parameters (voltages, temperatures, gas flows, etc.) are varied until optimal analyte responses are determined. The method analytes may have different optima requiring some compromise between the optima.

10.10.1.3 Optimize the product ion for each analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (approximately 0.4 mL/min). This tune can be done on a mix of the method analytes. The MS/MS parameters (collision gas pressure, collision energy, etc.) are varied until optimal analyte responses are determined. Typically, the carboxylic acids have very similar MS/MS conditions and the sulfonic acids have similar MS/MS conditions.

10.10.2 Establish LC operating parameters that optimize resolution and peak shape. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted.

Cautions: LC system components, as well as the mobile phase constituents, contain many of the method analytes in this method. Thus, these PFAS's will build up on the head of the LC column during mobile phase equilibration. To minimize the background PFAS peaks and to keep background levels constant, the time the LC column sits at initial conditions must be kept constant and as short as possible (while ensuring reproducible retention times). In addition, prior to daily use, flush the column with 100% methanol for at least 20 min before initiating a sequence. It may be necessary on some systems to flush other LC components such as wash syringes, sample needles or any other system components before daily use.

10.10.3 Inject a mid-level CAL standard under LC/MS conditions to obtain the retention times of each method analyte. If analyzing for PFTA, ensure that the LC conditions are adequate to prevent co-elution of PFTA and the mobile phase interferants. These interferants have the same precursor and products ions as PFTA, and under faster LC conditions may co-elute with PFTA. Divide the chromatogram into retention time windows each of which contains one or more chromatographic peaks. During MS/MS analysis, fragment a small number of selected precursor ions ([M-H]-) for the analytes in each window and choose the most abundant product ion. For maximum sensitivity, small mass windows of ±0.5 daltons around the product ion mass were used for quantitation.

10.10.4 Inject a mid-level CAL standard under optimized LC/MS/MS conditions to ensure that each method analyte is observed in its MS/MS window and that there are at least 10 scans across the peak for optimum precision.

10.10.4.1 If broad, split or fronting peaks are observed for the first two eluting chromatographic peaks (if only two analytes are being analyzed, both must be evaluated), change the initial mobile phase conditions to higher

aqueous content until the peak asymmetry ratio for each peak is 0.8 – 1.5. The peak asymmetry factor is calculated as described in Section 9.9.1 on a mid-level CAL standard. The peak asymmetry factor must meet the above criteria for the first two eluting peaks during the IDL and every time a new calibration curve is generated. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted.

NOTE: PFHxS, PFOS, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 5 due to chromatographic resolution of the linear and branched isomers of these compounds. Most PFAS's are produced by two different processes. One process gives rise to linear PFAS's only while the other process produces both linear and branched isomers. Thus, both branched and linear PFAS's can potentially be found in the environment. For the aforementioned compounds that give rise to more than one peak, all the chromatographic peaks observed in the standard must be integrated and the areas totaled. Chromatographic peaks in a sample must be integrated in the same way as the CAL standard.

10.10.5 Prepare a set of CAL standards as described in Section 8.2.5. The lowest concentration CAL standard must be at or below the RL (2 ng/L), which may depend on system sensitivity.

10.10.6 The LC/MS/MS system is calibrated using the isotope dilution technique. Target analytes are quantitated against their isotopically labeled analog (Extracted Internal Standard) where commercially available. If a labeled analog is not commercially available, the extracted internal standard with the closest retention time and /or closest chemical similarity is to be used. Use the LC/MS/MS data system software to generate a linear regression or quadratic calibration curve for each of the analytes. This curve must always be forced through zero and may be concentration weighted, if necessary. Forcing zero allows for a better estimate of the background levels of method analytes. A minimum of 5 levels are required for a linear calibration model and a minimum of 6 levels are required for a quadratic calibration model.

10.10.7 CALIBRATION ACCEPTANCE CRITERIA – A linear fit is acceptable if the coefficient of determination (r^2) is greater than 0.99. When quantitated using the initial calibration curve, each calibration point, except the lowest point, for each analyte must calculate to be within 70-130% of its true value. The lowest CAL point must calculate to be within 50-150% of its true value. If these criteria cannot be met, the analyst will have difficulty meeting ongoing QC criteria. It is recommended that corrective action is taken to reanalyze the CAL standards, restrict the range of calibration, or select an alternate method of calibration (forcing the curve through zero is still required).

10.10.7.1 CAUTION: When acquiring MS/MS data, LC operating conditions must be carefully reproduced for each analysis to provide reproducible retention times. If this is not done, the correct ions will not be monitored at the appropriate times. As a precautionary measure, the chromatographic peaks in each window must not elute too close to the edge of the segment time window.

10.11 CONTINUING CALIBRATION CHECK (CCV) – Minimum daily calibration verification is as follows. Verify the initial calibration at the beginning and end of each group of analyses, and after every tenth sample during analyses. In this context, a "sample" is considered to be a Field Sample. MBs, CCVs, LCSs, MSs, FDs FRBs and MSDs are not counted as samples. The beginning CCV of each analysis batch must be at or below the RL in order to verify instrument sensitivity prior to any analyses. If standards have been prepared such that all low CAL points are not in the same CAL solution, it may be necessary to analyze two CAL standards to meet this requirement. Alternatively, the analyte concentrations in the analyte PDS may be customized to meet these criteria. Subsequent CCVs should alternate between a medium and Low concentration CAL standard.

10.11.1 Inject an aliquot of the appropriate concentration CAL standard and analyze with the same conditions used during the initial calibration.

10.11.2 Calculate the concentration of each analyte and EIS in the CCV. The calculated amount for each analyte for medium level CCVs must be within ± 30% of the true value with an allowance of 10% of the reported analytes to be greater than 30%. The calculated amount for each EIS must be within ± 50% of the true value. The calculated amount for the lowest calibration point for each analyte must be within ± 50%. If these conditions do not exist, then all data for the problem analyte must be considered invalid, and remedial action should be taken (Sect. 10.7.4) which may require recalibration. Any Field or QC Samples that have been analyzed since the last acceptable calibration verification should be reanalyzed after adequate calibration has been restored, with the following exception. If the CCV fails because the calculated concentration is greater than 130% (150% for the low-level CCV) for a particular method analyte, and Field Sample extracts show no detection for that method analyte, non-detects may be reported without re-analysis.

10.11.3 REMEDIAL ACTION – Failure to meet CCV QC performance criteria may require remedial action. Major maintenance, such as cleaning the electrospray probe, atmospheric pressure ionization source, cleaning the mass analyzer, replacing the LC column, etc., requires recalibration (Sect 10.6) and verification of sensitivity by analyzing a CCV at or below the RL (Sect 10.7).

10.12 EXTRACT ANALYSIS

10.12.1 Establish operating conditions equivalent to those summarized in Tables 6-8 of Section 16. Instrument conditions and columns should be optimized prior to the initiation of the IDC.

10.12.2 Establish an appropriate retention time window for each analyte. This should be based on measurements of actual retention time variation for each method analyte in CAL standard solutions analyzed on the LC over the course of time. A value of plus or minus three times the standard deviation of the retention time obtained for each method analyte while establishing the initial calibration and completing the IDC can be used to calculate a suggested window size. However, the experience of the analyst should weigh heavily on the determination of the appropriate retention window size.

10.12.3 Calibrate the system by either the analysis of a calibration curve (Sect. 10.6) or by confirming the initial calibration is still valid by analyzing a CCV as described

in Section 10.7. If establishing an initial calibration, complete the IDC as described in Section 13.2.

10.12.4 Begin analyzing Field Samples, including QC samples, at their appropriate frequency by injecting the same size aliquots under the same conditions used to analyze the CAL standards.

10.12.5 At the conclusion of data acquisition, use the same software that was used in the calibration procedure to identify peaks of interest in predetermined retention time windows. Use the data system software to examine the ion abundances of the peaks in the chromatogram. Identify an analyte by comparison of its retention time with that of the corresponding method analyte peak in a reference standard.

10.12.6 The analyst must not extrapolate beyond the established calibration range. If an analyte peak area exceeds the range of the initial calibration curve, the sample should be re-extracted with a reduced sample volume in order to bring the out of range target analytes into the calibration range. If a smaller sample size would not be representative of the entire sample, the following options are recommended. Re-extract an additional aliquot of sufficient size to insure that it is representative of the entire sample. Spike it with a higher concentration of internal standard. Prior to LC/MS analysis, dilute the sample so that it has a concentration of internal standard equivalent to that present in the calibration standard. Then, analyze the diluted extract.

11. Data Evaluation, Calculations and Reporting

11.1 Complete chromatographic resolution is not necessary for accurate and precise measurements of analyte concentrations using MS/MS. In validating this method, concentrations were calculated by measuring the product ions listed in Table 7.

11.2 Calculate analyte concentrations using the multipoint calibration established in Section 10.6. Do not use daily calibration verification data to quantitate analytes in samples. Adjust final analyte concentrations to reflect the actual sample volume determined in Section 10.6 where:

C_{ex} = (Area of target analyte * Concentration of Labeled analog) / (area of labeled analog * CF)

C_s = (C_{ex} / sample volume in ml) * 1000

C_{ex} = The concentration of the analyte in the extract
CF = calibration factor from calibration.

11.3 Prior to reporting the data, the chromatogram should be reviewed for any incorrect peak identification or poor integration.

11.4 PFHxS, PFOS, PFOA, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 5 due to the linear and branch isomers of these compounds (Sect. 10.6.4.1). The areas of all the linear and branched isomer peaks observed in the CAL standards for each of these analytes must be summed and the concentrations reported as a total for each of these analytes.

11.5 Calculations must utilize all available digits of precision, but final reported concentrations should be rounded to an appropriate number of significant figures (one digit of uncertainty), typically two, and not more than three significant figures.

12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

12.1 Section 9.0 outlines sample batch QC acceptance criteria. If non-compliant organic compound results are to be reported, the Organic Section Head and/or the Laboratory Director, and the Operations Manager must approve the reporting of these results. The laboratory Project Manager shall be notified, and may choose to relay the non-compliance to the client, for approval, or other corrective action, such as re-sampling and re-analysis. The analyst, Data Reviewer, or Department Supervisor performing the secondary review initiates the project narrative, and the narrative must clearly document the non-compliance and provide a reason for acceptance of these results.

12.2 All results for the organic compounds of interest are reportable without qualification if extraction and analytical holding times are met, preservation requirements (including cooler temperatures) are met, all QC criteria are met, and matrix interference is not suspected during extraction or analysis of the samples. If any of the below QC parameters are not met, all associated samples must be evaluated for re-extraction and/or re-analysis.

13. Method Performance

13.1 Detection Limit Study (DL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

13.1.1 The laboratory follows the procedure to determine the DL, LOD, and/or LOQ as outlined in Alpha SOP ID 1732. These studies performed by the laboratory are maintained on file for review.

13.2 Demonstration of Capability Studies

13.2.1 The IDC must be successfully performed prior to analyzing any Field Samples. Prior to conducting the IDC, the analyst must first generate an acceptable Initial Calibration following the procedure outlined in Section 10.6.

13.2.2 INITIAL DEMONSTRATION OF LOW SYSTEM BACKGROUND – Any time a new lot of SPE cartridges, solvents, centrifuge tubes, disposable pipets, and autosampler vials are used, it must be demonstrated that an MB is reasonably free of contamination and that the criteria in Section 9.2.1 are met. If an automated extraction system is used, an MB should be extracted on each port to ensure that all the valves and tubing are free from potential PFAS contamination.

13.2.3 INITIAL DEMONSTRATION OF PRECISION (IDP) – Prepare, extract, and analyze four to seven replicate LCSs fortified near the midrange of the initial calibration curve according to the procedure described in Section 10. Sample preservatives as described in Section 6.2.1 must be added to these samples. The relative standard deviation (RSD) of the results of the replicate analyses must be less than 20%.

13.2.4 INITIAL DEMONSTRATION OF ACCURACY (IDA) – Using the same set of replicate data generated for Section 13.2.3, calculate average recovery. The average recovery of the replicate values must be within ± 30% of the true value.

13.2.5 INITIAL DEMONSTRATION OF PEAK ASYMMETRY FACTOR – Peak asymmetry factors must be calculated using the equation in Section 9.10.1 for the first two eluting peaks (if only two analytes are being analyzed, both must be evaluated) in a mid-level CAL standard. The peak asymmetry factors must fall in the range of 0.8 to 1.5. See guidance in Section 10.6.4.1 if the calculated peak asymmetry factors do not meet the criteria.

13.2.6 Refer to Alpha SOP ID 1739 for further information regarding IDC/DOC Generation.

13.2.7 The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

14. Pollution Prevention and Waste Management

14.1 Refer to Alpha's Chemical Hygiene Plan and Hazardous Waste Management and Disposal SOP for further pollution prevention and waste management information.

14.2 This method utilizes SPE to extract analytes from water. It requires the use of very small volumes of organic solvent and very small quantities of pure analytes, thereby minimizing the potential hazards to both the analyst and the environment as compared to the use of large volumes of organic solvents in conventional liquid-liquid extractions.

14.3 The analytical procedures described in this method generate relatively small amounts of waste since only small amounts of reagents and solvents are used. The matrices of concern are finished drinking water or source water. However, laboratory waste management practices must be conducted consistent with all applicable rules and regulations, and that laboratories protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. Also, compliance is required with any sewage discharge permits and regulations, particularly the hazardous waste identification rules and land disposal restrictions.

15. Referenced Documents

Chemical Hygiene Plan – ID 2124

SOP ID 1732 Detection Limit (DL), Limit of Detection (LOD) & Limit of Quantitation (LOQ) SOP

SOP ID 1739 Demonstration of Capability (DOC) Generation SOP

SOP ID 1728 Hazardous Waste Management and Disposal SOP

16. Attachments

Table 7: LC Method Conditions

Time (min)	2 mM Ammonium Acetate (5:95 MeOH/H_2O)	100% Methanol
Initial	100.0	0.0
1.0	100.0	0.0
2.2	85.0	15.0
11	20.0	80.0
11.4	0.0	100.0
12.4	100.0	00.0
15.5	100.0	0.0
Waters Aquity UPLC ® BEHC_{18} 2.1 x 50 mm packed with 1.7 µm BEH C_{18} stationary phase Flow rate of 0.4 mL/min 3 µL injection		

Table 8: ESI-MS Method Conditions

ESI Conditions	
Polarity	Negative ion
Capillary needle voltage	.5 kV
Cone Gas Flow	25 L/hr
Nitrogen desolvation gas	1000 L/hr
Desolvation gas temp.	500 ºC

Table 9: Method Analyte Source, Retention Times (RTs), and EIS References

#	Analyte	Transition	RT	IS	Type
1	M3PBA	216>171	2.65		REC
2	PFBA	213 > 169	2.65	2: M4PFBA	
3	M4PFBA	217 > 172	2.65	1: M3PBA	EIS
4	PFPeA	263 > 219	5.67	4: M5PFPEA	
5	M5PFPEA	268 > 223	5.66	1: M3PBA	EIS
6	PFBS	299 > 80	6.35	6: M3PFBS	
7	M3PFBS	302 > 80	6.35	29:M4PFOS	EIS
8	FtS 4:2	327 > 307	7.47	9: M2-4:2FTS	
9	M2-4:2FTS	329 > 81	7.47	29:M4PFOS	EIS
10	PFHxA	303 > 269	7.57	10: M5PFHxA	
11	M5PFHxA	318 > 273	7.57	19:M2PFOA	EIS
12	PFPeS	349 > 80	7.88	18: M3PFHxS	
13	PFHpA	363 > 319	8.80	14: M4PFHpA	
14	M4PFHpA	367 > 322	8.80	19:M2PFOA	EIS

#	Analyte	Transition	RT	IS	Type
15	L-PFHxS	399 > 80	8.94	18: M3PFHxS	
16	br-PFHxS	399 > 80	8.72	18: M3PFHxS	
17	PFHxS Total	399 > 80	8.94	18: M3PFHxS	
18	M3PFHxS	402 > 80	8.94	29:M4PFOS	EIS
19	MPFOA	415 > 370	9.7		REC
20	PFOA	413 > 369	9.7	23: M8PFOA	
21	br-PFOA	413 > 369	9.48	23: M8PFOA	
22	PFOA Total	413 > 369	9.7	23: M8PFOA	
23	M8PFOA	421 > 376	9.7	19: M2PFOA	EIS
24	FtS 6:2	427 > 407	9.66	25: M2-6:2FTS	
25	M2-6:2FTS	429 > 409	9.66	29:M4PFOS	EIS
26	PFHpS	449 > 80	9.78	33: M8PFOS	
27	PFNA	463 > 419	10.41	33: M8PFOS	
28	M9PFNA	472 > 427	10.41	19: M2PFOA	EIS
29	M4PFOS	501 > 80	10.45		REC
30	PFOS	499 > 80	10.45	33: M8PFOS	
31	br-PFOS	499 > 80	10.27	33: M8PFOS	
32	PFOS Total	499 > 80	10.45	33: M8PFOS	
33	M8PFOS	507 > 80	10.45	29: M4PFOS	EIS
34	FtS 8:2	527 > 507	10.99	38: M2-8:2FTS	
35	M2-8:2FTS	529 > 509	10.99	29:M4PFOS	EIS
36	M2PFDA	515 > 470	11.00		REC
37	PFDA	513 > 469	11.00	38: M6PFDA	
38	M6PFDA	519 > 474	11.00	36: M2PFDA	EIS
39	PFNS	549 > 80	11.02	33:M8PFOS	
40	NMeFOSAA	570 > 419	11.41	41: D3-NMeFOSAA	
41	d3-NMeFOSAA	573 > 419	11.41	36: M2PFDA	EIS
42	PFOSA	498 > 78	11.48	29: M8FOSA	
43	M8FOSA	506 > 78	11.48	19: M2PFOA	EIS
44	PFUnDA	563 > 519	11.51	41: M7-PFUDA	
45	M7-PFUDA	570 > 525	11.51	36: M2PFDA	EIS
46	PFDS	599 > 80	11.51	33:M8PFOS	
47	NEtFOSAA	584 > 419	11.68	48: d5-NEtFOSAA	
48	d5-NEtFOSAA	589 > 419	11.68	36: M2PFDA	EIS
49	PFDoA	613 > 569	11.96	50: MPFDOA	
50	MPFDOA	615 > 570	11.96	36: M2PFDA	EIS
51	PFTriA	663 > 619	12.34	50: MPFDOA	
52	PFTeA	713 > 669	12.6	53: M2PFTEDA	
53	M2PFTEDA	715 > 670	12.6	36: M2PFDA	EIS

#	Analyte	Transition	RT	IS	Type
54	M3HFPO-DA	329>285	7.97	19: M2PFOA	EIS
55	HFPO-DA	332>287	7.97	54: M3HFPO-DA	
56	ADONA	377>251	8.00	23: M8PFOA	
57	PFHxDA	813>769	13.20	59: M2PFHxDA	
58	PFODA	913>869	13.50	59: M2PFHxDA	
59	M2PFHxDA	815>770	13.20	36:M2PFDA	EIS
60	NEtFOSA	526>169	11.00	61: NMeFOSA	
61	NMeFOSA	512>169	10.50	63: d3-NMeFOSA	
62	d3-NMeFOSA	515>169	10.50	36: M2PFDA	EIS
63	d5-NEtFOSA	531>169	11.00	36: M2PFDA	EIS
64	NMeFOSE	556>122	11.25	66: d7-NMeFOSE	
65	NEtFOSE	570>136	10.75	67: d9-NEtFOSE	
66	d7-NMeFOSE	563>126	11.25	36: M2PFDA	EIS
67	d9-NEtFOSE	579>142	10.75	36: M2PFDA	EIS
68	FtS 10:2	627>607	11.50	25: M2-6:2FTS	
69	PFDoS	699>99	12.50	33: M8PFOS	
70	9ClPF3ONS	531>351	10.23	33: M8PFOS	
10	11ClPF3OUdS	631>451	11.27	33: M8PFOS	

Appendix G: Third Party Data Validator

Sherif N. Mina

Meridian Consultant Group, Inc. (MCGI)
Ph. (301)803-9207
e-mail: s.mina@meridiancgi.com

Experience Summary: More than 38 years of extensive and diverse experience in various environmental projects, data validation and laboratory operations, including several environmental project management for USACE Baltimore, Norfolk, Louisville, Philadelphia, Alaska, Alabama, and New England Districts; US Navy, and Air Force (AFCEE) organizations; U.S. EPA Headquarters (Region III); and DoE; along with many others. Those projects were in support for several installations/projects for feasibility study (FS), remedial investigation (RI) and remediation projects. Some of these projects are Letterkenny Army Depot, PA, USACE Baltimore District; and APG, MD, USACE Baltimore District; Mechanicsburg, PA, US Navy; Nansemond River Beachfront, VA, USACE Norfolk District; Housatonic River, MA, USACE New England District; Fort Pickette, VA, USACE Norfolk District; and so many others to list.

Strong understanding of scientific issues and the legal implication of technical decisions, with the knowledge of regulatory process. Ability to communicate professionally and act as a liaison with various State and Federal agencies personnel, on all levels, ensuring a successful and strong partnership with the client; with strong Management skills.

Areas of expertise and knowledge include, but not limited to, Laboratory QA/QC, DQA, DQO, QAPjP, Feasibility Study, Environmental Data Validation, Litigation Support, Field Audits, Laboratory Procurement, Support on Environmental Issues, Providing critical support in developing sampling/analysis plans, and Training. Statistical Data Analysis according to USEPA Guidelines for Calculating UCL for Exposure Point Concentrations At Hazardous Waste Sites, December 2002, using the ProUCL software developed by the EPA & Lockheed Martin.

Education: B.S. in Chemistry (1984), Alexandria University, Egypt; M.S. in Applied Chemistry (1987), Alexandria University, Egypt; and Post-graduate studies toward another M.S. in Environmental Science, NJIT, NJ (25 out of 30 Credit Points).

Training/Certification: USEPA, Region I Trained and Certified for Data Validation.

Experience History:

Meridian Consultant Group, Annapolis, MD, 1995-Present. As General Manager/Project Manager, served on a variety of projects supporting several Federal and State Agencies, and private clients.

Project Manager for Letterkenny Army Depot, PA, for over 7 years, in support for RI/FS and remediation, prepared technical and cost proposals for environmental analysis and data

validation, assisted the client in developing and writing the QAPjP & DQO. Participated in several meetings between USEPA Region III and USACE, Baltimore District to help resolving technical issues and problems that arose during the course of the project. Provided technical support to QAPP implementation and data discrepancy and nonconformance identification. Conducted Laboratory Audits, and developed a professional business relation with the laboratory to ensure proper sample analyses and to resolve any problems during the analyses. Provided oversight to the data validation team ensuring high-quality reports for a wide range of sample matrices (Tissue, Air, Wipes, Soils & Aqueous) and analyses. The responsibilities also included interfacing with USEPA, Region III and acting as the client's advocate, in addition to providing Data Management assistance to the client.

Project Manager for Fort Pickette, VA, for over 4 years, in support for RI/FS and remediation, prepared technical and cost proposals for environmental data validation. Conducted a Seminar to USACE, Norfolk District regarding issues with the project and the sample analyses/data validation process. Provided technical direction to QAPjP implementation, including data documentation and document control, data assessment and validation, data discrepancy and nonconformance identification, and field & laboratory QA/QC programs. The project included interfacing with USEPA, Region III to resolve issues regarding the analysis and the validation of the data, and following up with the laboratory to ensure proper sample analyses and to resolve any issues. Provided oversight to the data validation team and reviewed the final reports according to the USEPA Region III Modifications to National Functional Guideline for Organic Data Review, and for Inorganic Data Review.

Also served as **Project Manager/Chemist** on contractual basis to **ERT, Inc**. for analytical data processing and analysis for the following projects: Nike RI/FS, Tobyhanna facility investigation, NASA Goddard Space Flight Center remedial investigation, Savanna Army Depot RI/FS, and former landfills at GSFC. Responsible for providing technical support, reviewing field analytical results, reviewing analytical data, data discrepancy and nonconformance identification, validating data and analysis and creating final data validation reports according to EPA, Region III.

Also served as **QC Officer/Chemist** on contractual basis to **EnviroSystems Laboratory, Inc**. for analytical data QC Review, writing all the laboratory SOPs and QA Manual. Responsible for providing technical support, reviewing analytical data, data discrepancy and nonconformance identification, creating final data packages according to USEPA, CLP Program.

Project Manager for several other major projects including Mechanicsburg, PA, US Navy; with similar roles to the projects above. In addition to providing Statistical Data Analysis according to USEPA Guidelines for Calculating UCL for Exposure Point Concentrations At Hazardous Waste Sites, December 2002, using the ProUCL software developed by the EPA & Lockheed Martin.

Other projects included EIA, DQA, DQO, QAPjP, Environmental Data Validation, Litigation Support, Laboratory Procurement/Audits, Data Management, Support to clients on

Environmental Issues, Developing sampling/analysis plans, and Training. In addition, responsibilities include Proposal Writing, Marketing, Personnel Management, Financial Management and Budget.

Lockheed Martin, Annapolis, MD, 1992-1994. As a Senior Scientist, under the ESAT team, providing support to USEPA, Region III. Responsibilities included Environmental Data Validation for different matrices (Tissue, Wipes, Soil and Aqueous) and wide range of analyses such as VOCs, SVOCs, Pesticides, PCBs, Herbicides, PCBs Congeners, Dioxin/Furan, Explosives, Radiological analysis, Metals, Wet Chem Parameters and others. Wrote and reviewed final data validation reports. Participated in developing the current USEPA Region III modifications to National Functional Guidelines for Data Validation, and conducted a training program for the USEPA, Region III. Also participated in preparing and teaching the course material for a 4-day Training Seminar for the Organic Data Validation, under USEPA, Region III supervision.

Chemalysis, Inc. Savage, MD, 1991-1992. Served as the Organic Laboratory Supervisor, responsible for volatile, semi-volatile, pesticide/PCBs sample analyses and extraction , reviewing all data and the required documentation and preparing final reports.

B&B Environmental, Oakland, NJ, 1989-1991. Served as the Organic Laboratory Supervisor, responsible for volatile, semi-volatile, Pesticide/PCBs sample analyses and extraction , reviewing all data and the required documentation and preparing final reports.

US Testing, Hoboken, NJ, 1988-1989. As GC/MS Chemist, responsible for volatile and semi-volatile sample analyses, reviewing all data and the required documentation and preparing final reports.

CHEMIX Inc., Alexandria, Egypt, 1984-1988. As Chemist, responsible for analyzing and treating Boiler water, routine visits to the clients to help solving problems regarding the operation of their Boiler system, and preparing final weekly reports.

Appendix H

46-70 McLean Avenue, Yonkers, NY

Site Management Forms

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
TEL: (631) 268-8800
FAX: (631) 269-1599

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	**Total to Date**
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Other:

CONTRACTOR CERTIFICATION
I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of _____ (**Contractor Name**), which is responsible for the work documented on this form. According to my knowledge and belief, all of the information provided in this form is accurate and the site management program complies with the DER-10, DER-31, and CP-49 policies. _____ **Date** **Contractor**

Appendix I

46-70 McLean Avenue, Yonkers, NY

Field Activities Plan

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
TEL: (631) 268-8800
FAX: (631) 269-1599

FIELD OPERATING PROCEDURES

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B.1 FIELD SAMPLING PROCEDURES

B.1.1 Sampling Personnel

The activities associated with the remedial investigation will be performed by or under the auspices of a Quality Assurance Officer. The sample staff (samplers) will possess a minimum of a BA Degree in the Earth, Space or Biological Sciences or a BS Degree in Engineering. Samplers will have a minimum of one (1) year experience in environmental/geological fieldwork. Additionally, all samplers will have received mandatory forty-hour Occupational Safety and Health Administration (OSHA) training on working with potentially hazardous materials and appropriate Hazard Communication Program and "Right-To-Know" training.

B.1.2 Geophysical Survey

A geophysical survey will be performed over target portions of the planimetric surface of the subject property utilizing a GSSI model SIR-2 ground penetrating radar (GPR) system equipped with a 400MHz antenna. The survey will be performed to identify the presence of any abandoned and/or active underground injection wells associated with the on-site sanitary systems on the Site.

A GPR system consists of a radar control unit, control cable and a transducer (antenna). The control unit transmits a trigger pulse at a normal repetition rate of 50 KHz. The trigger pulse is sent to the transmitter electronics in the transducer via the control cable. The transmitter electronics amplify the trigger pulses into bipolar pulses that are radiated to the subsurface. The transformed pulses vary in shape and frequency according to the transducer used. In the subsurface, variations of the signal occur at boundaries where there is a dielectric contrast (void, steel, soil type, etc.). Signal reflections travel back to the control unit represented as color graphic images for interpolation. This system is capable of transmitting electromagnetic energy in the frequency range of 16MHz to 2000MHz.

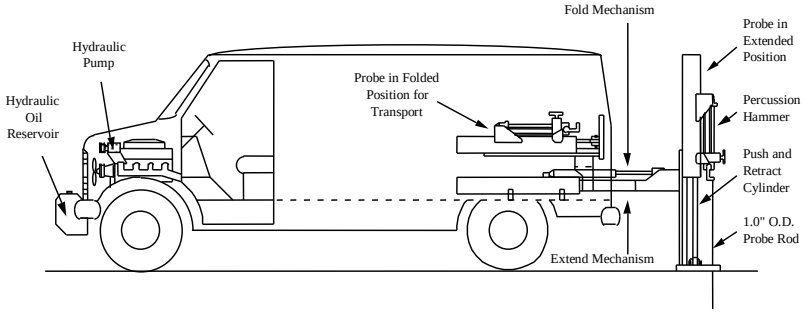
A qualified Impact Environmental Consulting, Inc. technician will specify a coordinate system on the planimetric surface of the site to map any subsurface dielectric anomalies detected on the premises. The operator will use knowledge of the subsurface soil composition to calibrate the SIR-2 system to site-specific conditions. Factor settings such as range, gain, number of gain points, and scans per unit, may be modified to yield the most accurate data to describe the subsurface conditions.

Upon finding a dielectric anomaly, a more spatially specific coordinate system may be designed over the area to determine size, shape and orientation. The data collected during the survey will be reviewed by the operator and compared against past experience, technical judgment and prior site knowledge to classify any detected anomalies.

B.1.3 Subsurface Vapor Probe and Soil Boring Installation/Soil Sampling

Subsurface probes will be installed using a *Geoprobe* hydraulically powered probing tool. Mechanized, vehicle mounted probe systems apply both static force and hydraulically powered percussion hammers for tool placement (static down forces up to 18,000 pounds combined with percussion hammers of eight horsepower continuous output). Recovery of large sample volumes will be facilitated with a probe-driven sampler. The probe-driven sampler consists of a hollow probe, which opens via a remote-control mechanism at the selected sampling depth in the soil profile to allow soil to enter as it was advanced. Discrete media samples will be secured at the desired depths and contained within a non-reactive transparent plastic sleeve that lined the hollow probe. The plastic sleeves will be removed for subsequent inspection and sample aliquot acquisition.

Geoprobe Operating System



B.1.4 Sample Characterization

A visual inspection of all soil samples recovered for the hydrogeological study will be conducted to classify the sample media. Color classifications will be made in accordance with the Munsell Classification System. Gradation classifications will be made in accordance with the Unified Soil Classification System.

B.1.5 Field Headspace Analysis

Headspace analysis will be performed on each of the acquired soil samples utilizing a portable photo ionization detection meter to measure what, if any, hydrocarbon concentrations were present in isolated portions of the secured samples. Calibration of the PID will be conducted prior to sampling using a span gas of known concentration. Headspace analysis will be conducted by partially filling a wide-mouth glass container with sample aliquot and sealing the top with aluminum foil, thereby creating a void. This void is referred to as the sample headspace. To facilitate the detection of any hydrocarbons contained within the headspace, the container will be agitated for a period of thirty (30) seconds. The probe of the vapor analyzer will then be injected through the foil into the headspace to measure the hydrocarbon concentrations present. A Photovac Micro-Tip, photo ionization detection meter (PID) will be the organic vapor analyzer selected for the headspace analysis. A PID utilizes the principle of photo ionization for detection and measurement of hydrocarbon compounds. A PID does not respond to all compounds similarly; rather, each compound has its own response factor relative to its calibration. For this investigation, the PID will be calibrated to isobutylene. Hydrocarbon relative response factors for a PID calibrated to isobutylene are published by the manufacturer.

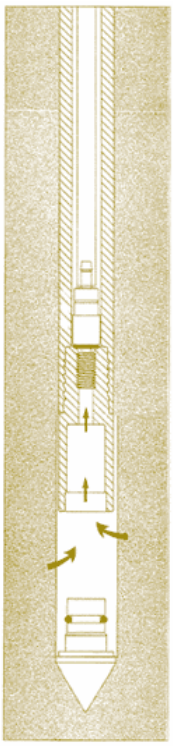
B.1.6 Soil Gas Survey – Photoionization Detector

The concrete slab will be cored at the sampling points using an electric powered core drill. Subsurface probes will be installed using *Geoprobe* manual probing tools. The probes will be equipped with retractable points that allow for soil gas to be measured at discrete depths. Each soil gas sample will be collected from the retractable point utilizing 3/8-inch in diameter disposable tubing. The soil gas will be drawn (purged) for approximately 15 seconds using a portable vacuum pump. The photo ionization detector will then be attached to the tubing to secure a soil gas reading.

B.1.7 Soil Gas Survey –Laboratory Analysis

Subsurface probes will be installed using a Geoprobe operating system. The probes will be equipped with a port run tubing system that allows for soil gas to be measured at discrete depths (see diagram below). This soil-gas sampling device uses a vacuum tight seal that isolates the sample acquisition to the specified depth. This device will assure quality control of the multi-depth soil-gas samples and eliminate the potential for inaccurate data. Each soil gas sample will be collected from the port run tubing system-utilizing 3/8-inch in diameter disposable Teflon tubing. The soil gas will be drawn (purged) for approximately 30 seconds using a portable vacuum pump. The soil gas will be pumped into a decontaminated portable pump and collected within a tedlar bag for preservation. Purging and sample collection flow rates will not exceed 0.2 liters per minute.

Geoprobe Port Run Tubing System



Tracer gas field testing, using helium gas, will be performed on all implants prior to sampling, to verify the integrity of each implant seal and to limit the possibility of sample dilution from surface air. The tracer gas field test will consist of sealing the area surrounding the implant with plastic sheeting and then introduce the tracer gas underneath the sheeting, so that the area where the probe intersects the ground is immersed in the tracer gas. A Model MGD-2002 Multi-Gas Leak Locator or equivalently approved helium detector will be connected to the soil vapor implant and sub-slab vapor implant, in accordance with Section 2.7.5 of the *October 2006, Guidance for Evaluating Soil Vapor Intrusion in the State of New York* NYSDOH guidance document, and tracer gas concentrations in the well will be recorded in the sampling log sheet. This procedure will be duplicated at each implant, prior to sample collection. The laboratory will confirm the field tracer gas tests by first analyzing approximately 85 to 90% of each sample canister for VOC's via USEPA method TO-15 and then use a helium detector to analyze the remaining contents in the Summa Canisters.

The sampling logs with the recorded field tracer gas test measurements and the tracer gas measurements reported by the laboratory will be submitted to NYSDEC with the initial sampling round report. NYSDEC will review the field and laboratory tracer gas test results to determine if the bentonite/cement grout seal

for each implant will require repairs and/or replacement to reduce the infiltration of ambient air and if additional tracer gas field/laboratory testing is required in the subsequent soil vapor sampling round.

B.1.8 Permanent Well Installation

Permanent monitoring wells are installed to provide repeated access to groundwater for collecting samples, as well as for obtaining water-level and other field data. Because monitoring wells are used to collect samples, it is important that construction materials not interfere with sample quality either by contributing contaminants or by sorbing contaminants already present. Further, construction materials must be compatible with (i.e., not degraded by) contaminants present in soils or groundwater.

Monitoring wells are potential contaminant migration routes between aquifers or from the surface to the subsurface. Construction procedures and standards must ensure that neither passive nor active introduction of contaminants can occur. Properly installed hydraulic seals and locking well covers reduce the potential for cross-contamination of monitoring wells.

Equipment needed:

- Drilling or auguring equipment appropriate to site conditions, drilling depth, and other project requirements.
- Drill bits appropriate for the expected soil and rock type(s) to be encountered.
- Sufficient threaded flush-joint riser pipe of an approved material [stainless steel, polyvinyl chloride (PVC)] in convenient lengths. *(NOTE: No glues are permitted.)*
- Sufficient threaded flush-joint slotted screen of an approved material (stainless steel, PVC) to meet design criteria. *(NOTE: No glues are permitted.)*
- Properly sized and washed filter pack material (quartz sand) in sufficient volume to meet well design criteria.
- Powdered bentonite.
- Photoionization detector.
- Steel surface casing (if required).
- Steel protective casing with locking cap.
- Tremie pump and pipe.
- Protective clothing, as required.
- Weighted measuring tape.

The following steps will be followed when installing monitor wells:

1. Advance the borehole to the required depth using a bit or auger flight of a diameter sufficient to allow for insertion of the tremie pipe when the casing is centered. It is preferred that the borehole be at least 2 inches in diameter larger than the casing diameter. The borehole should be drilled slightly deeper than required for the combined length of casing and screen. The final completion depth should be sounded with a decontaminated, weighted tape before continuance of well placement.

2. Make up the screen for installation. The casing and screen must be decontaminated. Tighten joints.
3. Withdraw the drill rods and bit through the auger flights. Check the borehole depth with a weighted surveyor's tape.
4. Lower the casing string into the drill casing.
5. Install the filter pack. Six inches or more of filter pack material should be spotted at the bottom of the hole, under the screen. Filter pack will be installed to 2 - 3 feet above the top of the screen.
6. Check the depth to the top of the filter pack with a weighted tape.
7. Tremie, or for shallow wells (<35 feet), gravity feed bentonite onto the top of the filter pack.
8. Pure bentonite grout (or equivalent) will be used as the annular seal, grout will be mechanically mixed with the appropriate amount of water. For shallow wells (<35 feet) granular bentonite may be substituted for grout.
9. Tremie the grout into the annulus using a tremie. Slowly withdraw the tremie pipe as the annulus fills. Grout the well to within 1 foot of the surface. Compare actual volume of grout placed with calculated volume. Both should be annotated in the field logbook.
10. After installing grout, dismantle and clean tremie equipment.
11. Finish the concrete pad so that it slopes away from the wellhead in all directions with a minimum thickness of 4 inches. If weather conditions warrant, cover the concrete until cured. Lock the well cover.
12. If the well design specified guard posts, dig the holes and set the guard posts in concrete separate from the concrete pad. Posts and concrete must extend to a depth of 2 feet.
13. Record the appropriate construction/completion information in the field logbook and on the appropriate monitoring well installation.
14. If a form was used for the concrete pad, return to the well site after the concrete has cured for at least 24 hours and remove the form. Backfill around the pad with native soil. Drill a weep hole for protective casing and just above the concrete pad.
15. The well identification should be marked on the protective casing and PVC cap. Paint the well cover and posts, if required.

B.1.9 Well Development

Monitor wells are developed to remove fines from the filter pack. Wells should not be developed for 24 hours after completion when a bentonite grout is used to seal the annular space. However, wells may be developed before grouting if conditions warrant. Wells are purged immediately before groundwater sampling to remove stagnant water and a sample representative of groundwater conditions. Wells should be sampled within 3 hours of purging (optimum) to 24 hours after purging (maximum, for low recharge conditions).

Equipment needed:

- Pump, pump tubing, or bailer and rope or wire line
- Water-level meter
- Temperature, conductivity and pH meters
- Personnel protective equipment as specified in the site-specific HASP
- Decontamination supplies
- Disposal drums, if required
- Photoionization Detector

Procedures.

The following steps will be followed when developing wells:

1. Put on personnel protective clothing and equipment as specified in the site-specific HASP.
2. Open and check the condition of the wellhead, including the condition of the surveyed reference mark, if any. Use photoionization detector at wellhead to determine the presence of VOCs (if applicable).
3. Determine the depth to static water level and depth to bottom of the casing.
4. Prepare the necessary equipment for developing the well. There are a number of techniques that can be used to develop a well. Some of the more common methods are bailing, surging and purge, and over pumping.
5. Continue well development until produced water is clear and free of suspended solids.
6. Remove the pump assembly or bailers from the well, decontaminate, and cleanup the site.
7. Lock the well cover before leaving. Dispose of produced water as required by the project work plan.

B.1.10 Monitoring Well Sampling

Monitoring well sampling is conducted with the goal of collecting data representative of groundwater conditions in the subsurface. The data obtained from a sampling event is typically very important for decision making, as it may be used to identify the presence of constituents of concern in groundwater, monitor the performance of a remedial measure, or evaluate the risks to potential receptors.

A written site specific monitoring or sampling plan is typically available that identifies the frequency of sampling, the wells to be monitored, equipment to be used, required laboratory analytical methods and parameters, sampling procedures, equipment decontamination procedures, sample quality

assurance/quality control (QA/QC) measures and data reporting requirements. Each monitoring or sampling plan will vary from one site to the next and should be reviewed when planning for a monitoring well sampling event.

Equipment:

The following is a list of standard equipment needed to conduct monitoring well sampling. Additional equipment may be required based on the sampling techniques and site conditions.

- Health and Safety Plan (HASP)
- Field Book
- Personal Protective Equipment
- Decontamination Equipment
- Traffic Control Devices
- Polyethylene Sheeting
- Bailers
- String
- Pumps
- Power Source to Operate Pumps
- Water Level Meter
- Tubing
- Buckets
- Sample Bottles
- Cooler
- Ice
- Bubble Wrap
- Calculator
- Disposable gloves

Procedures

Monitoring Well Gauging

Monitoring wells are typically gauged before sampling. Gauging includes measuring the depth to water (and/or non-aqueous phase liquids) and depth to bottom in the monitoring well with an electronic water level meter (WLM) or electronic interface probe (EIP). An EIP is used to gauge a well that contains non-aqueous phase liquids (NAPL-floating product). If wells do not contain NAPL, then a WLM is sufficient. The list of monitoring wells to be gauged should be provided in the monitoring or sampling plan and listed on the PTA. The entire network of monitoring wells should be gauged before sampling begins.

Sample Bottles

Groundwater samples are collected into laboratory supplied bottles. Bottles are typically ordered from the laboratory in advance of the sampling event. The size, bottle material (glass, plastic), and number of

bottles required for each sample will depend on the constituents being analyzed for and the analytical methods. Bottles delivered from the laboratory may contain a small amount of preservative. The preservative is to remain in the bottle. Overfilling the bottle may result in dilution of the preservative and should be avoided. When sampling for volatile compounds, no air (bubbles) may be present in the sample bottle.

Sampling Techniques

Many different techniques exist for sampling monitoring wells. The techniques vary depending on the constituents of concern, depth to groundwater, diameter of monitoring well and regulatory requirements. The technique appropriate for a specific site should be identified in the monitoring and sampling plan

Purging

Many of the sampling techniques include purging the monitoring well prior to sample collection. Purging is indented to remove stagnant water from the monitoring well after which a representative sample of the groundwater from the subsurface can be collected. During purging, three to five volumes of standing water in the well are removed. The volume of water in a monitoring can be calculated using the following equation:

Feet of standing water in well * Conversion factor = 1 well volume

Example:
10' * 0.65 = 6.5 gallons (1 well volume)

Well Diameter (in inches)	Conversion Factor
½	0.01
1	0.04
2	0.16
3	0.37
4	0.65
6	1.50

Purge water must be managed in accordance with the monitoring or sampling plan and local regulations.

Field Monitoring

Monitor indicator parameters (main indicator parameter for VOCs is DO) during purging, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, Eh and DO) at three to five-minute intervals. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:

1. 50 NTUs for turbidity

+/-0.1 for pH

2. +/-3% for conductance
3. +/-10 mv for redox potential
4. +/-10% for DO and turbidity

Sample Chain of Custody

The chain of custody (COC) form is used to record the inventory of samples to be delivered to the laboratory and document the transfer of custody from the sampler to the laboratory. All samples, including QA/QC samples, to be delivered to the laboratory must be listed on the COC along with requested analytical methods and parameters. The COC is to remain with the samples from the time of collection until receipt at the laboratory.

Sample Handling, Storage and Shipment Samples should be stored in laboratory-supplied coolers immediately after sampling. The cooler must contain ice in order to bring the temperature of the sample to 4 degrees Celsius. Samples must remain on ice until received by the laboratory. Care must be exercised to ensure that bottles do not break during handling of the cooler. Glass-on-glass contact often leads to breakage and should be avoided by wrapping each bottle in bubble wrap material.

Samples are to be delivered to the laboratory in coolers as soon as possible after collection. Each laboratory analytical method has a unique holding time, which is defined as the maximum time between sample collection and analysis by the laboratory. Samples analyzed after the hold time are usually considered invalid. Hold times may vary from one day to 6 months depending on the laboratory analytical methods. Holding time information can be obtained from the laboratory. It is the responsibility of the sampler to confirm that the delivery method will ensure receipt of the samples by the laboratory within the allotted holding time.

Sample delivery options include: shipment by common courier, personal delivery to the laboratory and delivery by the laboratory's courier service. Each laboratory may have a preferred sample delivery process. Coolers must be packed with sufficient amounts of ice and bubble wrap material to ensure the samples will be received by the laboratory intact and at an acceptable temperature. A custody seal, provided by the laboratory, should be placed over the opening between the lid and the base of the cooler, and the seal ID number recorded on the chain of custody form. The custody seal provides a means of alerting the laboratory if the cooler has been opened, and potentially tampered with, between the time it was sealed by the sampler and received by the laboratory. Guidance on cooler packing may be obtained from the laboratory.

Decontamination

Decontamination is necessary to avoid cross-contaminating samples. Sampling equipment that is not dedicated to a specific well must be decontaminated before sampling and after each sample is collected. Decontamination procedures may be specific to the site's monitoring or sampling plan. Typical equipment decontamination procedures may include rinses in the following sequence:

1) Tap water rinse
2) Alconox rinse
3) Tap Water Rinse
4) Deionized water rinse

When possible, samples should be collected from the least contaminated wells first and progress onto the more contaminated wells in order to reduce chances of sample cross-contamination.

Documenting a Monitoring Well Sampling Event

Information from the monitoring well sampling event must be documented on a field data form or recorded in the site-specific field book. Information to be recorded includes weather conditions, well integrity issues, well gauging information, purge volumes, sampling equipment and supplies used, sample identifications, sample collection times and the presence of any conditions that may compromise the integrity of the samples.

B.1.11 Low Flow Well Purging and Sampling

Purpose

The purpose of the low flow (low formation stress) purging and sampling procedure is to collect groundwater samples from monitoring wells that are representative of ground water conditions in a particular geological formation. This is accomplished by setting the intake velocity of the sampling pump to a flow rate, which limits drawdown inside the well casing. The placement of the intake of the sampling pump should be midway within the most permeable zone of the formation.

Equipment

- Pump system (adjustable rate, positive displacement groundwater sampling pump e.g., bladder or centrifugal pump)
- Control box (with or without a built-in compressor)
- Compressed Nitrogen tank (if necessary)
- Indicator parameter monitoring device(s)

- Flow measurement device (Flow cell)
- Personal Protection Equipment (PPE)
- Field Book
- Health and Safety Plan (HASP)
- Tools to access monitoring wells
- Disposable gloves
- Kevlar gloves
- Safety cones
- Sample containers (provided by laboratory)
- Chains of Custody (provided by laboratory)
- Blank or Pre-printed labels
- Glassware with appropriate preservative (provided by the laboratory)
- Ice
- Calculator
- Adsorbent pads
- Electronic interface probe
- Decontamination equipment
- String
- Appropriate size bailers
- Tubing (preferably Teflon for organics)

Procedure

Remove the gripper cap at all well locations and allow the water table to equilibrate, take care to secure all wells by closing the flush mount covers. Start sampling at the well-known or believed to have the least contamination and systematically to the most contaminated well, remembering to conduct proper decon procedure. During gauging and sampling activities equipment should not come into direct contact with the ground surface, plastic sheeting may be utilized as a clean and disposable working surface.

Slowly lower the pump to the depth specified for that well, the pump intake should never be set within two feet of the bottom of any well. This prevents disturbance and resuspension of any sediment. Record the depth of the pump intake. Re-measure the water level and begin purging, keeping the purge rate within 200-500 millimeters per minute (ml/min). Water level should be measured and recorded at three to five-minute intervals. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less is desired). Monitor indicator parameters (main indicator parameter for VOCs is DO) during purging, monitor and record the field indicator parameters (turbidity, temperature,

specific conductance, pH, Eh and DO) at three to five-minute intervals. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:

1. 50 NTUs for turbidity
2. +/-0.1 for pH
3. +/-3% for conductance
4. +/-10 mv for redox potential
5. +/-10% for DO

Collect sample from dedicated or disposable tubing. Remove any non-dedicated equipment from the well. Secure all wells. Fill out the chain of custody. At the end of the sampling day, coolers will be taped shut with the custodian's initials placed on custody seals at points of entry. Samples will be shipped via lab courier to the contract laboratory for morning delivery, picked up by courier or delivered directly to the laboratory by the field personnel at the end of the sampling day.

Contact with the laboratory will be made within 24 hours after each sampling event to ensure that samples arrived safely and with proper integrity preserved.

B.1.12 Grouting Bore Holes

Subsequent to the completion of each soil and groundwater probe installed during the remedial investigation, bottom-up grouting of the borehole will be conducted to grade. The grouting system was designed specifically for direct push applications. With powerful reciprocating (piston) pumps, the Geoprobe Grout Machines will deliver standard ASTM grout materials through 1.25-inch diameter Geoprobe probe rods or through 3/8-inch (1/4-inch inside diameter) polyethylene tubing. The pump is rated at 1000 psi with flow rates from 0.9 to 2.3 gpm.

B.1.13 Emerging Contaminant PFAS

The NYSDEC requires analysis for Per- and Polyfluoroalkyl Substances (PFAS) for new remedial program Sites as part of the investigation of potentially affected media, including soil, groundwater, surface water and sediment as an addition to the standard TAL/TCL sampling. Soil vapor sampling for PFAS is not required.

The following is the list of the 21 PFAS compounds identified by the NYSDEC for investigation:

- Perfluorobutanoic Acid
- Perfluoropentanoic acid
- Perfluorohexanoic acid
- Perfluoroheptanoic acid
- Perfluorooctanoic acid (PFOA)
- Perfluorononanoic acid
- Perfluorodecanoic acid
- Perfluoroundecanoic acid
- Perfluorododecanoic acid
- Perfluoro-n-tridecanoic acid
- Perfluorotetradecanoic acid
- Perfluorobutane sulfonic acid
- Perfluorohexane sulfonic acid
- Perfluoroheptane sulfonic acid
- Perfluorooctane sulfonic acid (PFOS)
- Perfluorodecane sulfonic acid
- 6:2 Fluorotelomersulfonic acid
- 8:2 Fluorotelomersulfonic acid
- Perfluorooctanesulfonamide
- N-methyl perfluoro-1-octanesulfonamidoacetic acid
- N-ethyl perfluoro-1-octanesulfonamidoacetic acid

PFAS Sampling Protocol:

Since the probability of false positives is relatively high during PFAS sample collection, due to the potential for many sources of cross-contamination combined with the low laboratory detection limits, guidance is needed for staff who will perform subsurface investigation activities (i.e., soil borings, monitoring well installation) and for staff collecting and/or handling PFAS environmental samples.

There are many products/materials/supplies that contain PFAS which pose a greater risk for introducing PFAS contamination into a sample during the sample collection process. These sources include the water used during drilling or decontamination, materials used within the sampling environment, sampling equipment, field clothing and personal protective equipment, sun and biological protection products, personal hygiene and personal care products, food packaging and the environment itself.

Field Clothing and Personal Protective Equipment (PPE)

Due to the extensive use of PFAS in many industries and products, clothing and PPE are likely to contain PFAS. Personnel completing field investigation work that will include the collection of samples for PFAS

analysis will need to address the physical, chemical and biological hazards associated with the Site. Field planning is essential to mitigate the potential for PFAS cross-contamination and to maintain personal safety.

- No clothing or boots with protective coatings can be worn (e.g., waterproof, water-repellent, fire-repellant or stain-resistant clothing or footwear). No Gore-Tex® or Tyvek material clothing/boots.
- Clothing worn during the collection of samples for PFAS analysis should be made of natural fibers (preferable cotton) and must have been previously washed a minimum of 5 times (i.e. no new clothing), without fabric softener and not with other clothing that may contain coatings.
- Use disposable, coating-free polyethylene coveralls and boot as applicable.
- Do not use personal care products on the day of sample collection:
    - Use PFAS-free soap and shampoo when scheduled for sample collection.
    - Limit toothpaste, mouthwash and dental floss to fluoride free options.
    - Do not use lotions, moisturizers, cosmetics, sunscreen or insect repellents prior to sampling.
- Use disposable, nitrile gloves.
- Do not use aluminum foil, prepackaged food, fast food wrappers or containers.

<u>Field Sampling Equipment/Materials</u>:

Because of the potential presence of PFAS in equipment typically used for drilling and to collect soil, groundwater, surface water, sediment, and drinking water samples, as well as the need for very low reporting limits, special handling and care must be taken when collecting samples for PFAS analysis to avoid sample contamination. The following guidance should be considered when using field sampling equipment.

- A screening of the equipment and materials that will be used during field sampling activities must be completed to identify equipment/materials that may be potential PFAS sources.
- Identify and use a PFAS free water source for drilling and decontamination of equipment.
- Use high density polyethylene [HDPE] water holding tanks.
- Use HDPE or silicone tubing materials.
- Use HDPE or polypropylene containers with HDPE or polypropylene caps.
- Use regular ice and Ziploc bags where there is no direct contact with the sample.
- Use loose plain paper, metal clipboard, ballpoint pens.
- When feasible, utilize single-use, disposable polyethylene or silicone materials (tubing, bailers, etc.) for monitoring well purging and sampling.

- Consumable core liners and catchers must be PVC.
- When using positive displacement/submersible pumps, familiarize yourself with the sampling pump/accessory equipment specifications to confirm that the device components do not contain Teflon® or Polytetrafluoroethylene (PTFE). Do not use pumps and tubing that contain Teflon™ and other fluoropolymer-containing materials.
- Do not use waterproof/treated paper or field books, plastic clipboards, water proof markers, Post-its and other adhesive paper products.
- Do not use passive diffusion bags for groundwater sampling.
- Do not use low density polyethylene (LDPE) sampling equipment/materials.
- Do not use drill casing thread lubricants that contain PFAS. Verify with supplier.
- Do not use LDPE or glass bottles with Teflon™-lined caps.
- Do not use chemical ice packs (i.e., Blue ice®).
- Do not handle any packaged food or drinks, aluminum foil, adhesive labels, etc. at or around sampling site.

Equipment Prep and Decontamination Procedures

The following procedure should be used to decontaminate HPDE, polypropylene or stainless-steel equipment used to collect samples for PFAS analysis. Because of the extremely low detection and reporting levels required for PFAS analysis, precaution should be taken to ensure decontamination materials (e.g., soap, tap water, deionized water) are not contaminated with PFAS prior to use. Traditional best practice techniques and procedures shall be subject to modification to prevent the introduction of non-site-derived contaminants including PFAS. Sample containers will be new and used only once for each sample and disposable equipment (e.g., gloves, tubing, etc.) will not be reused, therefore; these items will not require decontamination. All non-dedicated or non-disposable sampling equipment (i.e., the stainless-steel compositing vessel(s), flow-through cell, etc.) will be decontaminated between sample locations. The following guidance should be considered when preparing equipment and decontamination of equipment.

- An equipment decontamination area with a decon pad should be set up in the field to accommodate the sampling and drilling equipment.
- General Sampling Equipment Decon:
    - Rinse equipment with PFAS free – municipal PFAS free water to remove solids.
    - Use a polyethylene or poly vinyl chloride (PVC) brush and a low-phosphate lab detergent (i.e., Alconox) to scrub the equipment to remove residue and particulates.
    - Triple rinse clean equipment with PFAS Free deionized water and let air dry.

- Decontaminate sampling equipment after sampling at each location, or at the end of the field work day.
- The decontamination water should be changed between equipment cleanings.
- Clean, decontaminated equipment will be placed on clean polyethylene plastic or HPDE sheets to air dry. Direct contact with the ground will be avoided.

- Drilling Equipment Decon:
  - Drilling equipment, including rig, tooling, augers, bits, samplers, tremie pipes, etc. will be cleaned with a hot water pressure washer within a decon pad constructed of on clean polyethylene plastic or HPDE sheets and barriers to contain liquid generated.
  - The clean drilling equipment will be rinsed with PFAS Free deionized water and let air dry on clean polyethylene plastic or HPDE sheets.
  - Drilling equipment must be cleaned before beginning work (when applicable), in-between/following completion of borings, wells, and at the end of the field work day.
  - Tools, drill rods, and augers will be placed on polyethylene plastic or HPDE sheets following pressure washing. Direct contact with the ground will be avoided.
  - Decon water will be temporarily collected in 55-gallon drums and transported to a waste accumulation area for later disposal.
- Well Development Equipment Decon:
  - Prior to well development, non-dedicated equipment (e.g., bailers, PFOS-free pumps, etc.) will be washed with potable water and a PFC/phosphate-free detergent (i.e., Alconox®).
  - The sampling equipment will then be rinsed with potable water followed by a triple rinse with PFAS Free deionized water.
  - The clean/decontaminated equipment will be placed on polyethylene plastic or HPDE sheets to air dry. At no time, will washed equipment be placed directly on the ground.
  - Decon water will be temporarily collected in 55-gallon drums and transported to a waste accumulation area for later disposal.

Sample Collection

PFAS are ubiquitous in consumer products and the pervasive presence of these chemicals coupled with very sensitive analytical methods makes contamination of samples both in the lab and the field a significant concern from sources extraneous of the environmental media being sampled. The following guidance should be considered when undertaking collection of samples for PFAS analysis.

- Transport of sample collection supplies and equipment have the potential to come into contact with carpets and fabric in vehicles which have likely been treated with stain-resistant/water proofing containing PFAS. Steps should be taken to minimize this contact by packaging supplies

and equipment in the designated coolers and/or using polyethylene plastic or HPDE sheets as a barrier.

- Sample container labels should be prepared to the extent possible using a ball-point pen only before arrival at the sampling site and completed at the Site with a ball point pen; do not use sharpie or other permanent markers. No waterproof logbooks or plastic clipboards are to be used.
- Keep materials/equipment that may contain PFAS away from the sampling area and avoid physical contact with anything likely to contain PFAS (e.g., food, clothing, personal care products, etc.) during the sample collection process.
- Maintain an inventory of items used/maintained in the sampling area.
- If other sampling is to be performed, ALWAYS collect PFAS samples first. This avoids contact with any other type of sample container, bottles or package materials
- All sample containers use for PFAS sampling must come from the laboratory that will also be performing the PFAS analysis. Recommended sampling containers should be HDPE bottles fitted with unlined (no Teflon) polyethylene screw caps.
- Sample containers must be stored in a PFAS free container prior to sampling.
- For all environmental media, hands should be washed well before sampling.
- Wear disposable, powder free nitrile gloves to handle sampling equipment and sample containers. Clean nitrile gloves should be used when collecting the sample.
- Take precautions not to touch any surfaces prior to sample collection.
- As with all other samples, do not place the sample bottle cap on any surface when collecting the sample, and avoid all contact with the inside of the sample bottle or its cap.
- Sample directly into the provided HDPE bottle seal with cap. Place the bottles into individual sealed plastic bag (e.g. Ziploc®) separate from other samples in a clean, dedicated cooler for PFAS samples only.
- Use bagged ice (PFAS free) in the dedicated PFAS sample cooler; NO chemical ice packs in this cooler.
- No samples collected for other parameters can be stored with the PFAS samples.

PFAS Analysis and Reporting

The designated analytical laboratory must provide a full category B deliverable, and a DUSR will be prepared by an independent 3rd party data validator. QA/QC samples will be collected as required in DER-10, Section 2.3(c).

Modified EPA Method 537.1 is the preferred method to use for environmental samples due to its ability to achieve very low detection limits. Reporting limits for PFAS in groundwater and soil are to be 2 ng/L (ppt) and 0.5 ug/kg (ppb), respectively. If contract labs or work plans submitted by responsible parties indicate that they are not able to achieve these reporting limits for the entire list of 21 PFAS, site specific decisions will need to be made by the NYSDEC project manager in consultation with the NYSDEC remedial program chemist. Note: Reporting limits for PFOA and PFOS in groundwater should not exceed 2 ng/L.

The NYSDEC has developed a PFAS Analyte List for remedial programs. If lab and/or matrix specific issues are encountered for any compounds, the NYSDEC PM, in consul with the NYSDEC Remedial Program Chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each Site.

Summary of Prohibited and Acceptable Items for PFAS Sampling

Prohibited	Acceptable
Field Equipment	
Teflon/Silicone containing materials	HDPE, stainless steel, polypropylene materials
LDPE materials	Acetate liners
Waterproof field books/paper/bottle labels	Loose non-waterproof paper, and non-waterproof sample labels
Plastic Clipboards/binders/hard cover notebooks	Aluminum field clipboards or with Masonite
Waterproof markers/sharpies	Pens
Post-it-notes	Wet-ice
Chemical ice packs	
Field clothing and PPE	
New cotton clothing or synthetic water resistant, waterproof, or stain-treated clothing, clothing treated with Gore-Tex	Well laundered clothing made of natural fibers (preferably cotton)
Clothing laundered with fabric softener	No fabric softener
Boots containing Gore-Tex or treated with water resistant spray	Boots made with polyurethane and PVC
Tyvek	Laundered cotton clothing
Cosmetics, moisturizers, hand cream etc. as part of personal cleaning/showering routine, or non-natural toxic containing sunscreens and insecticides	Natural, non-toxic, and natural sunscreens/insect repellents.
Sample Containers	
LDPE or glass containers	HDPE or polypropylene
Teflon-lined caps	Unlined polypropylene caps
Rain events	
Waterproof or resistant rain gear	Wet weather gear made from polyurethane and PVC only
Equipment Decontamination	
Decon 90 Liquinox Water from onsite well	Alconox 7th Generation Free & Clear Dish Soap
Food considerations	
All food and drink with the exceptions of those noted on the right	Bottled water with hydration fluids (i.e. Gatorade and Powerade) to be brought and consumed only in staging areas
Vehicle Considerations	
Vehicle fabrics, carpets and mats may contain PFAAs	Avoid utilizing areas inside vehicles as sample/staging areas

B.1.14 Emerging Contaminant 1,4-Dioxane

The NYSDEC requires analysis for 1-4 Dioxane for new remedial program Sites as part of the investigation of potentially affected media, including soil, groundwater, surface water and sediment as an addition to the standard TAL/TCL sampling. Soil vapor sampling for 1,4-Dioxane is not required. 1,4-Dioxane is used as a stabilizer and inhibitor in chlorinated solvents, and used for a wide variety of other industrial processes. It is present in adhesives, sealants, cosmetics, pharmaceuticals, rubber chemicals and surface coatings.

The NYSDEC reporting limit for 1,4-dioxane in groundwater should be no higher than 0.35 µg/L (ppb) and no higher than 0.1 mg/kg (ppm) in soil. Materials used in environmental sampling can be a source of 1,4-dioxane contamination. 1,4-Dioxane also might be present in detergents used to decontaminate environmental sampling equipment.

Because of the potential presence of 1,4-dioxane in equipment typically used to collect environmental samples, as well as the need for very low reporting limits, special handling and care must be taken when collecting samples to avoid sample contamination. The best practice techniques and procedures provided in Section B.1.13 entitled *Emerging Contaminant PFAS* should be implemented when collecting samples for 1,4-dioxane analysis.

Although ELAP offers certification for both EPA Method 8260 SIM and EPA Method 8270 SIM in waters, the NYSDEC DER is advising the use of Method 8270 SIM because it provides a more robust extraction procedure, uses a larger sample volume, and is less vulnerable to interference from chlorinated solvents. The analysis currently performed for SVOCs in soil is adequate for evaluation of 1,4-dioxane in soil, which already has an established SCO.

B.2 QA/QC FIELD PROCEDURES

B.2.1 Decontamination Procedures

Prior to arrival on the Site and between sample locations, the probes will be decontaminated by steam cleaning, Alconox wash, and rinsing with distilled water. This will be followed by air drying as per project requirements. All sampling apparatus will be dedicated or disposable. A clean, new liner will be used for each sample. Parts will be inspected for wear and damage before each use.

B.2.2 Field Blanks

A field blank is a sample of analyte-free water transferred, at the project site, into an appropriate container for the purpose of distinguishing ambient air contamination from in-situ sample contamination. Field blanks are used to indicate potential cross contamination from sampling equipment as quality control of decontamination procedures. With regards to field sampling, one field blank will be collected for every work day. The procedures for obtaining a field blank sample are as follows:

- Collect two sets of sample vessels. One vessel shall contain analyte free water and the other is empty.
- Run the analyte free water through the decontaminated sampling equipment into the empty vessel. Analye the water of this collecting vessel for target analytes.

B.2.3 Trip Blanks

A trip blank is used to identify the presence of volatile compound contamination attributable to transfer across a sample container septum during shipping and storage of samples. A trip blank is a sample of analyte-free matrix that is transported from the laboratory to the sampling site with the sample containers. The trip blank is stored on-site with the sample containers and field samples and then transported back to the laboratory with the samples for analysis. The trip blank is received and processed as a sample by the laboratory. One trip blank shall be submitted per pickup from laboratory personnel.

B.2.4 Duplicate Samples

Duplicate sample collection will apply to groundwater, soil, soil vapor and ambient air samples collected at this Site. A duplicate (replicate) sample is collected to control the general sampling methodology that is being employed. This sample ensures that a representative sample is being collected. Duplicate samples may also be submitted to verify the accuracy of analytical results.

B.2.5 Matrix Spike/Matrix Spike Duplicate Samples

Matrix Spike/Matrix Spike Duplicate sample collection will apply to groundwater samples collected at this Site. A Matrix Spike and Spike Duplicate (MS/MSD) sample(s) are representative but randomly chosen client samples that have known concentrations of analytes of interest added to the samples prior to sample preparation and analysis. They are processed along with the same un-spiked sample. The purpose of the MS/MSD is to document the accuracy and precision of the method for that specific sample.

B.3 RECORD KEEPING AND DOCUMENTATION PROCEDURES

B.3.1 Sampling Documentation

The sample team or individual performing an activity shall be required to keep a weatherproof Site field notebook. The Site field notebook will be used on-site to record notes pertaining to the field sampling plan. Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during projects and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence. The field notebook entries should be factual, detailed, and objective. All entries are to be signed and dated. All members of the field investigation team are to use this notebook, which shall be kept as a permanent record. The field notebook shall be filled out at the location of sample collection immediately after sampling. It shall contain sample descriptions including: sample number, sample collection time, sample location, sample description, sampling method used, daily weather conditions, field measurements, name of sampler, and other site-specific observations. The field notebook shall contain any deviations from the protocol contained herein, visitor's names, and community contacts made during sampling, and geologic and other site-specific information that may be noteworthy.

B.3.2 Sample Containers and Analytical Requirements

All sample vessels will be "level A" certified decontaminated containers supplied by a New York State Certified Commercial Laboratory. Samples analyzed for hydrocarbons will be placed in containers with Teflon lined caps. All samples will be preserved by cooling them to a temperature of approximately four degrees Celsius. If glass bottles are used, extra glass bottles will be obtained from the laboratory to allow for accidental breakage that may occur. Necessary preservatives will be placed in the sample bottles by the laboratory. The sample bottles will be handled carefully so that preservatives and glassware are not inadvertently spilled. All liquid samples will be put into 40-ml glass vials with Teflon liners.

B.3.3 Sample Tracking System

In order to provide for proper identification in the field, and proper tracking in the laboratory, all samples must be labeled clear and in a consistent fashion using the procedures and protocols described below and with the following subsections.

Sample labels will be waterproof and have a pre-assigned, unique number that is indelible.

Field personnel must maintain a field notebook. This notebook must be water resistant with sequentially numbered pages. Field activities shall be sequentially recorded at a later time. The notebook, along with the chain of custody form, must contain sufficient information to allow reconstruction of the sample collection and handling procedure at a later time. Each sample shall have a corresponding notebook entry that includes:

- Sample ID number
- Well location and number
- Date and time
- Analysis for which sample was collected
- Additional comments as necessary
- Sampler's name

Each sample must have a corresponding notebook entry on a chain-of-custody form. The manifest entry for sampling at any one location is to be completed before sampling is initiated by the same sampling team at any other location. In cases where the samples leave the immediate control of the sampling team, the samples must be sealed.

B.3.4 Sample Identification System

Each sample collected shall be designated by an alphanumeric code that shall identify the type of sampling location, the specific location, the matrix sampled, and a specific sample designation. Site specific procedures are described below.

Sample identifications shall contain a sequential code consisting of three segments. The first segment shall designate the project number. The second segment shall identify the location type. Location types shall be identified by a two-letter code. For example, MW will be used for monitoring well and GP for geoprobe. The third segment shall identify the specific sample location. The specific sampling location shall be identified using a three-digit number.

The fourth segment shall identify the matrix type and sample designation or identifier that identifies the sample depth, the sample event number, or other designation depending on the sample type. The matrix type shall be designated by a two-letter code. For example: GW will be used for groundwater. The sample identifier shall be represented by a two digit numeric code. Sampling events or rounds, such as for groundwater sampling shall be numbered in sequence beginning with "01" that corresponds to the round of sampling.

The following shall be a general guide for sample identification:

First Segment	Second Segment	Third Segment	Fourth Segment
NNN	AA	NNN	AANN
Project #	Location Type	Specific Type	Matrix Sample Identifier
455	GP	1	GW01

Symbol Definitions:	Location Type:	Matrix Type:
A = Alphabetic	MW = Monitoring Well	S = Soil
N = Numeric	GP = Geoprobe	GW = Groundwater

B.3.5 Sample Transfer

Samples shall be containerized and immediately transferred within a cooler to the mobile laboratory with minimal disturbance. Chain-of-custody forms will be completed at the time of sample collection and will accompany the samples inside a cooler for transfer from sample team to mobile laboratory representatives.

B.3.6 Chain-of-Custody Protocol

The primary objective of the sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. Sample custody for samples collected during the investigation will be maintained by the field personnel collecting the samples. Field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are transferred to the mobile laboratory.

Appendix J

46-70 McLean Avenue, Yonkers, NY

HASP

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
TEL: (631) 268-8800
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CONSTRUCTION HEALTH AND SAFETY PLAN

NYSDEC BROWNFIELD CLEANUP PROGRAM

Submitted for:

46-70 McLean Avenue Auto Repair Laundry Site
46-70 McLean Avenue
Yonkers, New York 10705
Westchester Tax Map Designation: Section 1, Block 203; Lot 51.61

Submitted to:

Environmental Remediation - Site Control Section
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-7020

Prepared for:

SnL Yonkers, LLC
3333 New Hyde Park Road, Suite 200
Lake Success, New York 11042

July 28, 2023
IEC Project Number: #15514

IMPACT ENVIRONMENTAL | 170 Keyland Court | Bohemia | New York | 11716 | 631.269.8800

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1 Introduction

This Construction Health and Safety Plan (CCHASP) describes the procedures to be followed in order to reduce employee exposure to potential health and safety hazards that may be present during environmental remediation activities being performed at the Site. The emergency response procedures necessary to respond to such hazards are also described within this CHASP. All activities performed under this CHASP are targeted to comply with Occupational Safety and Health Administration (OSHA) Regulations 29 CFR Part 1910.1025.

This document is not, nor does it purport to be, a complete description of all safety and health requirements applicable to work performed at the site. Rather, the CCHASP is a general overview of the compliance policies and work practices applicable to the primary tasks and hazards associated with the environmental assessment portion of the development project, as well as a recitation of minimum safety and health compliance obligations for contractors, subcontractors and workers at the site. All subcontractors of any tier operating at the worksite are obligated to implement and maintain comprehensive safety and health plans for their own employees and to ensure that their employees comply with all applicable safety and health requirements. All subcontractors operating at the worksite should refer to the applicable specific OSHA Standards for detailed requirements.

1.1 Purpose

The purpose of this CCHASP is to provide the contractors' field personnel, as well as other site-occupants, with an understanding of the potential chemical and physical hazards that exist or may arise while portions of this project are being performed. To this end, this CCHASP also presents information on the progression of the environmental restoration activities and specific details regarding the handling of materials excavated from the Site.

The primary objective is to ensure the well being of all field personnel and the community surrounding this site. In order to accomplish this, project staff and approved subcontractors of any tier shall acknowledge and adhere to the policies and procedures established herein. Accordingly, all personnel assigned to the remediation activities associated with this project (Remedial Personnel) shall read this CCHASP and sign the Agreement and Acknowledgment Statement (**Appendix A**) to certify that they have read, understood, and agree to abide by its provisions. A copy of this CHASP will be available to anyone that requests it. Personnel involved in construction activities (Construction Personnel) and other Personnel (e.g. government officials, administrators, bank inspectors, assessors, etc.) that will have limited exposure to the site native soil/fill material during construction activities will be instructed on how to reduce the probability of exposure to site contaminants, but will not be required read the CHASP.

2 Application of Health and Safety Plan

The procedures of this CCHASP apply for any person that will enter the boundaries of the site or a portion of the Site during environmental remediation activities or construction, until the existing soil/fill material has been covered with either a paved surface or an uncontaminated soil cap. When the Project Manager has designated an area of the site as clear of any environmental issues, construction contractors and subcontractors of any tier will perform the balance of the work in accordance with their individual OSHA-compliant corporate CHASP.

2.1 Restoration Personnel

Employees of contractors and subcontractors of any tier performing the following activities will be considered Restoration Personnel:

- Excavation of native soil/fill material
- Loading of native soil/fill onto vehicles
- Processing of native soil/fill into components
- Transporting of native soil/fill across the site
- Sampling of native soil/fill material for subsequent physical or chemical analysis
- Cleaning or decontaminating equipment or personnel
- Handling of ground waters

All subcontractors, of any tier, must submit a CHASP to the Site Health and Safety Officer for review and approval prior to mobilizing to the site. Only CHASPs that comply with this CHASP will be approved. Where a subcontractors CHASP is deficient, the Site Health and Safety Officer will provide written notification of any required changes. Approved CHASPs will be submitted to the Project Manager and retained on-site for reference by the Site Health and Safety Officer.

2.2 Construction Personnel

For this document, “Construction Personnel” is the term given for those employees of contractors and subcontractors of any tier performing activities associated with site development other than those performed by the Remedial Personnel. This designation does not preclude that Construction Personnel will traverse or work upon native soil/fill material, rather, it infers that it will not involve performing tasks that will create a route of exposure to the contaminants contained therein. Construction Personnel will receive instruction to limit the potential for exposure to these contaminants. Construction Personnel will be prohibited from entering Environmental Remediation Areas (i.e., active excavation / handling / processing areas, loading areas, exclusion zones or support zones).

3 Key Personnel / Identification of Health & Safety Personnel

3.1 Key Personnel

A list of the pertinent personnel authorized to be present on site is as follows:

Title	Name	Telephone Number
Senior Project Manager *Impact Environmental*	Greg Mendez-Chicas	(O) 631-269-8800 ext: 124 (C) 908-763-5095
Project Manager *Impact Environmental*	Chris Connolly	(O) 631-269-8800 ext: 152 (C) (631) 664-4425
Field Operations Leader *Impact Environmental*	Daniel Fruhauf	(O) 631-269-8800 ext: 141 (C) 631-901-2470
Site Health & Safety Officer *Impact Environmental*	Marius Sidlauskas	(O) 631-269-8800 ext: 121

3.2 Organizational Responsibility

3.2.1 Senior Project Manager

The Senior Project Manager will be responsible for implementing the project and obtaining any necessary personnel or resources for the completion of the project. Specific duties will include:

- Selecting a Site Health and Safety Officer and field personnel for the work to be undertaken on site;
- Providing authority and resources to ensure that the Site Health and Safety Officer is able to implement and manage safety procedures;
- Preparing reports and recommendations about the project to clients and affected personnel;
- Ensuring that all persons allowed to enter the site (e.g.., EPA, contractors, state officials, visitors) are made aware of the potential hazards associated with the substances known or suspected to be on site, and are knowledgeable as to the on-site copy of the specific CHASP; and
- Ensuring that the Site Health and Safety Officer is aware of all of the provisions of this CHASP and is instructing all personnel on site about the safety practices and emergency procedures defined in the plan.

3.2.2 Project Manager

The Project Manager will be responsible for implementing the Senior Project Manager' duties as well as oversee activities regarding the project both in the field and in the office as well as interact with environmental regulatory agencies, sub-contractors and internal company personnel.

- Coordinating the activities of all construction and Remedial Personnel, to include informing them of the required Personal Protective Equipment (PPE) and insuring their signature acknowledging this CHASP;
- Ensuring that the tasks assigned are being completed as planned and on schedule; and
- Serving as liaison with public officials where there is no Public Affairs official designated.

3.2.3 Field Operations Leader

The Field Operations Leader will be responsible for field operations and safety. Specific duties will include, but are not limited to:

- Scheduling with the construction company and their subcontractors;
- Coordinating with the Site Health and Safety Officer in determining protection levels;
- Documenting field activities;
- Coordinate activities between environmental and construction personnel;
- Coordination with waste management contractors; and
- Review and approval of waste disposal facilities.

In the event that the Project Manager and the Site Health and Safety Officer are not on site, the Field Operations Leader will assume all responsibility of the Site Health and Safety Officer.

3.2.4 Site Health and Safety Officer

The Site Health and Safety Officer shall be responsible for the implementation of the CHASP on site. Specific duties will include:

- Monitoring the compliance of construction and environmental remediation activities personnel (field personnel) for the routine and proper use of the PPE that has been designated for each task;
- Routinely inspecting PPE and clothing to ensure that it is in good condition and is being stored and maintained properly;
- Stopping work on the site or changing work assignments or procedures if any operation threatens the health and safety of workers or the public;
- Monitoring personnel who enter and exit the site and all controlled access points;

- Reporting any signs of fatigue, work-related stress, or chemical exposures to the Project Manager;
- Dismissing field personnel from the site if their actions or negligence endanger themselves, co-workers, or the public, and reporting the same to the Project Manager;
- Reporting any accidents or violations of the CHASP plan to the Project Manager and documenting the same for the project in the records;
- Knowing emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire and police departments;
- Ensuring that all project-related personnel have signed the personnel agreement and acknowledgments form contained in this CHASP; and
- Coordinate upgrading and downgrading PPE as necessary due to changes in exposure levels, monitoring results, weather, and other site conditions.

4 Chemical Hazard Analysis and Control Measures

Based on the Phase II and Phase IIb ESAs performed at the site in April and July 2020 by Structural Engineering Technologies, PC, the contaminants of concern include the following:

- VOC's identified in groundwater: Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX), Isopropylbenzene, p-Isopropyltoluene, Sec-Butylbenzene, Cyclohexane and Methylcyclohexane, 1,2-Dibromo-3-chloropropane, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene identified at elevated levels in groundwater
- SVOC: Naphthalene identified in groundwater
- VOCs identified in soil vapor: Carbon Tetrachloride, trichloroethene (TCE), tetrachloroethene (PCE), methylene chloride, Vinyl Chloride, Cyclohexane, Ethyl Benzene, n-Heptane, n-Hexane, Xylenes, and Toluene.

Volatile organic compounds (VOC's) were detected in groundwater and soil vapor samples. One SVOC was detected in groundwater. A summary of the health hazards associated with the contaminant of concerns are shown below.

4.1 Volatile Organic Compounds

The Phase II and Phase IIb ESAs performed at the site have identified petroleum and chlorinated solvent related VOC's in groundwater and soil vapor.

Soil vapor sampling results indicate that Carbon Tetrachloride was detected in three sub slab soil vapor samples and in the indoor and outdoor air samples. Due to the concentrations of Carbon Tetrachloride detected, mitigation is recommended according to the NYSDOH soil vapor intrusion (SVI) decision Matrix A. Tetrachloroethene (PCE), was detected in five of the six sub-slab soil vapor samples, one of the indoor air samples and in the outdoor air sample. Due to the concentrations detected, the levels of PCE should be monitored over time according to NYSDOH SVI decision Matrix B. Trichloroethene (TCE) and Methylene Chloride were detected in one soil vapor sample (SV-4), however according to the NYSDOH SVI decision Matrix B, no further action is required. Vinyl Chloride was detected in one soil vapor sample (SV-5), however according to the NYSDOH SVI decision Matric C no further action is required. Other VOCs detected in soil vapor at elevated concentrations in sample SV-6 included Cyclohexane, Ethyl Benzene, n-Heptane, n-Hexane, o-Xylene, m&p-Xylene, and Toluene.

Groundwater sample results indicate that eleven VOCs were detected in MW-8 at concentrations above their respective groundwater quality standards. Those VOCs include 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Ethyl Benzene, Isopropylbenzene, n-Butylbenzene, n-propylbenzene, o-Xylene, p&m-Xylene, p-Isopropyltoluene, Sec-butylbenzene, Toluene.

Prolonged exposure to VOCs above their respective OSHA permissible exposure limits may result in irritation of the mucous membranes of the respiratory system, eyes, and mouth. Overexposure to VOCs may also result in the depression of the central nervous system. Symptoms may include drowsiness, headache, and fatigue.

4.2 Semi-Volatile Organic Compounds

One (1) SVOC, Napthalene, was detected above groundwater quality standards in MW-8. Prolonged exposure to SVOCs above OSHA permissible exposure limits may result in adverse health effects including endocrine and thyroid disruption, immunotoxicity, reproductive toxicity, cancer, and adverse effects on fetal and child development and neurologic function.

5 Health and Safety Risk Analysis

The field tasks covered by the CHASP will include supplemental investigated task such as, drilling, and containerization of soil samples. Additionally, standard job task hazards that are inherent to an investigative project will exist.

5.1 Explosion and Fire

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to explosion and fire. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Fire Protection and Prevention Standard, set forth at 29 C.F.R. § 1910 part 1926.35, as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations. The following are possible fire and explosion hazards that may be encountered on the job site along with fire preventive measures to take.

5.1.1 Flammable Vapors

The presence of flammable vapors can pose a potential fire and health hazard. Hazard reduction procedures include monitoring the ambient air with an oxygen/LEL meter (combustible gas indicator). If the LEL reading exceeds 20%, all work will stop and employees will leave the site immediately and contact the fire department. For OSHA-defined "confined space" activities, work will stop if the LEL reading exceeds 10%.

5.1.2 High Oxygen Levels

Atmospheres that contain a level of oxygen greater than 23% pose an extreme fire hazard (the usual ambient oxygen level is approximately 20.5%). All personnel encountering atmospheres that contain a level of oxygen greater than 23% must evacuate the site immediately and must notify the Fire Department. If the oxygen level is less than 19.5%, do not enter the space without level B PPE.

5.1.3 Fire Prevention

- During equipment operation, periodic vapor concentration measurements should be taken with an explosimeter or combustimeter. If at any time the vapor concentrations exceed 20% of the lower explosive limit (LEL), then the Site Health and Safety Officer or designated field worker should immediately shut down all operations.
- Only approved safety cans will be used to transport and store flammable liquids.
- All gasoline and diesel-driven engines requiring refueling must be shut down and allowed to cool prior to filling.
- Smoking is not allowed during any operations within the work area in which petroleum products or solvents in free-floating, dissolved, or vapor forms, or other flammable liquids may be present.
- No open flame or spark is allowed in any area containing petroleum products or other flammable liquids.

5.2 Operational Safety Hazards

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to earth moving equipment. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Excavation Standard, set forth at 29 C.F.R. § 1910 Subpart P as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

5.2.1 Heavy Machinery / Equipment

All site employees must remain aware of those site activities that involve the use of heavy equipment and machinery. Respiratory protection and protective eyewear may be worn frequently during site activities. This protective equipment significantly reduces peripheral vision of the wearer. Therefore, it is essential that all employees at the site exercise extreme caution during operation of equipment and machinery to avoid physical injury to themselves or others.

5.2.2 Vehicular Traffic

All employees will be required to wear a fluorescent safety vest at all times while on site. In addition, supplemental traffic safety equipment use can be exercised when warranted by specific task. Supplemental equipment can be items such as cones, flags, barricades, and/or caution tape. Drivers of waste transportation vehicles will only exit vehicles in designated areas within the Support Zone. During this time, drivers will only be allowed to inspect the placement of waste loads and cover their trailers.

5.3 Noise Hazards

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to noise hazards. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Occupational Noise Exposure Standard, set forth at 29 C.F.R. § 1910 part 1926.52, as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

Hearing protection shall be provided to the employees where sound pressure levels exceed 85 dB. Hearing protection shall be worn where sound pressure levels in areas and/or on equipment exceeds 90 dB. Typical heavy excavation operations have been monitored with a sound level meter and indicate that hearing protection is required for all personnel while engaged in this action.

5.4 Safe Material Handling

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to safe material (soil/fill) handling. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Eye and Face, and Respiratory Safety Standards, set forth at 29 C.F.R. § 1910 Parts 1926.102 and 1926.103

as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

Skin and eye contact with contaminated soil/fill or materials in contact with the soil/fill may occur during excavation, drilling, sampling, handling and decontamination activities. Nitrile gloves and approved safety glasses must be worn to prevent exposure to the associated contaminants. Employees working at or near (within ten feet of) excavation fronts could be required to wear respiratory protection. If necessary, all associated activities will be performed pursuant to 29 C.F.R. § 1910 Parts 1926.134 (a)(2) and 1926.55.

5.5 Temperature Hazards

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to temperature stresses. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Technical Manual (TED 1-0.15A), Section III – Chapter 4 (1999) as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

Since climatic changes cannot be avoided, work schedules will be adjusted to provide time intervals for intake of juices, juice products, and water in an area free from contamination and in quantities appropriate for fluid replacement to prevent heat stress conditions from occurring.

5.5.1 Types of Heat Stress

Heat stress may occur even in moderate temperature areas and may present any or all of the following:

5.5.1.1 Heat Rash

Result of continuous exposure to heat, humid air, and chafing clothes. Heat rash is uncomfortable and decreases the ability to tolerate heat.

5.5.1.2 Heat Cramps

Result of the inadequate replacement of body electrolytes lost through perspiration. Signs include severe spasms and pain in the extremities and abdomen.

5.5.1.3 Heat Exhaustion

Result of increased stress on the vital organs of the body in the effort to meet the body's cooling demands. Signs include shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness.

5.5.1.4 Heat Stroke

Result of overworked cooling system. Heat stroke is the most serious form of heat stress. Body surfaces must be cooled and medical help must be obtained immediately to prevent severe injury and/or death. Signs include red,

hot, dry skin, absence of perspiration, nausea, dizziness and confusion, strong, rapid pulse that could lead to coma or death.

5.5.2 Heat Stress Prevention

A. Replace body fluids (water and electrolytes) lost through perspiration. Solutions may include a 0.1% salt and water solution or commercial mixes such as “Gatorade”. Employees must be encouraged to drink more than the amount required in order to satisfy thirst.
B. Use cooling devices to aid the natural body ventilation. Cooling occurs through evaporation of perspiration and limited body contact with heat-absorbing protective clothing. Utilize fans and air conditioners to assist in evaporation. Long, cotton underwear is suggested to absorb perspiration and limit any contact with heat-absorbing protective clothing (i.e., coated Tyvek suits).
C. Conduct non-emergency response activities in the early morning or evening during very hot weather.
D. Provide shelter against heat and direct sunlight to protect personnel. Take breaks in shaded areas.
E. Rotate workers utilizing protective clothing during hot weather.
F. Establish a work regime that will provide adequate rest periods, with personnel working in shifts.

5.6 Cold Exposure Hazards

Work schedules will be adjusted to provide sufficient rest periods in a heated area for warming up during operations conducted in cold weather. Also, thermal protective clothing such as wind and/or moisture resistant outerwear is recommended to be worn.

If work is performed continuously in the cold at or below -7 ºC (20 ºF), including wind chill factor, heated warming shelters (tents, cabins, company vehicles, rest rooms, etc.) shall be made available nearby and the worker should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation. A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing.

Dehydration, or the loss of body fluids, occurs in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of a diuretic and circulatory effect (adapted from TLV's and Biological Exposure Indices 1988-1989, ACGIH).

6 Personnel Training

6.1 Pre-assignment and OSHA Training

All Remedial Personnel that will be in direct contact (that is hand digging, sampling, processing) with the native soil/fill materials must complete an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and, where necessary, a current eight hour refresher course (as required annually after initial 40-hour training completion). Restoration Personnel that will not be in direct contact with native soil/fill materials are only required to prove they have read and understood the procedures presented in this CHASP.

On-site managers and supervisors of Restoration Personnel (Field Operations Leader, Site Health and Safety Officer) directly responsible for employees engaged in hazardous substance operations have received an initial 40-hour HAZWOPER training course and an additional (above the 40-hour HAZWOPER) eight hours of supervisory training. These training requirements comply with the OSHA Hazardous Waste Operations and Emergency Response Regulation, 29 CFR 1910.120. The Site Health and Safety Officer will be certified in First Aid and Cardiovascular Pulmonary Resuscitation.

The Site Health and Safety Officer will conduct an on-site training meeting for all Construction Personnel and observers that could potentially be exposed to the native soil/fill material during construction activities. Training meetings will be provided routinely for any new project personnel. This program will cover specific health and safety equipment and protocols and potential problems inherent to each project operation. The Site Health and Safety Officer will be present for any activities being performed by Construction Personnel that will involve the handling of soil/fill during construction activities to provide supervision on exposure reduction. This may include insuring the use of proper PPE and air quality monitoring.

6.2 Respirator Requirements

6.2.1 Respirator Requirements and Fit Testing

The OSHA respiratory protection standard, 29 CFR 1910.134, under paragraph (f)(2), requires fit testing for all employees using tight fitting respirators including filtering facepiece respirator. The fit test must be performed before the respirator is used and must be repeated at least annually and whenever a different respirator facepiece is used or a change in the employee's physical condition could affect the respirator fit.

The user seal check is a separate requirement under paragraph (g)(1)(iii) and must be performed each time the employee dons the respirator. Employers must adhere to the recommendations of the respirator's manufacturer; different manufacturers recommend different procedures.

6.2.2 Medical Surveillance

OSHA requires a medical evaluation to determine whether each employee required to wear a respirator is physically able to wear a respirator and perform the work. This evaluation can be a medical examination or an evaluation of employee responses to the OSHA Respirator Medical Evaluation Questionnaire located in **Appendix B** of the Respiratory Protection Standard. Either method must be performed by a physician or other licensed healthcare professional. **Appendix C** has a copy of the forms to be completed.

A medical examination may be necessary whenever the employee gives a positive response to any of questions 1 through 8 in **Appendix B**, Part A, Section 2.

7 Personal Protective Equipment

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to personal protective equipment. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Personal Protective Equipment Standard, set forth at 29 C.F.R. § 1910.Part 1926.28(a) as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biological hazards that may be encountered on-site when engineering and other controls are not feasible or cannot provide adequate protection. Careful selection and use of adequate PPE should protect the health of all on-site workers. No single combination of PPE is capable of protecting against all hazards. Therefore, PPE should be used in conjunction with, not in place of, other protective methods, such as engineering controls and safe work practices.

Site-specific chemicals of concern include semi-volatile organic compounds. These chemicals are of moderate to low hazard. Therefore, level D personal protective equipment will be required at all times when on site. The following is a breakdown of the types of protective clothing and equipment to be used during the site activities.

7.1.1 Levels of Protection

The Site Health and Safety Officer will determine whether a level of protection should be upgraded or downgraded. Changes in the level of protection will be recorded in the dedicated site logbook along with the rationale for the changes (see Section 7.1.3 for additional information on PPE upgrades). Level D PPE will be the minimum requirement at all times during the environmental remediation portion of the project.

7.1.2 Level D Personal Protective Equipment

All initial site access and activities will be done in Level D attire. Level D protection is sufficient under conditions where no contaminants are present or those activities that do not pose a potential threat of unexpected inhalation of or contact with hazardous levels of any substances. Typical Level D activities may include sediment, logging and groundwater sampling, and as surficial site surveys.

- Hard hat
- Safety glasses (as appropriate)
- Steel toe and shank boots
- Fluorescent vest
- Hearing protection (as appropriate)

7.1.3 Modified Level D Personal Protective Equipment

- Hard hat
- Safety glasses
- Steel toe and shank boots
- Fluorescent vest
- Nitrile "N-Dex" inner gloves
- Latex outer boots (chemical resistant)
- Polyethylene coated Tyvek suit
- Hearing protection (as appropriate)

7.1.4 Level C Personal Protective Equipment

Level C protection, as described in this plan, will be available at a minimum for those activities that involve surface and subsurface soil (strata disturbance such as well installation, and all subsurface media sampling activities such as split-spoon sampling and borings). Level C protection equipment should be readily available at all times. Consistent with OSHA training, prior to donning Level C, oxygen percent must be continuously monitored.

- Buddy system required at all times
- Full face respirator with NIOSH approved OV/AG/HEPA combination cartridges (MSA GMC-H)
- Saranex coated Tyvek Suit
- Inner Nitrile "N-Dex" gloves
- Outer Nitrile (NBR) gloves
- Steel toe and shank boots
- Outer boots (chemical resistant)
- Hard hat
- Hearing protection (as appropriate)

7.1.5 Level B Personal Protective Equipment

Some activities may require Level B protection. In atmospheres potentially containing toluene and xylenes, the protective ensemble should include chemical resistant clothing since the two compounds have skin absorption potential.

Regional Health and Safety representatives must be on site upon start-up of <u>any</u> project requiring level B protection. This should be understood to include subcontractors conducting Level B activity.

- Buddy system required at all times
- Supplied air respirator or SCBA
- Saranex coated Tyvek Suit
- Inner Nitrile "N-Dex" gloves

- Outer Nitrile (NBR) gloves
- Steel toe and shank boots
- Outer boots (chemical resistant)
- Hard hat
- Hearing protection (as appropriate)

7.1.6 Personal Use Factors and Equipment Change Out Schedule

Prohibitive or precautionary measures should be taken as necessary to prevent workers from jeopardizing safety during equipment use.

If necessary, all respiratory protective equipment used will be approved by NIOSH/MSHA. Respirator cartridges will be changed once per eight-hour shift at a minimum. This can be accomplished at the end of the workday during respirator decontamination. Employees working within the excavation front should change the cartridge of their respirators once every four hours. If odor breakthrough is detected while wearing the respirator or if breathing becomes difficult, change cartridges immediately. A filter change out schedule is provided below.

Remedial Worker	**Work Area**	**Filter Type**	**Replacement Rate**
Site Screener	EZ – At Excavation Front	MSA GMC-H	Every 4 Hours
Laborer	EZ – At Excavation Front	MSA GMC-H	Every 2 Hours
	SZ, CRZ	MSA GMC-H	Every 8 Hours
Equipment Operator	EZ	MSA GMC-H	Every 4 Hours
	SZ, CRZ	MSA GMC-H	Every 8 Hours
Administrator	EZ	MSA GMC-H	Every 4 Hours
	SZ, CRZ	MSA GMC-H	Every 8 Hours

When utilizing protective garments such as Tyvek suits, gloves, and booties, all seams between protective items will be sealed with duct tape.

Contact with contaminated surfaces, or surfaces suspected of being contaminated, should be avoided. This includes walking through, kneeling in, or placing equipment in puddles, mud, discolored surfaces, or on drums and other containers.

Eating, smoking, drinking, and/or the application of cosmetics in the immediate work area is prohibited. Ingestion of contaminants or absorption of contaminants into the skin may occur.

The use of contact lenses on the job site is strongly advised against. Contact lenses may trap contaminants and/or particulate between the lens and eye, causing irritation. However, when glasses are not available, contact lenses are preferred over faulty vision. When contact lenses are worn, safety glasses and/or goggles must be worn at all times while on the job site. Wearing contact lenses with a respirator in a contaminated atmosphere is prohibited under 29 CFR ss1910.134 (e)(5)(iii).

8 Work Zones

8.1 Work Zone Definitions

Work and support areas shall be established based on ambient air data and proposed work sites. They shall be established in order to contain contamination within the smallest areas possible and shall ensure that each employee has the proper PPE for the area or zone in which work is to be performed.

8.1.1 Exclusion Zone (EZ)

It is within this zone that the excavation or environmental remediation activities such as tank abandonment operations (as described in 8.1.1.1) are performed. No one shall enter this zone unless the appropriate PPE is donned. The location of this zone will change as the construction-related excavation activities are performed.

8.1.2 Contaminant Reduction Zone (CRZ)

It is within this zone that the decontamination process is undertaken. Personnel and their equipment must be adequately decontaminated before leaving this zone for the support zone. This zone will be set up between the EZ (no less than 100 feet away) and the site boundary.

8.1.3 Support Zone (SZ)

The support zone is considered to be uncontaminated; as such, protective clothing and equipment are not required but should be available for use in emergencies. All equipment and materials are stored and maintained within this zone. Protective clothing is put on within the SZ before entering the EZ or the CRZ. The SZ will be established in a safe environment at least 50 feet away from the EZ.

9 General Safety and Health Provisions

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to general safety and health provisions. Rather, contractors, subcontractors and workers at the site must refer to OSHA's General Safety and Health Provision Standard, set forth at 29 C.F.R. § 1910 subparts C and G as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

9.1 Safety Practices / Standing Orders

The following are important safety precautions that will be enforced during work activities.

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.
2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activity.
3. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garments are removed.
4. No excessive facial hair that interferes with the effectiveness of a respirator will be permitted on personnel required to wear respiratory protection equipment. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges attached to the respirator. Fit testing shall be performed prior to respirator use to ensure the wearer obtains a proper seal.
5. Contact with potentially contaminated surfaces should be avoided whenever possible. One should not walk through puddles; kneel on the ground; lean, sit, or place equipment on drums, containers, vehicles, or the ground.
6. Medicine and alcohol can potentate the effect from exposure to certain compounds. Prescribed drugs and alcoholic beverages should not be consumed by personnel involved in the project.
7. Personnel and equipment in the work areas should be minimized, consistent with effective site operations.
8. Work areas for various operational activities should be established.
9. Procedures for leaving the work area must be planned and implemented prior to going to the site. Work areas and decontamination procedures must be established on the basis of prevailing site conditions.
10. Respirators will be issued for the exclusive use of one worker and will be cleaned and disinfected after each use.
11. Safety gloves and boots shall be taped to the disposable, chemical-protective suits as necessary.
12. All unsafe equipment left unattended will be identified by a "DANGER, DO NOT OPERATE" tag.
13. Noise mufflers or earplugs may be required for all site personnel working around heavy equipment. This requirement will be at the discretion of the Site Health and Safety Officer. Disposable, form-fitting plugs are preferred.

14. Cartridges for air-purifying respirators in use will be changed daily at a minimum.

9.2 Buddy System

Site personnel will employ the buddy system when working under certain circumstances, such as enclosed spacing. Under the buddy system, each site worker is responsible for monitoring the well-being of another worker. No one will work alone when the buddy system is implemented. At no time will fewer than two employees be present at the site if activities are underway.

9.3 Site Communications Plan

Mobile telephone and/or two-way radios will be used to communicate between the work parties on the site. The following standard hand signals will be used in case of failure of radio communication:

- Hands on top of head = Need assistance
- Thumbs up = OK, I am alright, I understand
- Thumbs down = No, negative

Personnel in the Contaminated Zone should remain in constant radio communication or within sight of the project team leader. Any failure of radio communication will require the team leader to evaluate whether personnel should leave the zone.

9.4 Retention of Records

The following records will be maintained on-site and in corporate records for no less than three years.

- Fit test results
- OSHA Training Certification
- Medical Questionnaire and/or Medical Clearance
- Medical Data Sheets
- Accident Report Forms

10 Decontamination Plan

10.1 General

Personnel involved in work activities at the site may be exposed to compounds in a number of ways, despite the most stringent protective procedures. Site personnel may come in contact with vapors, gases, mists, particulates in the air, or other site media while performing site duties. Use of monitoring instruments and site equipment can also result in exposure and transmittal of hazardous substances.

In general, decontamination involves scrubbing with a detergent water solution followed by clean water rinses. All disposable items shall be disposed of in a dry container. Certain parts of contaminated respirators, such as harness assemblies and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in detergent and water and scrubbed with a brush. In addition to being contaminated, all respirators, non-disposable protective clothing, and other personal articles must be sanitized or replaced before they can be used again if they become soiled from exhalation, body oils, and perspiration. The manufacturer's instructions should be followed in sanitizing the respirator masks. The Site Health and Safety Officer will be responsible for the proper maintenance, decontamination, and sanitizing of any respirator equipment that may be used on-site. The decontamination zone layout and procedures should match the prescribed levels of personal protection.

The following procedures have been established to provide site personnel with minimum guidelines for proper decontamination. Personnel leaving the point of operations designated as the EZ must follow these minimum procedures. The decontamination process shall take place within the contaminant reduction zone.

10.2 Minimum Decontamination Procedure

Personnel leaving the point of operations should remove or change outer gloves. At a minimum, boots shall be cleaned of all accumulated soil/fill. Outer boots must be properly washed where gross contamination is evident or disposed of. If Tyvek suits are being utilized, they should be removed or changed. Personnel should remove the Tyvek suits so that the inner clothing does not come in contact with any contaminated surfaces. After Tyvek removal, personnel shall remove and discard outer Nitrile gloves. Personnel shall then remove the respirator, where applicable. Respirators shall be disinfected between uses with towelettes or other sanitary methods. Potable water, at a minimum, will be present so that site personnel can thoroughly wash hands and face after leaving the point of operations.

The Site Health and Safety Officer will monitor decontamination procedures to ensure their effectiveness. Modifications of the decontamination procedure may be necessary as determined by the Site Health and Safety Officer's observations.

10.3 Standard Decontamination Procedure

The following decontamination procedures should be implemented during site operations for the appropriate level of protection.

10.3.1 Level B

Segregated equipment drop	Deposit equipment (tools, sampling devices, notes, monitoring instruments, radios, etc.) used on the site onto plastic drop cloths.
Boot covers and glove wash	Outer boots and outer gloves should be scrubbed with a decontamination solution of detergent and water or replaced.
Rinse off boot covers and gloves	Decontamination solution should be rinsed off boot covers and gloves using generous amounts of water. Repeat as many times as necessary.
Tape removal	Remove tape from around boots and gloves and place into container with plastic liner.
Boot cover removal	Remove disposable boot covers and place into container with plastic liner.
Outer glove removal	Remove outer gloves and deposit in container with plastic liner.
Suit / safety boot wash	Completely wash splash suit, SCBA, gloves, and safety boots. Care should be exercised that no water is allowed into the SCBA regulator. It is suggested that the SCBA regulator be wrapped in plastic.
Suit / safety boot rinse	Thoroughly rinse off all decontamination solution from protective clothing.
Tank or canister changes	This is the last step in the decontamination procedure for those workers wishing to change air tanks and return to the EZ. The worker's air tank or cartridge is exchanged, new outer glove and boot covers are donned, and joints taped.
Removal of safety boots	Remove safety boots and deposit in container with a plastic liner.
SCBA backpack removal	Without removing the face piece, the SCBA backpack should be removed and placed on a table. The face piece should then be disconnected from the remaining SCBA unit and then proceed to the next station.
Splash suit removal	With care, remove the splash suit. The exterior of the splash suit should not come in contact with any inner layers of clothing.
Inner glove wash	The inner gloves should be washed with a mild decontamination solution (detergent / water).
Inner glove rinse	Generously rinse the inner gloves with water.
Face piece removal	Without touching the face with gloves, remove the face piece. The face piece should be deposited into a container that has a plastic liner.
Inner glove removal	Remove the inner glove and deposit into a container that has a plastic liner.
Field wash	Wash hands and face thoroughly. If highly toxic, skin corrosive, or skin absorbent materials are known or suspected to be present, a shower should be taken.

10.3.2 Level C and Level D

The decontamination procedure for Level C and Level D will be satisfied with the Minimum procedures outlined in section 8.2.

10.4 Heavy Equipment and Handling Equipment Decontamination

Equipment traversing the site and exiting the site will be subjected to a decontamination protocol. At a minimum the protocol will consist of an inspection of the truck fenders, tires and mud flaps for accumulated soil/fill, and removal of all accumulations using hand tools (brush, broom and scrapers). If deemed necessary by the Health and Safety Officer,

this inspection will be performed over a thirty by fifteen foot area that has been filled with ¾ inch crushed recycled concrete aggregate to facilitate the removal of soil/fill accumulations from the tires, and to immobilize soil/fill removed from the truck body. Additionally, all trucks hauling waste will be required to be covered prior to exiting the site.

At the conclusion of the use of each piece of excavation equipment on the site, it will be decontaminated with an Alconox / water solution followed by a clean water rinse within the Contaminant Reduction Zone. The rinsate will be allowed to charge into the site ground.

11 Emergency Response / Contingency Plan

11.1 Pre-Emergency Planning

In order to properly prepare for emergencies, Material Safety Data Sheets (MSDS) will be maintained on-site for the type of contaminants to which workers may be exposed. Based upon the results of previous investigations, The COCs for the Site are

Soil Vapor: Carbon Tetrachloride, trichloroethene (TCE), tetrachloroethene (PCE), methylene chloride, Vinyl Chloride, Cyclohexane, Ethyl Benzene, n-Heptane, n-Hexane, Xylenes, and Toluene.

Groundwater: Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX), Isopropylbenzene, p-Isopropyltoluene, Sec-Butylbenzene, Cyclohexane and Methylcyclohexane, 1,2-Dibromo-3-chloropropane, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, and Napthalene.

The MSDS are provided in **Appendix D**.

In the event a suspected or known hazardous substance or substance container is encountered during site activities, a contingency plan will be triggered (see Section 11.3).

11.2 Emergency Contact Information

In the event of an accident or emergency situation, emergency procedures will be executed. Said procedures can and will be executed by the first person to observe an accident or emergency situation. The Project Field Manager will be notified about the situation immediately after emergency procedures are implemented.

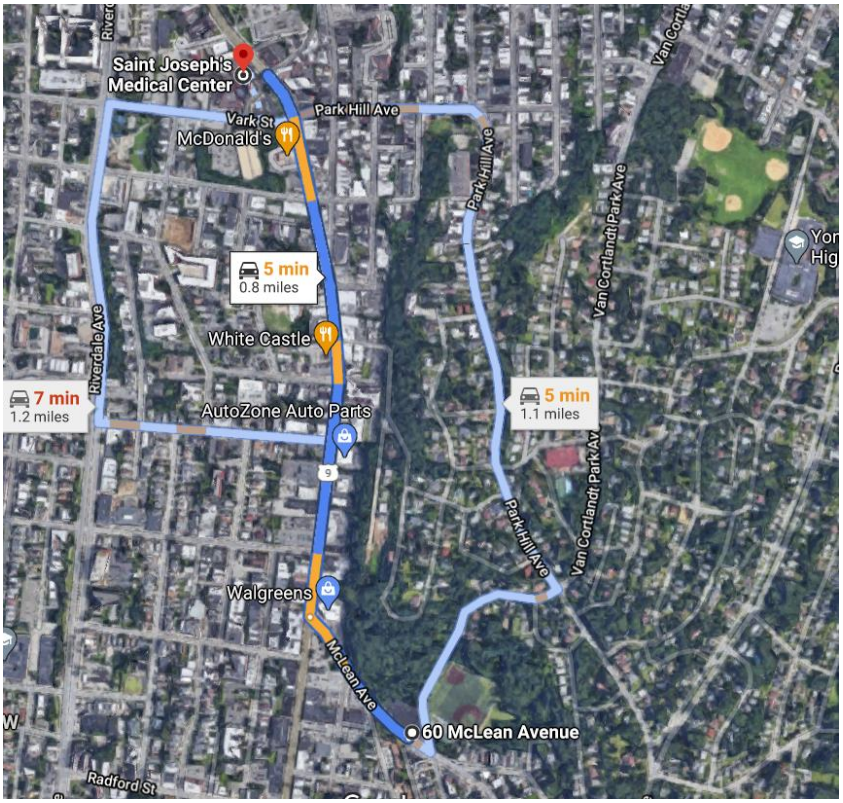
11.2.1 Emergency Contacts

Emergency:	911	
Hospital:	914-378-7000	**St Joseph's Medical Center**
Police:	911	Police
Fire Department:	911	NYFD
Chemtrec:	800-424-9300	
Poison Control Center:	800-336-6997	
National Response Center:	800-424-8802	
US EPA (24-hour hotline):	800-424-9346	

Start: 46-70 McLean Avenue Yonkers, NY 10705

- Head Northwest on McLean Ave toward Western Ave – 0.2mi
- Turn right at the Walgreens onto South Broadway – Destination will be on the left- 0.6 mi

End: St Joseph's Medical Center
127 South Broadway, Yonkers, NY 10701



11.2.2 Utility Emergencies / Initiating Subsurface Investigation Work

Where necessary, utility markouts will be called in via the one call center or to the individual entities listed below.

Mark Out One-Call Center (811)	1-800-272-4480	No-Cuts
Gas Company:	718-643-4050	Con Edison
Telephone Company:	516-661-6000	Verizon
Electric Company:	718-643-4050	Con Edison

11.3 Contingency / Evacuation Plan

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to emergency procedures. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Employee Emergency Action Plan Standard, set forth at 29 C.F.R. § 1910 Part 1926.35(a), as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

If an unknown substance or substance container is encountered during site activities, the following contingency plan will be triggered.

1. The Site Health and Safety Officer, Project Manager and Field Operations Leader will be notified and an Exclusion Zone (the aerial extent of which will be determined by the above safety staff) will be established.
2. All staff will be evacuated from the Exclusion Zone.
3. Air monitoring will be conducted down-wind of the Exclusion Zone.
4. The NYSDEC, as well as any other Government regulatory agency whose need may be prompted by the particular situation, will be notified.
5. Upon arrival of the NYSDEC or Government regulatory agency representative(s), site control will transfer to the appropriate Government personnel.

It may be possible that a situation could develop site emergency could necessitate the evacuation of all personnel from the site. If such a situation develops, an audible alarm shall be given for site evacuation (consisting of an air horn). Personnel shall evacuate the site in a calm and controlled fashion and regroup at a predetermined location. The route of evacuation will be dependent on wind direction, severity, type of incident, etc. The site must not be re-entered until back-up help, monitoring equipment, and/or personal protective equipment are on hand and the appropriate regulatory agencies have been notified.

11.4 Emergency Medical Treatment Procedures

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to medical treatment and first aid. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Medical Services and First Aid Standard, set forth at 29 C.F.R. § 1910 Part 1926.23 and 1926.50, as well as all supporting OSHA

Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

All injuries, no matter how slight, will be reported to the site safety supervisor immediately. The safety supervisor will complete an accident report for all incidents (**Appendix E**).

Some injuries, such as severe lacerations or burns, may require immediate treatment. Unless required due to immediate danger, seriously injured persons should not be moved without direction from attending medical personnel.

11.4.1 Standard Procedures for Injury

1. Notify the Site Health and Safety Officer, Project Manager, and the NYCDEP and NYCDHPD of all accidents, incidents, and near emergency situations.
2. If the injury is minor, trained personnel should proceed to administer appropriate first aid.
3. Telephone for ambulance/medical assistance if necessary. Whenever possible, notify the receiving hospital of the nature of physical injury or chemical overexposure. If no phone is available, transport the person to the nearest hospital. Refer to the map in section 11.2.1.
4. When transporting an injured person to a hospital, bring this Health and Safety Plan with the attached MSDS to assist medical personnel with diagnosis and treatment.

11.4.2 Chemical Overexposure

In all cases of chemical overexposure, follow standard procedures as outlined below for poison management, first aid, and, if applicable, cardiopulmonary resuscitation. Different routes of exposure and their respective first aid/poison management procedures are outlined below.

Ingestion	Do not induce vomiting unless prompted by a health professional. Transport person to nearest hospital immediately.
Inhalation / Confined Space	Do not enter a confined space to rescue someone who has been overcome unless properly equipped and a standby person present.
Inhalation / Other	Move the person from the contaminated environment. Initiate CPR if necessary. Call or have someone call for medical assistance. Refer to MSDS for additional specific information. If necessary, transport the victim to the nearest hospital as soon as possible.
Skin Contact / Non-Caustic Contaminant (Petroleum, Gasoline, etc.)	Wash off skin with a large amount of water immediately. Remove any affected clothing and rewash skin using soap, if available. Transport person to a medical facility if necessary.

Skin Contact / Corrosive Contaminant (Acids, Hydrogen Peroxide, etc.)	Wash off skin with a large amount of water immediately. Remove any affected clothing and rewash skin with water. Transport person to a medical facility if necessary.
Eyes	Hold eyelids open and rinse the eyes immediately with large amounts of water for 15 minutes. Never permit the eyes to be rubbed. Transport person to a medical facility as soon as possible.

11.4.3 First Aid for Injuries Incurred During Field Work

A first aid kit and an emergency eyewash will be available on-site. Field crews, when performing field operations, will carry portable first aid kits that include emergency eye wash stations.

11.4.4 First Aid Equipment List

The first aid kit(s) kept at the site will consist of a weatherproof container with individually sealed packages for each type of item.

The kit will include at least the following items:

- Gauze roller bandages, 1-inch and 2-inch
- Gauze compress bandages, 4-inch
- Gauze pads, 2-inch
- Adhesive tape, 1-inch
- Bandage, 1-inch
- Butterfly bandages
- Triangular bandages, 40-inch
- Ampules of ammonia inhalants
- Antiseptic applicators or swabs
- Burn dressing and sterilized towels
- Surgical scissors
- Eye dressing
- Portable emergency eye wash
- Emergency oxygen supply
- Alcohol
- Hydrogen peroxide
- Clinical grade thermometer
- Tourniquet

11.4.5 Other Emergency Equipment

One portable fire extinguisher with a rating (ratio) of 20 pound A/B/C and one portable fire extinguisher with a rating of 2A will be conspicuously and centrally located between the restricted and non-restricted zones. In addition, similar extinguishers of the same size and class will be located in the site office trailer so that maximum travel distance to the nearest unit shall not exceed 50 feet. Portable extinguishers will be properly tagged with inspection dates and maintained in accordance with standard maintenance procedures for portable fire extinguishers. Field personnel will be trained in fire extinguisher use before field operations begin.

An emergency at any part of the site, such as fire or chemical release, might require that some appropriately trained site workers direct traffic on or near the site.

The following safety equipment to be used for traffic should be kept readily available on site in the field office:

- reflective/fluorescent vests
- flares
- traffic cones (and flags, or the equivalent, as needed)
- hazard tape (barricades as needed)
- working flashlights

11.5 Record of Injuries Incurred On-Site

11.5.1 Occupational Injuries and Illnesses Form (OSHA 200)

All occupational injuries and illnesses that are required to be recorded under the Occupational Safety and Health Act will be registered on OSHA Form 200 (see **Appendix C**). The site safety supervisor will record occupational injuries and illnesses within 48 hours of occurrence, as required by statute.

11.5.2 Employer's First Report of Injury

The site safety supervisor for all accidents involving work injury at the site will complete this form (**Appendix E**). Follow-up procedures will include investigation of each accident or near-miss by the safety supervisor to assure that no similar accidents occur in the future.

Appendix A:
Acknowledgment Statement

DATE	EMPLOYEE NAME	SAFETY OFFICER/SUPERVISOR	ACKNOLEDGEMENT THAT YOU HAVE READ AND UNDERSTSAND THE HASP SUPPLEMENT – TARGET SAFETY TOPIC FOR CONSTRUCTION PERSONNEL

Appendix B:
OSHA Respirator Medical Evaluation Questionnaire

Attachment 4
Appendix C to 1910.134:OSHA Respirator Medical Evaluation Questionnaire (Mandatory)

To the employer: Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

To the employee:
Can you read (circle one): Yes No
Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place
that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health
care professional who will review it.
Part A. Section 1. (Mandatory) The following information must be provided by every employee who has been
selected to use any type of respirator (please print).
1. Today's date:_____
2. Your name:_____
3. Your age (to nearest year):_____
4. Sex (circle one): Male Female
5. Your height: _____ ft. _____ in.
6. Your weight: _____ lbs.
7. Your job title:_____
8. A phone number where you can be reached by the health care professional who reviews this questionnaire
(include the Area Code): _____
9. The best time to phone you at this number: _____
10. Has your employer told you how to contact the health care professional who will review this questionnaire
(circle one): . . . . . Yes No
11. Check the type of respirator you will use (you can check more than one category):
a. _____ N, R, or P disposable respirator (filter-mask, non-cartridge type only).
b. _____ Other type (for example, half- or full-facepiece type, powered-air purifying, supplied-air, self-contained
breathing apparatus).
12. Have you worn a respirator (circle one): . . . . . Yes No
If "yes," what
type(s):_____
_____
_____

Part A. Section 2. (Mandatory) Questions 1 through 9 below must be answered by every employee who has been
selected to use any type of respirator (please circle "yes" or "no").

1. Do you currently smoke tobacco, or have you smoked tobacco in the last month: . . . . . Yes No

2. Have you ever had any of the following conditions?

a. Seizures (fits): . . . . . Yes No
b. Diabetes (sugar disease): . . . . . Yes No
c. Allergic reactions that interfere with your breathing: . . . . . Yes No
d. Claustrophobia (fear of closed-in places): . . . . . Yes No
e. Trouble smelling odors (except when you had a cold): . . . . . Yes No

3. Have you ever had any of the following pulmonary or lung problems?

a. Asbestosis: . . . . . Yes No
b. Asthma: . . . . . Yes No
c. Chronic bronchitis: . . . . . Yes No
d. Emphysema: . . . . . Yes No
e. Pneumonia: . . . . . Yes No
f. Tuberculosis: . . . . . Yes No
g. Silicosis: . . . . . Yes No
h. Pneumothorax (collapsed lung): . . . . . Yes No
i. Lung cancer: . . . . . Yes No
j. Broken ribs: . . . . . Yes No
k. Any chest injuries or surgeries: . . . . . Yes No
l. Any other lung problem that you've been told about: . . . . . Yes No

4. Do you currently have any of the following symptoms of pulmonary or lung illness?

a. Shortness of breath: . . . . . Yes No
b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes No
c. Shortness of breath when walking with other people at an ordinary pace on level ground: . . Yes No
d. Have to stop for breath when walking at your own pace on level ground: . . . . . Yes No
e. Shortness of breath when washing or dressing yourself: . . . . . Yes No
f. Shortness of breath that interferes with your job: . . . . . Yes No
g. Coughing that produces phlegm (thick sputum): . . . . . Yes No
h. Coughing that wakes you early in the morning: . . . . . Yes No
i. Coughing that occurs mostly when you are lying down: . . . . . Yes No
j. Coughing up blood in the last month: . . . . . Yes No
k. Wheezing: . . . . . Yes No
l. Wheezing that interferes with your job: . . . . . Yes No
m. Chest pain when you breathe deeply: . . . . . Yes No
n. Any other symptoms that you think may be related to lung problems: . . . . . Yes No

5. Have you ever had any of the following cardiovascular or heart problems?

a. Heart attack: . . . . . Yes No
b. Stroke: . . . . . Yes No
c. Angina: . . . . . Yes No
d. Heart failure: . . . . . Yes No
e. Swelling in your legs or feet (not caused by walking): . . . . . Yes No
f. Heart arrhythmia (heart beating irregularly): . . . . . Yes No
g. High blood pressure: . . . . . Yes No
h. Any other heart problem that you've been told about: . . . . . Yes No

6. Have you ever had any of the following cardiovascular or heart symptoms?
a. Frequent pain or tightness in your chest: . . . . . Yes No
b. Pain or tightness in your chest during physical activity: . . . . . Yes No
c. Pain or tightness in your chest that interferes with your job: . . . . . Yes No
d. In the past two years, have you noticed your heart skipping or missing a beat: . . . . . Yes No
e. Heartburn or indigestion that is not related to eating: . . . . . Yes No
f. Any other symptoms that you think may be related to heart or circulation problems: . . . . . Yes No
7. Do you currently take medication for any of the following problems?
a. Breathing or lung problems: . . . . . Yes No
b. Heart trouble: . . . . . Yes No
c. Blood pressure: . . . . . Yes No
d. Seizures (fits): . . . . . Yes No
8. Has your wearing a respirator caused any of the following problems? (If you've never used a respirator, check the following space __ and go to question 9:)
a. Eye irritation: . . . . . Yes No
b. Skin allergies or rashes: . . . . . Yes No
c. Anxiety that occurs only when you use the respirator: . . . . . Yes No
d. Unusual weakness or fatigue: . . . . . Yes No
e. Any other problem that interferes with your use of a respirator: . . . . . Yes No
9. Would you like to talk to the health care professional who will review this questionnaire about your answers
to this questionnaire: . . . . . Yes No
Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been
selected to use other types of respirators, answering these questions is voluntary.
10. Have you ever lost vision in either eye (temporarily or permanently): . . . . . Yes No
11. Do you currently have any of the following vision problems?
a. Wear contact lenses: . . . . . Yes No
b. Wear glasses: . . . . . Yes No
c. Color blind: . . . . . Yes No
d. Any other eye or vision problem: . . . . . Yes No
12. Have you ever had an injury to your ears, including a broken ear drum: . . . . . Yes No
13. Do you currently have any of the following hearing problems?
a. Difficulty hearing: . . . . . Yes No
b. Wear a hearing aid: . . . . . Yes No
c. Any other hearing or ear problem: . . . . . Yes No
14. Have you ever had a back injury: . . . . . Yes No
15. Do you currently have any of the following musculoskeletal problems?
a. Weakness in any of your arms, hands, legs, or feet: . . . . . Yes No
b. Back pain: . . . . . Yes No
c. Difficulty fully moving your arms and legs: . . . . . Yes No
d. Pain or stiffness when you lean forward or backward at the waist: . . . . . Yes No
e. Difficulty fully moving your head up or down: . . . . . Yes No
f. Difficulty fully moving your head side to side: . . . . . Yes No
g. Difficulty bending at your knees: . . . . . Yes No
h. Difficulty squatting to the ground: . . . . . Yes No

i. Difficulty climbing a flight of stairs or a ladder carrying more than 25 lbs: . . . . . Yes No
j. Any other muscle or skeletal problem that interferes with using a respirator: . . . . . Yes No

Part B Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire.

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen: . . . . . Yes No

If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions: . . . . . Yes No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: . . . . . Yes No

If "yes," name the chemicals if you know them:_____
_____
_____

3. Have you ever worked with any of the materials, or under any of the conditions, listed below:

a. Asbestos: . . . . . Yes No
b. Silica (e.g., in sandblasting): . . . . . Yes No
c. Tungsten/cobalt (e.g., grinding or welding this material): . . . . . Yes No
d. Beryllium: . . . . . Yes No
e. Aluminum: . . . . . Yes No
f. Coal (for example, mining): . . . . . Yes No
g. Iron: . . . . . Yes No
h. Tin: . . . . . Yes No
i. Dusty environments: . . . . . Yes No
j. Any other hazardous exposures: . . . . . Yes No

If "yes," describe these exposures:_____
_____
___
_____
___

4. List any second jobs or side businesses you have:_____
_____
____

5. List your previous occupations:_____
_____
_____

6. List your current and previous hobbies:_____
_____
_____

7. Have you been in the military services? . . . . . Yes No

If "yes," were you exposed to biological or chemical agents (either in training or combat): . . . . . Yes No

8. Have you ever worked on a HAZMAT team? . . . . . Yes No

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): . . . . . Yes No
If "yes," name the medications if you know them:_____
10. Will you be using any of the following items with your respirator(s)?
a. HEPA Filters: . . . . . Yes No
b. Canisters (for example, gas masks): . . . . . Yes No
c. Cartridges: . . . . . Yes No
11. How often are you expected to use the respirator(s) (circle "yes" or "no" for all answers that apply to you)?:
a. Escape only (no rescue): . . . . . Yes No
b. Emergency rescue only: . . . . . Yes No
c. Less than 5 hours per week: . . . . . Yes No
d. Less than 2 hours per day: . . . . . Yes No
e. 2 to 4 hours per day: . . . . . Yes No
f. Over 4 hours per day: . . . . . Yes No
12. During the period you are using the respirator(s), is your work effort:
a. Light (less than 200 kcal per hour): . . . . . Yes No
If "yes," how long does this period last during the average shift:_____hrs._____mins.
Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work; or
standing while operating a drill press (1-3 lbs.) or controlling machines.
b. Moderate (200 to 350 kcal per hour): . . . . . Yes No
If "yes," how long does this period last during the average shift:_____hrs._____mins.
Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at
trunk level; walking on a level surface about 2 mph or down a 5-degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.
c. Heavy (above 350 kcal per hour): . . . . . Yes No
If "yes," how long does this period last during the average shift:_____hrs._____mins.
Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder; working
on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8-degree grade
about 2 mph; climbing stairs with a heavy load (about 50 lbs.).
13. Will you be wearing protective clothing and or equipment (other than the respirator) when you're using your
respirator: . . . . . Yes No
If "yes," describe this protective clothing and or equipment:_____
_____
____
14. Will you be working under hot conditions (temperature exceeding 77 deg. F): . . . . . Yes No
15. Will you be working under humid conditions: . . . . . Yes No

16. Describe the work you'll be doing while you're using your respirator(s):
_____
_____
_____
_____
17. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for
example, confined spaces, life-threatening gases):
_____
_____
_____
_____
18. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when
you're using your respirator(s):
Name of the first toxic substance:_____
Estimated maximum exposure level per shift:_____
Duration of exposure per shift_____
Name of the second toxic substance:_____
Estimated maximum exposure level per shift:_____
Duration of exposure per shift:_____
Name of the third toxic substance:_____
Estimated maximum exposure level per shift:_____
Duration of exposure per shift:_____
The name of any other toxic substances that you'll be exposed to while using your respirator:
_____
_____
_____
19. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and
well-being of others (for example, rescue, security):
_____
_____
_____
_____

Apéndice C: Cuestionario de Evaluación Médico obligado por la OSHA (La agencia de seguridad y salud ocupacional) Parte 29 CFR 1910.134 Mandatorio para Proteccion del Sistema Respiratorio

Marque con un circulo para indicar sus respuestas a cada pregunta.
Para el empleado: Puede usted leer (circule uno): Sí o No
Su patrón debe dejarlo responder estas preguntas durante horas de trabajo o en un tiempo y lugar que sea conveniente para usted. Para mantener este cuestionario confidencial, su patrón o supervisor no debe ver o revisar sus respuestas. Su patrón debe informarle a quien dar o enviar este cuestionario para ser revisado por un
profesional de sanidad con licencia autorizado por el estado.

Parte A. Sección 1. (Mandatorio). La siguiente información debe de ser proveida por cada empleado que ha
sido seleccionado para usar cualquier tipo de respirador (escriba claro por favor).

1. Fecha :_____
2. Nombre:_____
3. Edad:_____
4. Su sexo (circule uno) Masculino o Femenino
5. Altura: _____pies _____pulgadas
6. Peso: _____libras
7. Su ocupación, título o tipo de trabajo: _____
8. Número de teléfono al donde pueda ser llamado por un profesional de sanidad con licencia que revisara este cuestionario (incluya el área):_____
9. Indique la hora mas conveniente para llamarle a este numero:_____
10. ¿Le ha informado su patrón como comunicarse con el profesional de sanidad con licencia que va a revisar
este cuestionario (circule una respuesta)? . . . . . Sí o No
11. Anote el tipo de equipo protector respíratorio que va utilizar (puede anotar mas de una categoría)
a._____ Respirador disponible de clase N, R, o P (por ejemplo: respirador de filtro mécanico, respirador sin
cartucho)
b._____ Otros tipos (respirador con cartucho químico, máscara con cartucho químico, máscara con manguera con soplador (PAPR),máscara con manguera sin soplador (SAR), aparato respiratorio autónomos (SCBA)).
12. ¿Ha usado algun tipo de respirador ? . . . . . Sí o No

Si ha usado equipo protector respíratorio, que tipo(s) ha utilizado:
_____
_____

Parte A. Seccion 2. (Mandatorio): Preguntas del 1 al 9 deben ser contestadas por cada empleado que fue seleccionado a usar cualquier tipo de respirador. Marque con un circulo para indicar sus repuestas.

1. ¿Corrientemente fuma tabaco, o ha fumado tabaco durante el ultimo mes? . . . . . Sí o No
2. ¿Ha tenido algunas de las siguientes condiciones medicas?
a. Convulsiones : . . . . . Sí o No
b. Diabetes (azucar en la sangre): . . . . . Sí o No
c. Reacciones alergicas que no lo deja respirar: . . . . . Sí o No
d. Claustrofobia (miedo de estar en espacios cerrados): . . . . . Sí o No
e. Dificultad oliendo excepto cuando ha cogido un resfriado: . . . . . Sí o No
3. ¿Ha tenido algunas de los siguientes problemas pulmonares?
a. Asbestosis: . . . . . Sí o No
b. Asma: . . . . . Sí o No
c. Bronquitis cronica: . . . . . Sí o No
d. Emfisema: . . . . . Sí o No
e. Pulmonía: . . . . . Sí o No
f. Tuberculosis: . . . . . Sí o No
g. Silicosis: . . . . . Sí o No
h. Neumotorax (pulmon colapsado): . . . . . Sí o No
i. Cáncer en los pulmones: . . . . . Sí o No
j. Costillas quebradas: . . . . . Sí o No
k. Injuria o cirujía en el pecho: . . . . . Sí o No
l. Algun otro problema de los pulmones que le ha dicho su medico: . . . . . Sí o No
4. ¿Corrientemente tiene alguno de los siguientes síntomas o enfermedades en sus pulmones?
a. Respiración dificultosa . . . . . Sí o No
b. Respiración dificultosa cuando camina rapido sobre terreno plano o subiendo una colina: Sí o No
c. Respiración dificultosa cuando camina normalmente con otras personas sobre terreno plano: Sí o No
d. Cuando camina normalmente en terreno plano se encuentra corto de resuello? . . . . . Sí o No
e. Respiración dificultosa cuando se esta bañando o vistiendo: . . . . . Sí o No
f. Respiración dificultosa que lo impede trabajar: . . . . . Sí o No
g. Tos con flema: . . . . . Sí o No
h. Tos que lo despierta temprano en la mañana: . . . . . Sí o No
i. Tos que occure cuando esta acostado: . . . . . Sí o No
j. Ha tosido sangre en el ultimo mes: . . . . . Sí o No
k. Silbar o respirar con mucha dificultad: . . . . . Sí o No
l. Silbar que lo impede trabajar: . . . . . Sí o No
m. Dolor del pecho cuando respira profundamente: . . . . . Sí o No
n. Otros símtomas que crea usted estar relacionados a los pulmones: . . . . . Sí o No
5. ¿Ha tenido algunos de los siguientes problemas con el corazón?
a. Ataque cardiaco: . . . . . Sí o No
b. Ataque cerebrovascular: . . . . . Sí o No
c. Dolor en el pecho: . . . . . Sí o No
d. Falla de corazón: . . . . . Sí o No
e. Hinchazón en las piernas o pies (que no sea por caminar): . . . . . Sí o No
f. Latidos irregulares del corazón: . . . . . Sí o No
g. Alta presión: . . . . . Sí o No
h. Algun otro problema cardio-vascular o cardiaco: . . . . . Sí o No
6. ¿Ha tenido algunos de los siguientes síntomas causados por su corazón?
a. Dolor de pecho frecuente o pecho apretado: . . . . . Sí o No
b. Dolor o pecho apretado durante actividad fisica: . . . . . Sí o No

c. Dolor o pecho apretado que no lo deja trabajar normalmente: . . . . . Sí o No
d. En los ultimos dos años ha notado que su corazón late irregularmente: . . . . . Sí o No
e. Dolor en el pecho o indigestion que no es relacionado a la comida: . . . . . Sí o No
f. Algunos otros síntomas que usted piensa ser causado por problemas de su corazón o de su circulation.
. . . . . Sí o No
7. ¿Esta tomando medicina por algunso de los siguientes problemas?
a. Respiración dificultosa: . . . . . Sí o No
b. Problemas del corazón: . . . . . Sí o No
c. Alta presión : . . . . . Sí o No
d. Convulsiones: . . . . . Sí o No
8. ¿Le ha causado alguno de los siguientes problemas usando el respirador? (si no ha usado un respirador, deje
esta pregunta en blanco__ y continue con pregunta 9).
a. Irritación de los ojos: . . . . . Sí o No
b. Alergias del cutis o sarpullido: . . . . . Sí o No
c. Ansiedad que ocurre solamente cuando usa el respirado: . . . . . Sí o No
d. Debilidad, falta de vigor o fatiga desacostumbrada: . . . . . Sí o No
e. Algun otro problema que le impida utilizar su respirador: . . . . . Sí o No
9. ¿Le gustaria hablar con el profesional de sanidad con licencia autorizado por el estado que revisara este cuestionario sobre sus respuestas? . . . . . Sí o No

Las preguntas del 10 al 15 deben ser contestadas por los empleados seleccionados para usar una máscara
con cartucho químico o aparato respiratorio autónomo (SCBA). Los empleados que usan otro tipo de respirador no tienen que contestar estas preguntas.

10. ¿Ha perdido la vista en cualquiera de sus ojos (temporalmente o permanente): . . . . . Sí o No
11. ¿Corrientemente tiene algunos de los siguientes problemas con su vista?
a. Usa lentes de contacto: . . . . . Sí o No
b. Usa lentes: . . . . . Sí o No
c. Daltoniano (dificultad distinguiendo colores): . . . . . Sí o No
d. Tiene algún problema con sus ojos o su vista: . . . . . Sí o No
12. ¿Ha tenido daño en sus oidos incluyendo rotura del tímpano: . . . . . Sí o No
13. ¿Corrientemente tiene uno de las siguientes problemas para oir?
a. Dificultad oyendo: . . . . . Sí o No
b. Usa un aparato para oir: . . . . . Sí o No
c. Tiene algun otro problema con sus oidos o dificultad escuchando: . . . . . Sí o No
14. ¿Se ha dañado o lastimado su espalda? . . . . . Sí o No
15. ¿Tiene uno de los siguientes problemas de su aparato muscular or eskeleto?
a. Debilidad en sus brazos, manos, piernas o pies : . . . . . Sí o No
b. Dolor de espalda: . . . . . Sí o No
c. Dificultad para mover sus brazos y piernas completamente: . . . . . Sí o No
d. Dolor o engarrotamiento cuando se inclina para adelante o para atras: . . . . . Sí o No
e. Dificultad para mover su cabeza para arriba o para abajo completamente: . . . . . Sí o No
f. Dificultad para mover su cabeza de lado a lado: . . . . . Sí o No
g. Dificultad para agacharse doblando sus rodillas: . . . . . Sí o No
h. Dificultad para agacharse hasta tocar el piso: . . . . . Sí o No
i. Dificultad subiendo escaleras cargando mas de 25 libras: . . . . . Sí o No
j. Alguno problema muscular o con sus huesos que le evite usar un respirador: . . . . . Sí o No

Parte B - Las siguientes preguntas pueden ser agregadas al cuestionario a discrecion del profesional de
sanidad con licencia autorizado por el estado.

1. ¿Esta trabajando en las alturas arriba de 5,000 pies o en sitios que tienen menos oxígeno de lo normal? . . . . . Sí o No

Si la respuesta es "Sí", se ha sentido mareado, o ha tenido dificultad respirando, palpitaciones, o cualquier otro síntoma que usted no tiene cuando no esta trabajando bajo estas condiciones: . . . . . Sí o No

2. ¿En el trabajo o en su casa, ha estado expuesto a solventes o contaminantes peligrosos en el aire (por ejemplo, humos, neblina o polvos) o ha tenido contacto del cutis con químicas peligrosas? . . . . . Sí o No

Escriba las químicas y productos con las que ha estado expuesto, si sabe cuales son:_____

3. ¿Ha trabajado con los siguientes materiales o las condiciones anotadas abajo?:

a. Asbestos: . . . . . Sí o No
b. Sílice (Limpiar mediante un chorro de arena): . . . . . Sí o No
c. Tungsteno/Cobalto (pulverizar o soldadura): . . . . . Sí o No
d. Berilio: . . . . . Sí o No
e. Aluminio: . . . . . Sí o No
f. Carbón de piedra (minando): . . . . . Sí o No
g. Hierro: . . . . . Sí o No
h. Estaño: . . . . . Sí o No
i. Ambiente polvoriento: . . . . . Sí o No
j. Otra exposicion peligrosa: . . . . . Sí o No

Describa las exposiciones peligrosas:

_____
_____

4. ¿Tiene usted otro trabajo o un negocio aparte de este?

_____
_____
_____

5. Apunte su previos trabajos:

_____

6. Apunte sus pasatiempos:

_____
_____
_____

7. ¿Tiene servicio militar? . . . . . Sí o No

Si la respuesta es "Sí", ha estado expuesto a agentes químicos o biologicos durante entrenamiento o combate: . . . . . Sí o No

8. ¿Alguna vez ha trabajado en un equipo de HAZMAT (equipo respondedor a incidentes de materiales peligosos con emergencia)? . . . . . Sí o No

9. ¿Esta tomando alguna medicina que no haya mencionado en este cuestionario (incluyendo remedios caseros o
medicinas que compra sin receta)? . . . . . Sí o No
Si la respuesta es “Sí”, cuales son_____
10. ¿Va a usar algunas de las siguientes partes con su respirador?
a. filtros HEPA (filtro de alta eficiencia que remueve partículas tóxicas en la atmósfera): . . . . Sí o No
b. Canastillo (por ejemplo, máscara para gas): . . . . . Sí o No
c. Cartuchos: . . . . . Sí o No
11. ¿Cuántas veces espera usar un respirador?
a. Para salir de peligro solamente (no rescates): . . . . . Sí o No
b. Recates de emergencia solamente: . . . . . Sí o No
c. Menos de 5 horas *por semana*: . . . . . Sí o No
d. Menos de 2 horas *por día*: . . . . . Sí o No
e. 2 a 4 horas *por día*: . . . . . Sí o No
f. Mas de 4 horas *por día*: . . . . . Sí o No
12. ¿Durante el tiempo de usar el respirador, su trabajo es...?
a. **Ligero** (menos de 200 kcal por hora): . . . . . Sí o No
Si la respuesta es “sí”, cuanto tiempo dura la obra _____horas _____minutos
Ejemplos de trabajos ligeros: estar sentado escribiendo, escribiendo a máquina, diseñando, trabajando la línea de
montaje, o estar parado gobernando un taladro o máquinas:
b. **Moderado** (200-350 kcal por hora): . . . . . Sí o No
Si la respuesta es “sí”cuanto tiempo dura en promedio por jornada _____horas_____minutos
Ejemplos de trabajos moderados : sentado clavando o archivando; manejando un camión o autobús en trafico
pesado; estar de pie taladrando, clavando, trabajando la línea de montaje, o transferiendo una carga (de 35 libras)
a la altura de la cintura; caminando sobre tierra plana a 2 millas por hora o bajando a 3 millas por hora; empujando una carretilla con una carga pesada (de 100 libras) sobre terreno plano.
c. **Pesado** (mas de 350 kcal por hora): . . . . . Sí o No
Si la respuesta es “sí”cuanto tiempo dura en promedio por jornada _____horas_____minutos
Ejemplos de trabajos pesados: levantando cargas pesadas (mas de 50 libras) desde el piso hasta la altura de la
cintura o los hombros; trabajando cargando o descargando; transpalear; estar de pie trabajando de albañil o demenuzando moldes; subiendo a 2 millas por hora; subiendo la escalera con una carga pesada (mas de 50 libras).
13. ¿Va a estar usando ropa o equipo protectivo cuando use el respirador? . . . . . Sí o No
Si la respuesta es “sí” describa que va a estar
usando_____
_____
_____
14. ¿Va a estar trabajando en condiciones calurosas (temperatura mas de 77 grados F)? . . . . . Sí o No
15. ¿Va a estar trabajando en condiciones humedas? . . . . . Sí o No

16. Describa el tipo de trabajo que va a estar usted haciendo cuando use el respirador.

_____

_____

17. Describa cualquier situacion especial o peligrosa que pueda encontrar cuando este usando el respirador (por
ejemplo, espacios encerrados, gases que lo puedan matar, etc.)

_____

18. Provea la siguiente informacion si la sabe, por cada sustancia tóxica que usted va a estar expuesto cuando
este usando el respirador(s):

Nombre de la primera sustancia tóxica_____

Maximo nivel de exposición por jornada de trabajo_____

Tiempo de exposición por jornada_____

Nombre de la segunda sustancia tóxica_____

Maximo nivel de exposición por jornada de trabajo_____

Tiempo de exposición por jornada_____

Nombre de la tercera sustancia tóxica_____

Máximo nivel de exposición por jornada de trabajo_____

Tiempo de exposición por jornada_____

El nombre de cualquier sustancia tóxica que usted va a estar expuesto cuando este usted usando el
respirador_____

_____

19. Describa alguna responsabilidad especial que usted va a tener cuando usted este usado el respirador(s) que
pueda afectar la seguridad o la vida de otros (por ejemplo, rescate, seguridad).

_____

Appendix C:
OSHA Form 200-Occupational Injuries & Illnesses

Log and Summary of Occupational Injuries and illnesses

NOTE: This form is required by Public Law 91-596 and must be kept in the establishment for 5 years. Failure to maintain and post can result in issuance of citations and assessment of penalties. (*See posting requirements on the other side of form*)

RECORDABLE CASES: You are required to record information about every occupational death; every nonfatal occupational illness; and those nonfatal occupational injuries which involve one or more of the following: loss of conciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid) (*See definitions on the other side of form*)

Case or File Number	Date of Injury or Onset of Illness	Employee's Name	Occupation	Department	Description of Injury or Illness
Enter a nonduplicating number which will facilitate comparisons with supplementary records.	Enter Mo/Day	Enter first name or initial, middle initial, last name	Enter regular job title, not activity employee was performing when injury occurred or at onset of illness. In the absence of a formal title, enter a brief description of the employee's duties.	Enter department in which the employee is regularly employed or a description of normal workplace to which employee is assigned, even though temporarily working in another department at the time of injury or illness.	Enter a brief description of the injury or illness and indicate the part or parts of the body affected. Typical entries for this column might be: Amputation of 1st joint right forefinger; Strain of lower back; Contact dermatitis on both hands; Electrocution - body.
(A)	(B)	(C)	(D)	(E)	(F)
					PREVIOUS PAGE TOTALS =>
					TOTALS (Instructions on other side of form) =>

OSHA No. 200

U.S. Department of Labor

For Calendar Year _____ Page: _____ of _____

Company Name

Establishment Name

Establishment Address

Form Approved
O.M.B. No. 1218-0176
See OMB Disclosure Statement on reverse.

Extent of and Outcome of Injury						Type, Extent of, and Outcome of Illness												
Fatalities	Nonfatal Injuries					Type of Illness							Fatalities	Nonfatal Illnesses				
	Injuries with Lost Workdays				Injuries Without Lost Workdays	CHECK Only One Column for Each Illness (See other side of form for terminations or permanent transfers)								Illnesses with Lost Workdays				
Injury Related													Illness Related					Illnesses without Lost Workdays
Enter Date of death. mm/dd/yy	Enter a Check if injury involves DAYS away from work or restricted work activity or both.	Enter a Check if injury involves DAYS away from work.	Enter number of DAYS away from work	Enter number of DAYS of restricted work activity	Enter a Check if no entry was made in column 1 or 2 but the injury is recordable as defined above.	Occupational Skin Disorder or Disease	Dust Disease of the lungs	Respiratory Conditions due to toxic agents	Poisoning (systemic effects of toxic materials)	Disorders due to physical agents	Disorders associated with repeated trauma	All other occupational illnesses	Enter DATE of death, mm/dd/yy	Enter a CHECK if Illness involves DAYS away from work, or DAYS of restricted work activity or both.	Enter a CHECK if Illness involves DAYS away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity	Enter a CHECK if no entry was made in columns 8 or 9
						(7)												
(1)	(2)	(3)	(4)	(5)	(6)	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(8)	(9)	(10)	(11)	(12)	(13)

Certification of Annual Summary Totals by: _____ Title: _____ Date: _____

OSHA 200

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN FEBRUARY 1

OMB DISCLOSURE STATEMENT

Public reporting burden for this collection of information is estimated to vary from 4 to 30 (time in minutes) per response with an average of 15 (time in minutes) per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments regarding this estimate or any other aspect of this information collection, including suggestions for reducing this burden, please send them to the OSHA Office of Statistics, Room N-3644, 200 Constitution Avenue, N.W. Washington, D.C. 20210

Instructions for OSHA No. 200

I. Log and Summary of Occupational Injuries and Illnesses

Each employer who is subject to the recordkeeping requirements of the Occupational Safety and Health Act of 1970 must maintain for each establishment, a log of all recordable occupational injuries and illnesses. This form (OSHA No. 200) may be used for that purpose. A substitute for the OSHA No. 200 is acceptable if it is as detailed, easily readable, and understandable as the OSHA No. 200.

Enter each recordable case on the log within six (6) workdays after learning of its occurrence. Although other records must be maintained at the establishment to which they refer, it is possible to prepare and maintain the log at another location, using data processing equipment if desired. If the log is prepared elsewhere, a copy updated to within 45 calendar days must be present at all times in the establishment.

Logs must be maintained and retained for five (5) years following the end of the calendar year to which they relate. Logs must be available (normally at the establishment) for inspection and copying by representatives of the Department of Labor, or the Department of Health and Human Services, or States accorded jurisdiction under the Act. Access to the log is also provided to employees, former employees and their representatives.

II. Changes in Extent of or Outcome of Injury or Illness

If, during the 5-year period the log must be retained, there is a change in an extent and outcome of an injury or illness which affects entries in columns 1, 2, 6, 8, 9, or 13, the first entry should be lined out and a new entry made. For example, if an injured employee at first required only medical treatment but later lost workdays away from work, the check in column 6 should be lined out and checks entered in columns 2 and 3 and the number of lost workdays entered in column 4.

In another example, if an employee with an occupational illness lost wordays, returned to work, and then died of the illness, any entries in columns 9 through 12 would be lined out and the date of death entered in column 8.

The entire entry for an injury or illness should be lined out if later found to be nonrecordable. For example, an injury which is later determined not to be work related, or which was initially thought to involve medical treatement but later was determined to have involved only first aid.

III. Posting Requirements

A copy of the totals and information following the total line of the last page for the year, must be posted at each establishment in the place or places where notices to employees are customarily posted. This copy must be posted no later than February 1 and must remain in place until March 1. Even though there were no injuries or illnessed during the year, zeros must be entered on the totals line, and the form posted.

The person responsible for the annual summary totals shall certify that the totals are true and complete by signing at the bottom of the form.

IV. Instructions for Completing Log and Summary of Occupational injuries and illnesses

Column A - CASE OR FILE NUMBER. Self Expanatory

Column B - DATE OF INJURY OR ONSET OF ILLNESS

For occupational injuries, enter the date of the work accident which resulted in the injury. For occupational illnesses, enter the date of initial diagnosis of illness, or, if absence from work occurred before diagnosis, enter the first day of the absence attributable to the illness which was later diagnosed or recognized.

Columns C through F - Self Explanatory

Columns 1 and 8 - INJURY OR ILLNESS-RELATED DEATHS - Self Explanatory

Columns 2 and 9 - INJURIES OR ILLNESSES WITH LOST WORKDAYS - Self Explanatory

Any injury which involves days away from work, or days of restricted work activitiy, or both, must be recorded since it always involves one or more of the criteria for recordability.

Columns 3 and 10 - INJURIES OR ILLNESSES INVOLVING DAYS AWAY FROM WORK - Self Explanatory

Columns 4 and 11 - LOST WORKDAYS -- DAYS AWAY FROM WORK.
Enter the number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness. The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work. NOTE: For employees not having a regularly scheduled shift, such as certain truck drivers, construction workers, farm labor, casual labor, part-time employees, etc., it may be necessary to estimate the number of lost workdays. Estimates of lost workdays shall be based on prior work history of the employee AND days worked by employees, not ill or injured, working in the department and/or occupation of the ill or injured employee.

Columns 5 and 12 - LOST WORKDAYS -- DAYS OF RESTRICTED WORK ACTIVITY.
Enter the number of workdays (consecutive or not) on which because of injury or illness:
(1) the employee was assigned to another job on a temporary basis, or
(2) the employee worked at a permanent job less than full time, or
(3) the employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

Columns 6 and 13 - INJURIES OR ILLNESSES WITHOUT LOST WORKDAYS - Self Explanatory

Columns 7a through 7g - TYPE OF ILLNESS. Enter a check in only *one* column for each illness.
TERMINATION OR PERMANENT TRANSFER - Place an asterisk to the right of the entry in columns 7a through 7g (type of illness) which represented a termination of employment or permanent transfer.

V. Totals
Add number of entries in columns 1 and 8.
Add number of checks in columns 2, 3, 6, 7, 9, 10 and 13.
Add number of days in columns 4, 5, 11 and 12.
Yearly totals for each column (1-13) are required for posting. Running or page totals may be generated at the discretion of the employer.

In an employee's loss of workdays is continuing at the time the totals are summarized, estimate the number of future workdays the employee will lose and add that estimate to the workdays already lost and include this figure in the annual totals. No further entries are to be made with respect to such cases in the next year's log.

VI. Definitions
OCCUPATIONAL INJURY is any injury such as a cut, fracture, sprain, amputation, etc. which results from a work accident or from an exposure involving a single incident in the work environment. NOTE: Conditions resulting from animal bites, such as insect or snake bites or from one-time exposure to chemicals, are considered to be injuries.

OCCUPATIONAL ILLNESS of an amployee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

The following listing gives the categories of occupational illnesses and disorders that will be utilized for the purpose of classifying recordable illnesses. For porposes of information, examples of each category are given. These are typical examples, however, and are not to be considered the complete listing of the types of illnesses and disorders that are to be counted under each category.

7a. Occupational Skin Diseases or Disorders. Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; chrome ulcers; chemical burns or inflamation, etc.

7b. Dust Diseases of the Lungs (Pneumaconioses). Examples: Silicosis, asbestosis and other asbestos-related diseases, coal worker's pneumaconioses, byssinosis, siderosis, and other pneumaconioses.

7c. Respiratory Conditions Due to Toxic Agents. Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung; etc.

7d. Poisoning (Systemic Effects of Toxic Materials). Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by

carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins; etc.

7e. Disorders Due to Physical Agents (Other than Toxic Materials). Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat, freezing, frostbite, and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, X-rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn); etc.

7f. Disorders Associated with Repeated Trauma. Examples: Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis. Raynaud's phenomena; and other conditions due to repeated motion, vibration, or pressure.

7g. All Other Occupational Illnesses. Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis, etc.

MEDICAL TREATMENT includes treatment (other than first aid) administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does NOT include first aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

ESTABLISHMENT: A single physical location where business is conducted or where services or industrial operations are performed (for example: a factory, mill, store, hotel, resturant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office). Where distinctly separate activities are performed at a single physicial location, such as construction activities operated from the same physical locations as a lumber yard, each activity shall be treated as a separate establishment.

For firms engaged in activities which may be physically dispersed, such as agriculture; construction; transportation; communications and electric, gas, and sanitary services, records may be maintained at a place to which employees report each day.

Records for personnel who do not primarily report or work at a single establishment, such as traveling salesmen, technicians, engineers, etc., shall be maintained at the location from which they are paid or the base from which personnel operate to carry out their activities.

WORK ENVIRONMENT is comprised of the physical location, equipment, materials processed or used, and the kinds of operations performed in the course of an employee's work, wether on or off the employer's premisis.

Appendix D:
MSDS Sheets

SAFETY DATA SHEET

1. Identification

Product identifier **1,2-Dibromo-3-chloropropane**

Other means of identification

Item N-10149

Recommended use For Laboratory Use Only

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company name	Chem Service, Inc.	
Address	660 Tower Lane West Chester, PA 19380 United States	
Telephone	Toll Free	800-452-9994
	Direct	610-692-3026
Website	www.chemservice.com	
E-mail	info@chemservice.com	
Emergency phone number	Chemtrec US	800-424-9300
	Chemtrec outside US	+1 703-527-3887

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 4
Health hazards	Acute toxicity, oral	Category 3
	Acute toxicity, dermal	Category 4
	Skin corrosion/irritation	Category 2
	Serious eye damage/eye irritation	Category 2B
	Germ cell mutagenicity	Category 1
	Carcinogenicity	Category 1B
	Reproductive toxicity (fertility)	Category 1A
	Specific target organ toxicity, repeated exposure	Category 2
Environmental hazards	Hazardous to the aquatic environment, long-term hazard	Category 3
OSHA defined hazards	Not classified.	

Label elements



Signal word Danger

Hazard statement Combustible liquid. Toxic if swallowed. Harmful in contact with skin. Causes skin irritation. Causes eye irritation. May cause genetic defects. May cause cancer. May damage fertility. May cause damage to organs through prolonged or repeated exposure. Harmful to aquatic life with long lasting effects.

Precautionary statement

Prevention Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Do not breathe mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection.

Response	If swallowed: Immediately call a poison center/doctor. If on skin: Wash with plenty of water. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If exposed or concerned: Get medical advice/attention. Call a poison center/doctor if you feel unwell. Specific treatment (see this label). Rinse mouth. If skin irritation occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention. Take off contaminated clothing and wash before reuse. In case of fire: Use appropriate media to extinguish.
Storage	Store in a well-ventilated place. Keep cool. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	Not applicable.

3. Composition/information on ingredients

Substances

Chemical name	Common name and synonyms	CAS number	%
1,2-Dibromo-3-chloropropane		96-12-8	100

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash with plenty of soap and water. Call a POISON CENTER or doctor/physician if you feel unwell. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.
Ingestion	Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Most important symptoms/effects, acute and delayed	Exposed individuals may experience eye tearing, redness, and discomfort. Skin irritation. May cause redness and pain. Prolonged exposure may cause chronic effects.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	IF exposed or concerned: Get medical advice/attention. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	The product is combustible, and heating may generate vapors which may form explosive vapor/air mixtures. During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire-fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	Combustible liquid.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Immediately evacuate personnel to safe areas. Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up

Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Keep combustibles (wood, paper, oil, etc.) away from spilled material.

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Use water spray to reduce vapors or divert vapor cloud drift. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions

Avoid release to the environment. Contact local authorities in case of spillage to drain/aquatic environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from open flames, hot surfaces and sources of ignition. Do not breathe mist or vapor. Do not taste or swallow. Avoid contact with skin. Avoid contact with eyes. Avoid contact during pregnancy/while nursing. Avoid prolonged exposure. Avoid contact with clothing. Provide adequate ventilation. Wear appropriate personal protective equipment. Observe good industrial hygiene practices. When using, do not eat, drink or smoke. Wash hands thoroughly after handling. Wash contaminated clothing before reuse. Avoid release to the environment. Do not empty into drains.

Conditions for safe storage, including any incompatibilities

Store locked up. Keep away from heat, sparks and open flame. Store in original tightly closed container. Store in a cool, dry place out of direct sunlight. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS). Keep in an area equipped with sprinklers.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Material	Type	Value
1,2-Dibromo-3-chloropropane (CAS 96-12-8)	TWA	0.001 ppm

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear eye/face protection. Wear safety glasses with side shields (or goggles).

Skin protection

Hand protection

Wear appropriate chemical resistant gloves.

Other

Wear appropriate chemical resistant clothing.

Respiratory protection

If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn.

Thermal hazards

Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations

When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state

Liquid.

Form

Liquid

Color

Amber

Odor

Not available.

Odor threshold

Not available.

pH

Not available.

Melting point/freezing point

41 °F (5 °C)

Initial boiling point and boiling range	328.1 °F (164.5 °C) 39.99671 kPa
Flash point	170.0 °F (76.7 °C) Open Cup
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	0.08 kPa at 20 °C
Vapor density	2.09 at 14°C
Relative density	Not available.
Solubility(ies)	
Solubility (water)	1 g/l
Partition coefficient (n-octanol/water)	3
Auto-ignition temperature	Not available.
Decomposition temperature	383.9 °F (195.5 °C)
Viscosity	Not available.
Other information	
Density	2.0798 g/cm3 estimated
Flammability class	Combustible IIIA estimated
Molecular formula	C3-H5-Br2-Cl
Molecular weight	236.36 g/mol
Specific gravity	2.08 at 20 °C

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Avoid heat, sparks, open flames and other ignition sources. Avoid temperatures exceeding the decomposition temperature. Avoid temperatures exceeding the flash point. Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Toxic if swallowed.
Inhalation	Prolonged inhalation may be harmful. May cause damage to organs by inhalation.
Skin contact	Harmful in contact with skin. Causes skin irritation.
Eye contact	Causes eye irritation.
Symptoms related to the physical, chemical and toxicological characteristics	Exposed individuals may experience eye tearing, redness, and discomfort. Skin irritation. May cause redness and pain.

Information on toxicological effects

Acute toxicity	Toxic if swallowed. Harmful in contact with skin. Expected to be a low hazard for usual industrial or commercial handling by trained personnel.

Product	Species	Test Results
1,2-Dibromo-3-chloropropane (CAS 96-12-8)		
Acute		
Dermal		
LD50	Rabbit	1400 mg/kg
Oral		
LD50	Guinea pig	210 mg/kg
	Mouse	260 mg/kg
	Rabbit	100 mg/kg
	Rat	170 mg/kg
Other		
LD50	Mouse	123 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Causes eye irritation.

Respiratory or skin sensitization

Respiratory sensitization Not available.

Skin sensitization This product is not expected to cause skin sensitization.

Germ cell mutagenicity May cause genetic defects.

Carcinogenicity May cause cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

1,2-Dibromo-3-chloropropane (CAS 96-12-8) 2B Possibly carcinogenic to humans.

US. National Toxicology Program (NTP) Report on Carcinogens

1,2-Dibromo-3-chloropropane (CAS 96-12-8) Reasonably Anticipated to be a Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

1,2-Dibromo-3-chloropropane (CAS 96-12-8) Cancer

Reproductive toxicity Possible reproductive hazard. May damage fertility.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard Not available.

Chronic effects Prolonged inhalation may be harmful. Prolonged exposure may cause chronic effects. May cause damage to organs through prolonged or repeated exposure.

12. Ecological information

Ecotoxicity Harmful to aquatic life with long lasting effects. Accumulation in aquatic organisms is expected.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential Not available.

Partition coefficient n-octanol / water (log Kow)

2.96

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

US RCRA Hazardous Waste U List: Reference

1,2-Dibromo-3-chloropropane (CAS 96-12-8) U066

Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN2872
UN proper shipping name	Dibromochloropropane
Transport hazard class(es)	
Class	6.1(PGIII)
Subsidiary risk	-
Label(s)	6.1
Packing group	III
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	IB3, T4, TP1
Packaging exceptions	153
Packaging non bulk	203
Packaging bulk	241

IATA

UN number	UN2872
UN proper shipping name	Dibromochloropropanes
Transport hazard class(es)	
Class	6.1(PGIII)
Subsidiary risk	-
Packing group	III
Environmental hazards	No.
ERG Code	6L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Other information	
Passenger and cargo aircraft	Allowed.
Cargo aircraft only	Allowed.

IMDG

UN number	UN2872
UN proper shipping name	DIBROMOCHLOROPROPANES
Transport hazard class(es)	
Class	6.1(PGIII)
Subsidiary risk	-
Packing group	III
Environmental hazards	
Marine pollutant	No.
EmS	F-A, S-A
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not available.

DOT



IATA; IMDG



15. Regulatory information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

1,2-Dibromo-3-chloropropane (CAS 96-12-8) Listed.

SARA 304 Emergency release notification

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

1,2-Dibromo-3-chloropropane (CAS 96-12-8)
Cancer
Reproductive toxicity
Liver
Kidney
Central nervous system
Skin irritation
Eye irritation
respiratory tract irritation
Acute toxicity

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
1,2-Dibromo-3-chloropropane	96-12-8	100

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

1,2-Dibromo-3-chloropropane (CAS 96-12-8)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA)
0 mg/l
0.0002 mg/l

US state regulations

US. Massachusetts RTK - Substance List

1,2-Dibromo-3-chloropropane (CAS 96-12-8)

US. New Jersey Worker and Community Right-to-Know Act

1,2-Dibromo-3-chloropropane (CAS 96-12-8) 500 LBS

US. Pennsylvania RTK - Hazardous Substances

1,2-Dibromo-3-chloropropane (CAS 96-12-8)

US. Rhode Island RTK

1,2-Dibromo-3-chloropropane (CAS 96-12-8)

US. California Proposition 65

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

1,2-Dibromo-3-chloropropane (CAS 96-12-8) Listed: July 1, 1987

US - California Proposition 65 - CRT: Listed date/Male reproductive toxin

1,2-Dibromo-3-chloropropane (CAS 96-12-8) Listed: February 27, 1987

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 11-18-2014

Version # 01

NFPA ratings Health: 2
Flammability: 2
Instability: 1

Disclaimer The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded SDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

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This product is furnished FOR LABORATORY USE ONLY.

Material Safety Data Sheet
1,2,4-Trimethylbenzene

ACC# 73581

Section 1 - Chemical Product and Company Identification

MSDS Name: 1,2,4-Trimethylbenzene
Catalog Numbers: AC140090000, AC140090010, AC140090025, AC140095000
Synonyms: Pseudocumene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
95-63-6	1,2,4-Trimethylbenzene	98	202-436-9

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless clear liquid. Flash Point: 48 deg C.
Warning! Flammable liquid and vapor. Causes eye, skin, and respiratory tract irritation. Harmful if inhaled. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Target Organs: Blood, central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye: Causes eye irritation. Causes redness and pain.
Skin: Causes skin irritation. Causes redness and pain. May be harmful if absorbed through the skin.
Ingestion: May cause irritation of the digestive tract. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May be harmful if swallowed. May cause central nervous system depression.
Inhalation: Harmful if inhaled. Causes respiratory tract irritation. May cause drowsiness, unconsciousness, and central nervous system depression. Individuals exposed to a solvent containing a mixture of trimethylbenzenes have complained of nervousness, tension, anxiety, and asthmatic bronchitis. In addition, the peripheral blood showed a tendency to hypochromic anemia and a deviation from normal in the coagulability of the blood. Contamination of the solvent with benzene was probably responsible for the blood effects.
Chronic: Prolonged or repeated skin contact may cause dermatitis. May cause anemia and other blood cell abnormalities. Prolonged exposure may produce a narcotic effect. Prolonged or repeated exposure may cause nausea, dizziness, and headache.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing

contaminated clothing and shoes.
Ingestion: Do not induce vomiting. Possible aspiration hazard. Get medical aid immediately. Call a poison control center.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Possible aspiration hazard. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire. Containers may explode in the heat of a fire. Flammable liquid and vapor.
Extinguishing Media: Use water spray to cool fire-exposed containers. Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: 48 deg C (118.40 deg F)
Autoignition Temperature: 500 deg C (932.00 deg F)
Explosion Limits, Lower:0.9 vol %
Upper: 6.4 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Use a spark-proof tool. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood. Keep away from heat, sparks and flame.
Storage: Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,2,4-Trimethylbenzene	25 ppm TWA (listed under Trimethyl benzene).	25 ppm TWA; 125 mg/m3 TWA	none listed

OSHA Vacated PELs: 1,2,4-Trimethylbenzene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: colorless
Odor: aromatic odor
pH: Not available.
Vapor Pressure: 7 mm Hg @ 44.4 deg C
Vapor Density: 4.15 (air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 168 deg C @ 760 mmHg
Freezing/Melting Point:-44 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:0.880 g/cm3
Molecular Formula:C9H12
Molecular Weight:120.19

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 95-63-6: DC3325000
LD50/LC50:
CAS# 95-63-6:
Inhalation, rat: LC50 = 18000 mg/m3/4H;
Oral, mouse: LD50 = 6900 mg/kg;
Oral, rat: LD50 = 5 gm/kg;
.

Carcinogenicity:
CAS# 95-63-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Workers exposed to a mixture of trimethylbenzenes at up to 60 ppm experienced CNS changes, asthmatic bronchitis, and blood dyscrasias. Contamination of the solvent with benzene was probably responsible for the blood abnormalities.
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Sister Chromatid Exchange: Intraperitoneal, mouse = 900 mg/kg.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: LC50 = 77.2 mg/L; 96 Hr; Flow-through at 25 C (pH 7.24) Estimated Koc value = 720. 1,2,4-trimethylbenzene will have low mobility in soil. Volatilization from moist and dry soil surfaces is expected to occur. 1,2,4-Trimethylbenzene is expected to aerobically biodegrade in both soil and water. Anaerobic aquifer microcosms did not show significant biodegradation in comparison to poisoned controls. In water, 1,2,4-trimethylbenzene may adsorb to sediment or particulate matter.
Environmental: Bioconcentration in aquatic organisms is moderate to high based on BCF values of 31-275, measured in carp. 1,2,4-Trimethylbenzene is expected to photodegrade in natural waters. If released to the atmosphere, 1,2,4-trimethylbenzene will exist solely in the vapor phase in the ambient atmosphere. Vapor-phase 1,2,4-trimethylbenzene is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals and nitrate radicals with half-lives of about 12 hours and 6-30 days, respectively.
Physical: No information available.
Other: Do not empty into drains.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	FLAMMABLE LIQUIDS, N.O.S. (1,2,4-Trimethylbenzene)	FLAMMABLE LIQUIDS, N.O.S. (1,2,4-Trimethylbenzene)
Hazard Class:	3	3
UN Number:	UN1993	UN1993
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 95-63-6 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 95-63-6: Effective 4/29/83, Sunset 4/29/93
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 95-63-6: immediate, delayed, fire.

Section 313

This material contains 1,2,4-Trimethylbenzene (CAS# 95-63-6, 98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 95-63-6 can be found on the following state right to know lists: California, (listed as Trimethyl benzene), New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN N

Risk Phrases:

R 10 Flammable.
R 36/37/38 Irritating to eyes, respiratory system and skin.
R 20 Harmful by inhalation.
R 51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger / Protection)

CAS# 95-63-6: 3

Canada - DSL / NDSL

CAS# 95-63-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B3.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 95-63-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 5/19/1999
Revision #5 Date: 8/30/2007

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet
Mesitylene

ACC# 96021

Section 1 - Chemical Product and Company Identification

MSDS Name: Mesitylene
Catalog Numbers: AC125580000, AC125580010, AC125580050, AC125582500, AC161320000, AC161320010 AC161320010, AC161320050, AC161322500
Synonyms: 1,3,5-Trimethylbenzene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
108-67-8	Mesitylene	97+	203-604-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: APHA: 20 max liquid. Flash Point: 44 deg C.
Warning! Flammable liquid and vapor. Causes eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Target Organs: Blood, kidneys, central nervous system, liver, respiratory system, eyes, skin.

Potential Health Effects

Eye: Causes eye irritation.
Skin: Causes skin irritation. May be harmful if absorbed through the skin.
Ingestion: May cause irritation of the digestive tract. May be harmful if swallowed.
Inhalation: Causes respiratory tract irritation. May be harmful if inhaled.
Chronic: May cause liver and kidney damage. Laboratory experiments have resulted in mutagenic effects. Chronic exposure may cause blood effects. Exposure to high concentrations may cause central nervous system depression.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do not induce vomiting. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire. Containers may explode in the heat of a fire. Flammable liquid and vapor.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: 44 deg C (111.20 deg F)
Autoignition Temperature: 550 deg C (1,022.00 deg F)
Explosion Limits, Lower:1.00 vol %
Upper: 6.00 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Use a spark-proof tool. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Keep away from heat, sparks and flame. Do not ingest or inhale. Use only in a chemical fume hood.
Storage: Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Mesitylene	25 ppm TWA (listed under Trimethyl benzene).	25 ppm TWA; 125 mg/m3 TWA	none listed

OSHA Vacated PELs: Mesitylene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: APHA: 20 max
Odor: Peculiar aromatic
pH: Not available.
Vapor Pressure: 2.5 mbar @ 20 deg C
Vapor Density: 4.1(air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 163 - 166 deg C @ 760 mmHg
Freezing/Melting Point:-45 deg C
Decomposition Temperature: Not available.
Solubility: 2.9 g/L (20°C)
Specific Gravity/Density:0.868
Molecular Formula:C9H12
Molecular Weight:120.19

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 108-67-8: OX6825000
LD50/LC50:
CAS# 108-67-8:
Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, rat: LC50 = 24000 mg/m3/4H;
Oral, mouse: LD50 = 7000 mg/kg;
Oral, rat: LD50 = 5000 mg/kg;
.

Carcinogenicity:
CAS# 108-67-8: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Mutagenic effects have occurred in experimental animals.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: LC50 = 3.48 mg/L; 96 Hr; UnspecifiedFish: Goldfish: LC50 = 12.5-13.0 mg/L; 96 Hr; UnspecifiedFish: Goldfish: LC50 = 13.7 mg/L; 72 Hr; UnspecifiedWater flea Daphnia: EC50 = 50 mg/L; 72 Hr; Unspecified No data available.
Environmental: According to a classification scheme, BCF values of 23 to 342, measured in carp, suggest that

bioconcentration in aquatic organisms may occur. Biodegradation may be an important fate process for this compound in water; acclimation may increase the rate of biodegradation.
Physical: No information found.
Other: Do not empty into drains.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	1,3,5-TRIMETHYLBENZENE	1,3,5-TRIMETHYLBENZENE
Hazard Class:	3	3
UN Number:	UN2325	UN2325
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 108-67-8 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 108-67-8: Effective 2/13/84, Sunset 2/13/94
Chemical Test Rules
CAS# 108-67-8: 40 CFR 799.5075
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 108-67-8: immediate, fire.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 108-67-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania,

(listed as Trimethyl benzene), Minnesota, (listed as Trimethyl benzene), Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XI N

Risk Phrases:

R 10 Flammable.
R 37 Irritating to respiratory system.
R 51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger / Protection)

CAS# 108-67-8: 2

Canada - DSL / NDSL

CAS# 108-67-8 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B3, D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 108-67-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 5/19/1999
Revision #5 Date: 2/15/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet
sec-Butylbenzene, 99+%

ACC# 73785

Section 1 - Chemical Product and Company Identification

MSDS Name: sec-Butylbenzene, 99+%
Catalog Numbers: AC107860000, AC107860050, AC107860500, AC107861000, AC107862500, AC107865000 AC107865000
Synonyms: 2-Phenylbutane; Benzene, (1-methylpropyl)-; (1-Methylpropyl)benzene; Benzene, sec-butyl-
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
135-98-8	sec-Butylbenzene	99+	205-227-0

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear colorless liquid. Flash Point: 45 deg C.
Warning! Flammable liquid and vapor. Causes eye, skin, and respiratory tract irritation. May cause central nervous system depression.
Target Organs: Central nervous system.

Potential Health Effects

Eye: Causes eye irritation.
Skin: Causes skin irritation.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Ingestion of large amounts may cause CNS depression.
Inhalation: Causes respiratory tract irritation.
Chronic: Prolonged or repeated skin contact may cause dermatitis.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Flammable liquid and vapor.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. Use agent most appropriate to extinguish fire. Do NOT use straight streams of water.
Flash Point: 45 deg C (113.00 deg F)
Autoignition Temperature: 415 deg C (779.00 deg F)
Explosion Limits, Lower:0.80 vol %
Upper: 6.90 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
sec-Butylbenzene	none listed	none listed	none listed

OSHA Vacated PELs: sec-Butylbenzene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements

or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear colorless
Odor: None reported.
pH: Not available.
Vapor Pressure: 4 mm Hg @ 37.7 deg C
Vapor Density: 4.62
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 173 - 174 deg C @ 760 mm Hg
Freezing/Melting Point:-75 deg C
Decomposition Temperature: Not available.
Solubility: 0.015 g/L water
Specific Gravity/Density:0.8630 g/cm3
Molecular Formula:C10H14
Molecular Weight:134.22

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Ignition sources, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 135-98-8: CY9100000
LD50/LC50:
CAS# 135-98-8:
Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, skin: 100 mg/24H Moderate;
Oral, mouse: LD50 = 8700 mg/kg;
Oral, rat: LD50 = 2240 uL/kg;
Oral, rat: LD50 = 6300 mg/kg;
Skin, rabbit: LD50 = >16 mL/kg;
.

Carcinogenicity:
CAS# 135-98-8: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	BUTYL BENZENES	BUTYLBENZENES
Hazard Class:	3	3
UN Number:	UN2709	UN2709
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 135-98-8 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 135-98-8: Effective 6/1/87, Sunset 12/19/95
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 135-98-8 can be found on the following state right to know lists: Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XI

Risk Phrases:

R 10 Flammable.
R 36/37/38 Irritating to eyes, respiratory system and skin.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.
S 33 Take precautionary measures against static discharges.
S 9 Keep container in a well-ventilated place.

WGK (Water Danger / Protection)

CAS# 135-98-8: 1

Canada - DSL / NDSL

CAS# 135-98-8 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B3, D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #8 Date: 11/20/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

SAFETY DATA SHEET

Revision Date 23-Jan-2018 **Revision Number** 5

1. Identification

Product Name **p-Cymene**

Cat No. : **AC111760000; AC111760010; AC111760025; AC111760100; AC111762500**

CAS-No 99-87-6
Synonyms Dolcymene; p-Isopropyltoluene

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 3
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
May be fatal if swallowed and enters airways

Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation



Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
p-Cymene	99-87-6	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. Risk of serious damage to the lungs (by aspiration).
Ingestion	Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.
Most important symptoms and effects	Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray, carbon dioxide (CO2), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	No information available
Flash Point	47 °C / 116.6 °F
Method -	No information available
Autoignition Temperature	435 °C / 815 °F

Explosion Limits

Upper	5.60%
Lower	.70%
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Flammable. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2).
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	2	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required. Remove all sources of ignition. Take precautionary measures against static discharges.
Environmental Precautions	Should not be released into the environment.
Methods for Containment and Clean Up	Keep in suitable, closed containers for disposal. Soak up with inert absorbent material. Remove all sources of ignition. Take precautionary measures against static discharges. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling

Wear personal protective equipment/face protection. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Use spark-proof tools and explosion-proof equipment. Take precautionary measures against static discharges.

Storage

Keep in a dry, cool and well-ventilated place. Refer product specification and/or product label for specific storage temperature requirement. Keep container tightly closed. Keep away from heat, sparks and flame. Flammables area. Keep container tightly closed in a dry and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.

Engineering Measures

Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment.

Personal Protective Equipment

Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Clear
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-68 °C / -90.4 °F
Boiling Point/Range	176 - 178 °C / 348.8 - 352.4 °F @ 760 mmHg
Flash Point	47 °C / 116.6 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	5.60%
Lower	.70%
Vapor Pressure	1.5 mmHg @ 20 °C
Vapor Density	4.62 (Air = 1.0)
Specific Gravity	0.854
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	435 °C / 815 °F
Decomposition Temperature	No information available

Viscosity	No information available
Molecular Formula	C10 H14
Molecular Weight	134.22

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Keep away from open flames, hot surfaces and sources of ignition. Excess heat. Incompatible products.

Incompatible Materials Strong oxidizing agents, Strong acids, Strong bases

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization No information available.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
p-Cymene	LD50 = 4750 mg/kg (Rat) LD50 = 3669 mg/kg (Rat)	LD50 > 5000 mg/kg (Rabbit)	LC50 > 9.7 mg/L (Rat) 5 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
p-Cymene	99-87-6	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. .

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
p-Cymene	Not listed	LC50: 48 mg/L/96h (sheepshead minnow)	Not listed	LC50: 6.5 mg/L/48h

Persistence and Degradability Insoluble in water May persist based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility.

Component	log Pow
p-Cymene	4.1

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN2046
Proper Shipping Name CYMENES
Hazard Class 3
Packing Group III

TDG

UN-No UN2046
Proper Shipping Name CYMENES
Hazard Class 3
Packing Group III

IATA

UN-No UN2046
Proper Shipping Name CYMENES
Hazard Class 3
Packing Group III

IMDG/IMO

UN-No UN2046
Proper Shipping Name CYMENES
Hazard Class 3
Subsidiary Hazard Class P
Packing Group III

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
p-Cymene	99-87-6	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
p-Cymene	99-87-6	X	-	202-796-7	X	X	X	X	KE-21748

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
p-Cymene	X	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 23-Jan-2018
Print Date 23-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

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 a 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

End of SDS

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	**B-2, D-2A, D-2B**		

Section 1. Chemical Product and Company Identification

Product Name	**BENZENE**
Synonym	Benzol; aromatic hydrocarbons (C6H6); cyclohexatriene.
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3
Material Uses	Petrochemical manufactured by extraction process of petroleum fraction. Component of crude oil. Found in various refinery streams (eg. gasoline). Laboratory solvent. Used in manufacture of organic compounds (eg detergents, dyes, insecticides).

Code	W117
Validated on	**4/21/2004.**
In case of Emergency	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Benzene	71-43-2	99.6	0.5 ppm	2.5 ppm	Not established
2) Toluene	108-88-3	0.3	50 ppm	Not established	Not established
3) Non-aromatics	Mixture	0.1	Not established	Not established	Not established

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Flammable liquid. Exercise caution when handling this material. Contact with this product may cause skin and eye irritation. Prolonged or repeated contact may cause skin irritation, defatting, drying and dermatitis. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Aspiration of liquid drops into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure. May cause cancer. May cause heritable genetic effects (mutagenicity). For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.
Skin Contact	Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.
Inhalation	Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.
Note to Physician	Not available

Section 5. Fire-fighting Measures

Flammability	Class I - flammable liquid (NFPA).	**Flammable Limits**	LOWER: 1.3%; UPPER: 7.1% (NFPA).
Flash Points	CLOSED CUP: -11°C (12°F)	**Auto-Ignition Temperature**	498°C (928°F) (NFPA)
Fire Hazards in Presence of Various Substances	Extremely flammable in presence of open flames, sparks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Rapid escape of vapour may generate static charge causing ignition. This product can accumulate static charge and ignite. May accumulate in confined spaces.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire. Runoff to sewer may create fire or explosion hazard.
Products of Combustion	Carbon oxides (CO, CO2), aldehydes, ketones, smoke and irritating vapours as products of incomplete combustion.		

Fire Fighting Media and Instructions	NAERG2000, GUIDE 130, Flammable liquids (Non-polar/ Water-immiscible/ Noxious). CAUTION: This product has a very low flash point: Use of water spray when fighting fire may be inefficient. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions. SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk. FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Section 6. Accidental Release Measures

Material Release or Spill	IN THE EVENT OF A LARGE SPILL CONSIDER THE FOLLOWING CONTROL MEASURES: Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Evacuate non-essential personnel. Extinguish all ignition sources. Ventilate area. Stop leak if safe to do so. Ensure clean-up personnel wear appropriate personal protective equipment. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Ground and bond all equipment used to clean up the spilled material, as it may be a static accumulator. Avoid contact with spilled material. Avoid breathing vapours or mists of material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling	FLAMMABLE MATERIAL. Handle with care. Avoid contact with any sources of ignition, flames, heat, and sparks. Ensure all equipment is grounded/bonded. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Avoid confined spaces and areas with poor ventilation. Avoid contact with any incompatible or reactive materials. Wear proper personal protective equipment (See Section 8). Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated. Thoroughly wash all severely contaminated clothing before reuse.
Storage	Store away from heat and sources of ignition. Store in dry, cool, well-ventilated area. Store away from incompatible and reactive materials (See section 5 and 10). Avoid direct sunlight. Ensure the storage containers are grounded/bonded.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***	
Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Clear liquid.	**Viscosity**	Not available
Colour	Clear and colourless	**Pour Point**	Not available
Odour	Sweetish aromatic.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	80ºC (176ºF) (NFPA)	**Penetration**	Not applicable.
Density	0.88 @ 15ºC (41ºF).	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	2.8 (Air = 1) (NFPA)	**Ionicity (in water)**	Not available
Vapour Pressure	75 mmHg @ 20ºC (NFPA)	**Dispersion Properties**	Not available

Volatility	Volatile.	**Solubility**	Soluble in alcohol, petroleum oil, carbon disulphide, chloroform, ether and acetone. Insoluble in water.

Section 10. Stability and Reactivity

Corrosivity	Not available		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents, acids, chlorine, ozones, peroxides, plastics, rubbers and coatings.	**Decomposition Products**	May release COx, aldehydes, ketones, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation, and ingestion.
Acute Lethality	Acute toxicity information is not available for the product as a whole, therefore, data for some of the ingredients is provided below: Benzene (71-43-2): Acute oral toxicity (LD50): 930 mg/kg (rat). Acute dermal toxicity (LD50): >9400 mg/kg (rabbit). Acute inhalation toxicity (LC50): 13,700 ppm/4h (rat). Toluene (108-88-3): Acute oral toxicity (LD50): 636 mg/kg (rat). Acute dermal toxicity (LD50): 12,124 mg/kg (rabbit). Acute inhalation toxicity (LC50): 8800 ppm/4h (rat).
Chronic or Other Toxic Effects	
Dermal Route:	This product contains a component (at >= 1%) that can cause skin irritation. Therefore, this product is considered to be a skin irritant. Prolonged or repeated contact may defat and dry skin, and cause dermatitis. Harmful if absorbed through the skin.
Inhalation Route:	Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Oral Route:	Ingestion of this product may lead to aspiration of the liquid, especially if vomiting occurs. This may result in chemical pneumonitis (inflammation of the lungs) and/or pulmonary edema (an accumulation of fluid in the lungs). Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Eye Irritation/Inflammation:	This product contains a component (at >= 1%) that can cause eye irritation. Therefore, this product is considered to be an eye irritant.
Immunotoxicity:	Not available
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	This product contains a component(s) at >= 0.1% that has been shown to cause mutagenicity in laboratory tests. Therefore, this product is considered to be a mutagen. (Benzene).
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	Some test results have shown that Toluene was teratogenic in the absence of maternal toxicity, but the applicability of these results to WHMIS is unknown.
Carcinogenicity (ACGIH):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. (Considered to be A1 by the ACGIH. Benzene, 71-43-2)
Carcinogenicity (IARC):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. (Considered to be carcinogenic to humans (group 1) by IARC. Benzene, 71-43-2)
Carcinogenicity (NTP):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. (Known to be a human carcinogen according to NTP. Benzene, 71-43-2)
Carcinogenicity (IRIS):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. (Considered to be carcinogenic by IRIS. Benzene, 71-43-2)
Carcinogenicity (OSHA):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. (Considered to be carcinogenic by OSHA. Benzene, 71-43-2)
Other Considerations	No additional remark.

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal	Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

TDG Classification	BENZENE, 3, UN1114, PGII (CL-TDG)	**Special Provisions for Transport**	See Transportation of Dangerous Goods Regulations.

Section 15. Regulatory Information

Other Regulations

This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DSD/DPD (Europe)	Not evaluated.	**HCS (U.S.A.)**	CLASS: Contains material which may cause cancer. CLASS: Flammable liquid having a flash point lower than 37.8°C (100°F). CLASS: Irritating substance. CLASS: Target organ effects.
ADR (Europe) (Pictograms)	**NOT EVALUATED FOR EUROPEAN TRANSPORT** **NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.**	**DOT (U.S.A) (Pictograms)**	

HMIS (U.S.A.)

Health Hazard	2*
Fire Hazard	3
Reactivity	0
Personal Protection	K

NFPA (U.S.A.)



Rating	
0	Insignificant
1	Slight
2	Moderate
3	High
4	Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia

FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS
Internet: www.petro-canada.ca/msds

Western Canada, Ontario & Central Canada, telephone: 1-800-668-0220; fax: 1-800-837-1228
Quebec & Eastern Canada, telephone: 514-640-8308; fax: 514-640-8385

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 4/21/2004.

Data entry by Product Safety - RS.

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet
Ethylbenzene

ACC# 00596

Section 1 - Chemical Product and Company Identification

MSDS Name: Ethylbenzene
Catalog Numbers: AC118080000, AC118080025, AC118080250, AC118080251, AC118085000, 11808-0010, O2751-1
Synonyms: Ethylbenzol; Phenylethane.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
100-41-4	Ethylbenzene	>99	202-849-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 15 deg C.
Warning! Flammable liquid and vapor. Causes eye, skin, and respiratory tract irritation. May be harmful if inhaled. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system depression.
Target Organs: Central nervous system.

Potential Health Effects

Eye: Causes severe eye irritation. Causes redness and pain.
Skin: Causes skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin. Causes redness and pain.
Ingestion: May cause irritation of the digestive tract. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. Vapors may cause dizziness or suffocation.
Chronic: Chronic inhalation may cause effects similar to those of acute inhalation.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: 15 deg C (59.00 deg F)
Autoignition Temperature: 432 deg C (809.60 deg F)
Explosion Limits, Lower:1.2%
Upper: 6.8%
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation. Control runoff and isolate discharged material for proper disposal. Use water spray to cool and disperse vapors and protect personnel.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Avoid breathing vapor or mist.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Ethylbenzene	100 ppm TWA; 125 ppm STEL	100 ppm TWA; 435 mg/m3	100 ppm TWA; 435 mg/m3

		TWA 800 ppm IDLH	TWA

OSHA Vacated PELs: Ethylbenzene: 100 ppm TWA; 435 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: aromatic odor
pH: Not available.
Vapor Pressure: 9.6 mm Hg @ 25 deg C
Vapor Density: 3.7 (air=1)
Evaporation Rate:<1 (butyl acetate=1)
Viscosity: 0.63 mPa s 20 C
Boiling Point: 136 deg C
Freezing/Melting Point:-95 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:0.86
Molecular Formula:C8H10
Molecular Weight:106.17

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Ignition sources, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 100-41-4: DA0700000
LD50/LC50:
CAS# 100-41-4:
Draize test, rabbit, eye: 500 mg Severe;
Inhalation, mouse: LC50 = 35500 mg/m3/2H;
Inhalation, rat: LC50 = 55000 mg/m3/2H;
Oral, rat: LD50 = 3500 mg/kg;
Oral, rat: LD50 = 3500 mg/kg;
Skin, rabbit: LD50 = 17800 uL/kg;
.
Inhalation rat LC50: 17.2 mg/l/4H from BASF.
Carcinogenicity:
CAS# 100-41-4:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 6/11/04
- **NTP:** Not listed.
- **IARC:** Group 2B carcinogen

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Mutation in mammalian somatic cells(Rodent,mouse) Lymphocyte = 80 mg/L.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 14.0 mg/L; 96 Hr.; Static BioassayFish: Fathead Minnow: LC50 = 12.1 mg/L; 96 Hr.; Flow-through BioassayFish: Bluegill/Sunfish: LC50 = 150.0 mg/L; 96 Hr.; Static Bioassay, pH 6.5-7.9, 21-23 degrees CWater flea EC50 = 2.1 mg/L; 48 Hr.; Static BioassayWater flea EC50 = 75.0 mg/L; 48 Hr.; Static Bioassay Shrimp (mysidoposis bahia), LC50=87.6 mg/L/96hr. Sheepshead minnow LC50=275 mg/L/96hr. Fathead minnow LC50=42.3 mg/L/96hr in hard water &48.5 mg/L/96hr in softwater.
Environmental: Experimental data on the bioconcentration of ethylbenzene include a log BCF of 1.9 in goldfish and the log BCF of 0.67 for clams exposed to the water-soluble fraction of crude oil. Using its octanol/water partition coefficient (log Kow= 3.15) and using a recommended regression equation, one can calculate a log BCF in fish of 2.16 indicating that ethylbenzene should not significantly bioconcentrate in aquatic organisms. Ethylbenzene has a moderate adsorption for soil. The measured Koc for silt loam was 164
Physical: The predominant photochemical reaction of ethylbenzene in the atmosphere is with hydroxyl radicals; the tropospheric half-life for this reaction is 5.5 and 24 hr in the summer and winter, actively. Degradation is somewhat faster under photochemical smog situations. Photooxidation products which have been identified include ethylphenol, benzaldehyde, acetophenone and m- and p-ethylnitrobenzene. Ethylbenzene is resistant to hydrolysis. Ethylbenzene does not significantly absorb light above 290 nm in methanol solution.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ETHYLBENZENE	ETHYLBENZENE
Hazard Class:	3	3
UN Number:	UN1175	UN1175
Packing Group:	II	II
Additional Info:		FLASHPOINT 15 C

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 100-41-4 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 100-41-4: Effective 6/19/87, Sunset 6/19/97

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 100-41-4: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 100-41-4: immediate, delayed, fire.

Section 313

This material contains Ethylbenzene (CAS# 100-41-4, >99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 100-41-4 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 100-41-4 is listed as a Hazardous Substance under the CWA. CAS# 100-41-4 is listed as a Priority Pollutant under the Clean Water Act. CAS# 100-41-4 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 100-41-4 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Ethylbenzene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN F

Risk Phrases:

R 11 Highly flammable.

R 20 Harmful by inhalation.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.

S 24/25 Avoid contact with skin and eyes.

S 29 Do not empty into drains.

WGK (Water Danger/Protection)

CAS# 100-41-4: 1

Canada - DSL/NDSL

CAS# 100-41-4 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2B, D2A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 100-41-4 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 4/28/1999
Revision #6 Date: 11/29/2007

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet
Naphthalene

ACC# 16120

Section 1 - Chemical Product and Company Identification

MSDS Name: Naphthalene
Catalog Numbers: AC164210010, AC164210025, AC180200010, AC180200050, AC180202500, AC180900010, AC180902500, S76307, S763071, S93309, N134-500, N7-500
Synonyms: Coal tar camphor; Tar camphor; Naphthalin; White tar; Naphthene; Moth flakes: Moth balls.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
91-20-3	Naphthalene	>98	202-049-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white solid. Flash Point: 78 deg C.
Warning! Flammable solid. Harmful if inhaled or swallowed. Causes eye, skin, and respiratory tract irritation. May be harmful if absorbed through the skin. May cause blood abnormalities. Hygroscopic (absorbs moisture from the air).
Target Organs: Blood, respiratory system, eyes, skin.

Potential Health Effects

Eye: Naphthalene is an eye irritant. The vapor causes eye irritation at 15 ppm. Eye contact with the solid material may result in conjunctivitis, superficial injury to the cornea, diminished visual acuity, and other effects. It may cause cataracts.
Skin: Causes mild skin irritation. May be absorbed through the skin in harmful amounts. Incidence of skin hypersensitivity is not widespread in the general population &, based on the long history of use of naphthalene as a consumer product, this effect is mostly confined to industrial exposure where coal tar contamination may be present.
Ingestion: Harmful if swallowed. May cause liver and kidney damage. May cause methemoglobinemia, cyanosis (bluish discoloration of skin due to deficient oxygenation of the blood), convulsions, and death. May cause severe digestive tract irritation with abdominal pain, nausea, vomiting and diarrhea. Ingestion of large quantities may cause severe hemolytic anemia and hemoglobinuria.
Inhalation: Harmful if inhaled. Causes respiratory tract irritation. Readily absorbed when inhaled. Material volatilizes at room temperature. Hemolytic anemia (destruction of red blood cells) is the primary health concern for humans exposed to naphthalene for either short or long periods of time. Other effects may include nausea, profuse perspiration, vomiting, kidney damage and liver damage. Optic neuritis (inflammation of the optic nerve) has been observed. Cataracts have also occurred.
Chronic: Prolonged or repeated skin contact may cause dermatitis. May cause liver and kidney damage. May cause

anemia and other blood cell abnormalities. Animal studies have reported that fetal effects/abnormalities may occur when maternal toxicity is seen. Effects may be delayed. Chronic exposure may cause lung damage. Laboratory experiments have resulted in mutagenic effects. Chronic exposure may cause corneal injury, optical neuritis, blurred vision, and possible cataract formation. Chronic inhalation, skin absorption or ingestion of naphthalene have caused severe hemolytic anemia.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Individuals with a glucose-6-phosphate dehyrogenase deficiency are hypersensitive to the effects of naphthalene.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Flammable solid. Dusts may be an explosion hazard if mixed with air at critical proportions and in the presence of an ignition source. Volatile solid that gives off flammable vapors when heated.
Extinguishing Media: Water or foam may cause frothing. Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: 78 deg C (172.40 deg F)
Autoignition Temperature: 526 deg C (978.80 deg F)
Explosion Limits, Lower:0.90 vol %
Upper: 5.90 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Scoop up with a nonsparking tool, then place into a suitable container for disposal. Avoid generating dusty conditions. Remove all sources of ignition. Provide ventilation. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Avoid breathing dust, mist, or vapor. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Use only with adequate ventilation.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Storage under a nitrogen blanket has been recommended. Store protected from moisture. Separate from oxidizing materials.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Naphthalene	10 ppm TWA; 15 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	10 ppm TWA; 50 mg/m3 TWA 250 ppm IDLH	10 ppm TWA; 50 mg/m3 TWA

OSHA Vacated PELs: Naphthalene: 10 ppm TWA; 50 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear chemical splash goggles.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Solid

Appearance: white

Odor: mothball-like

pH: Not available.

Vapor Pressure: 0.05 mm Hg @ 20 deg C

Vapor Density: 4.4 (air=1)

Evaporation Rate:<1.0 (butyl acetate=1)

Viscosity: Not available.

Boiling Point: 218 deg C

Freezing/Melting Point:79 - 82 deg C

Decomposition Temperature:540 deg C

Solubility: Insoluble.

Specific Gravity/Density:0.9900g/cm3

Molecular Formula:C10H8

Molecular Weight:128.17

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to Avoid: Ignition sources, dust generation, moisture, excess heat, exposure to moist air or water, steam.

Incompatibilities with Other Materials: Strong oxidizing agents.

Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 91-20-3: QJ0525000
LD50/LC50:
CAS# 91-20-3:
Draize test, rabbit, eye: 100 mg Mild;
Inhalation, rat: LC50 = >340 mg/m3/1H;
Oral, mouse: LD50 = 316 mg/kg;
Oral, rat: LD50 = 490 mg/kg;
Skin, rabbit: LD50 = >20 gm/kg;
Skin, rat: LD50 = >2500 mg/kg;
.

Carcinogenicity:
CAS# 91-20-3:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 4/19/02
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

Epidemiology: Incidents in which blankets or clothing containing naphthalene caused acute hemolysis in infants, in some cases fatal, have been described.The percutaneous absorption and systemic intoxication with naphthalene can be facilitated by oily vehicles.
Teratogenicity: Naphthalene and its metabolites have been reported to cross the human placenta in amounts sufficient to cause fetal toxicity.Oral, rat: TDLo = 4500 mg/kg (female 6-15 day(s) after conception).Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus) and Specific Developmental Abnormalities - other developmental abnormalities.Intraperitoneal, rat: TDLo = 5925 mg/kg (female 1-15 day(s) after conception) Specific Developmental Abnormalities - musculoskeletal system and cardiovascular (circulatory) system.
Reproductive Effects: No information available.
Mutagenicity: Micronucleus Test: Human, Lymphocyte = 30 mg/L.; Cytogenetic Analysis: Hamster, Ovary = 30 mg/L.; Sister Chromatid Exchange: Hamster, Ovary = 15 mg/L.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 1.60 mg/L; 96 Hr; Flow-through at 15 CFish: Fathead Minnow: LC50 = 6.14 mg/L; 96 Hr; Flow-through at 24.5 CWater flea Daphnia: EC50 = 2.16-8.60 mg/L; 48 Hr; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 = 0.93 mg/L; 30 min; Microtox testFish: Pink salmon: LC50 = 1.24 mg/L; 96 Hr; (fry) Static bioassay at 12°C Releases into water are lost due to volatilization, photolysis, adsorption, and biodegradation. The principal loss processes will depend on local conditions but half-lives can be expected to range from a couple of days to a few months. When adsorbed to sediment, biodegradation occurs much more rapidly than in the overlying water column. When spilled on land, naphthalene is adsorbed moderately to soil and undergoes biodegradation. However, in some cases it will appear in the groundwater where biodegradation still may occur if conditions are aerobic.
Environmental: Bioconcentration occurs to a moderate extent but since depuration and metabolism readily proceed in aquatic organisms, this is a short term problem. transport and disposal of fuel oil, coal tar, etc. In the atmosphere, naphthalene rapidly photodegrades (half-life 3-8 hr). Naphthalene shows low biological oxygen demand and is expected to cause little O2 depletion in aquatic systems.
Physical: Log P (oct) = 3.01 - 3.59
Other: Harmful to aquatic life in very low concentrations.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA

guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 91-20-3: waste number U165.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	NAPHTHALENE, CRUDE	NAPHTHALENE
Hazard Class:	4.1	4.1
UN Number:	UN1334	UN1334
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 91-20-3 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 91-20-3: Effective 6/1/87, Sunset 6/1/97
Chemical Test Rules
CAS# 91-20-3: 40 CFR 799.5115
Section 12b
CAS# 91-20-3: Section 4
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 91-20-3: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 91-20-3: immediate, delayed, fire.
Section 313
This material contains Naphthalene (CAS# 91-20-3, >98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 91-20-3 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 91-20-3 is listed as a Hazardous Substance under the CWA. CAS# 91-20-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 91-20-3 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 91-20-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains Naphthalene, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: CAS# 91-20-3: 5.8 æg/day NSRL

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN N

Risk Phrases:

R 22 Harmful if swallowed.
R 40 Limited evidence of a carcinogenic effect.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 36/37 Wear suitable protective clothing and gloves.
S 46 If swallowed, seek medical advice immediately and show this container or label.
S 60 This material and its container must be disposed of as hazardous waste.
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger / Protection)

CAS# 91-20-3: 2

Canada - DSL / NDSL

CAS# 91-20-3 is listed on Canada's DSL List.

Canada - WHMIS

not available.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 91-20-3 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 5/14/1999
Revision #7 Date: 11/28/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

SAFETY DATA SHEET

Creation Date 16-Apr-2012 **Revision Date** 19-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Cumene**

Cat No. : **AC329730000; AC329730025; AC329730050; AC329735000**

CAS-No 98-82-8
Synonyms Isopropylbenzene

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 3
Acute oral toxicity	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Carcinogenicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor

Harmful if swallowed
Causes skin irritation
Causes eye irritation
Suspected of causing cancer
May cause respiratory irritation
May be fatal if swallowed and enters airways



Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Wear protective gloves/protective clothing/eye protection/face protection
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Response
Call a POISON CENTER or doctor/physician if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
Take off contaminated clothing and wash before reuse
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
Rinse mouth
Do NOT induce vomiting
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Toxic to aquatic life with long lasting effects
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %

Cumene	98-82-8	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention.

Inhalation Remove to fresh air. Get medical attention. If not breathing, give artificial respiration. Risk of serious damage to the lungs (by aspiration).

Ingestion Do NOT induce vomiting. Get medical attention. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.

Most important symptoms and effects Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray, carbon dioxide (CO2), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.

Unsuitable Extinguishing Media Do not use a solid water stream as it may scatter and spread fire

Flash Point 31 °C / 87 °F

Method - No information available

Autoignition Temperature 424 °C / 795 °F

Explosion Limits

Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Flammable. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2).
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	2	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Keep in suitable, closed containers for disposal. Soak up with inert absorbent material. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment. Take precautionary measures against static discharges.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges. Use spark-proof tools and explosion-proof equipment.

Storage Keep container tightly closed in a dry and well-ventilated place. Keep away from heat, sparks and flame. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Cumene	TWA: 50 ppm	(Vacated) TWA: 50 ppm (Vacated) TWA: 245 mg/m³ Skin TWA: 50 ppm TWA: 245 mg/m³	IDLH: 900 ppm TWA: 50 ppm TWA: 245 mg/m³	TWA: 50 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment.

Personal Protective Equipment

Eye/face Protection Tight sealing safety goggles. Face protection shield.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-96 °C / -141 °F
Boiling Point/Range	152 - 154 °C / 306 - 309 °F
Flash Point	31 °C / 87 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable

Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	5.3 hPa @ 20 °C
Vapor Density	No information available
Specific Gravity	0.862
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	424 °C / 795 °F
Decomposition Temperature	No information available
Viscosity	0.79 mPa.s at 20 °C
Molecular Formula	C9 H12
Molecular Weight	120.19

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Excess heat. Incompatible products. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cumene	1400 mg/kg (Rat) 2700 mg/kg (Rat)	LD50 = 12300 µL/kg (Rabbit)	LC50 > 3577 ppm (Rat) 6 h LC50 = 39000 mg/m³ (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes, respiratory system and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Cumene	98-82-8	Group 2B	Reasonably Anticipated	Not listed	X	Not listed

IARC (International Agency for Research on Cancer)

IARC (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard Category 1

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Contains a substance which is:. Very toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Cumene	EC50: = 2.6 mg/L, 72h (Pseudokirchneriella subcapitata)	LC50: = 2.7 mg/L, 96h semi-static (Oncorhynchus mykiss) LC50: = 4.8 mg/L, 96h flow-through (Oncorhynchus mykiss) LC50: 6.04 - 6.61 mg/L, 96h flow-through (Pimephales promelas) LC50: = 5.1 mg/L, 96h semi-static (Poecilia reticulata)	EC50 = 0.89 mg/L 5 min EC50 = 1.10 mg/L 15 min EC50 = 1.48 mg/L 30 min EC50 = 172 mg/L 24 h	EC50: 7.9 - 14.1 mg/L, 48h Static (Daphnia magna) EC50: = 0.6 mg/L, 48h (Daphnia magna)

Persistence and Degradability Persistence is unlikely

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Cumene	3.7

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Cumene - 98-82-8	U055	-

14. Transport information

DOT

UN-No UN1918
Proper Shipping Name ISOPROPYLBENZENE
Hazard Class 3
Packing Group III

TDG

UN-No UN1918
Proper Shipping Name ISOPROPYLBENZENE
Hazard Class 3
Packing Group III

IATA

UN-No UN1918
Proper Shipping Name ISOPROPYLBENZENE
Hazard Class 3
Packing Group III

IMDG/IMO

UN-No UN1918
Proper Shipping Name ISOPROPYLBENZENE
Hazard Class 3
Packing Group III

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Cumene	98-82-8	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Cumene	98-82-8	X	-	202-704-5	X	X	X	X	KE-23957

U.S. Federal Regulations

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Cumene	98-82-8	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Cumene	X		-

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Cumene	5000 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Cumene	98-82-8	Carcinogen	-	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Cumene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Serious risk, Grade 3

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 16-Apr-2012
Revision Date 19-Jan-2018
Print Date 19-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

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 a 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

End of SDS

Material Safety Data Sheet
Cyclohexane

ACC# 05870

Section 1 - Chemical Product and Company Identification

MSDS Name: Cyclohexane
Catalog Numbers: AC111110000, AC111110010, AC111110025, AC111110050, AC111110100, AC111110250, AC167740000, AC167740010, AC167740025, AC167745000, AC176810000, AC176810010, AC176810025, AC176810050, AC176810250, AC176815000, AC210570000, AC210570010, AC210570025, AC279590000, AC279590010, AC279590025, AC326590000, AC326590010, AC326590025, AC326830000, AC326831000, AC326832500, AC364660000, AC364660010, AC364661000, AC406020000, AC406025000, AC610040040, AC610150040, AC610291000, S79990, S79990-1, S93227, S93228, S93327A, S93328A, C553-4, C555-1, C555-4, C556-1, C556-4, C556-500, C620-1, C620-4, C620SK-1, C620SK-4, O2093-20, O2093-4
Synonyms: Benzene hexahydride; Hexahydrobenzene; Hexamethylene.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
110-82-7	Cyclohexane	>99	203-806-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: -20 deg C.
Danger! Extremely flammable liquid and vapor. Vapor may cause flash fire. Breathing vapors may cause drowsiness and dizziness. Causes skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause eye and respiratory tract irritation.
Target Organs: Central nervous system, skin.

Potential Health Effects

Eye: May cause mild eye irritation. Vapors may cause eye irritation.
Skin: May cause irritation with burning pain, itching and redness. Not expected to cause an allergic skin reaction. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts.
Ingestion: Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May cause central nervous system depression.
Inhalation: May cause respiratory tract irritation. Inhalation of vapors may cause drowsiness and dizziness.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Liquid will float and may reignite on the surface of water. Extremely flammable liquid and vapor. Vapor may cause flash fire. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.
Extinguishing Media: Water may be ineffective. This material is lighter than water and insoluble in water. The fire could easily be spread by the use of water in an area where the water cannot be contained. Do NOT use straight streams of water. For large fires, use water spray, fog or regular foam. For small fires, use dry chemical, carbon dioxide, water spray or regular foam. Cool containers with flooding quantities of water until well after fire is out.
Flash Point: -20 deg C (-4.00 deg F)
Autoignition Temperature: 245 deg C (473.00 deg F)
Explosion Limits, Lower:1.3
Upper: 8.0
NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Avoid breathing vapor.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the

permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Cyclohexane	100 ppm TWA	300 ppm TWA; 1050 mg/m3 TWA 1300 ppm IDLH	300 ppm TWA; 1050 mg/m3 TWA

OSHA Vacated PELs: Cyclohexane: 300 ppm TWA; 1050 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear chemical splash goggles.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: colorless

Odor: sweetish odor - chloroform-like

pH: Not available.

Vapor Pressure: 96.9 mm Hg @ 25 deg C

Vapor Density: 2.90 (air=1)

Evaporation Rate:6.1 (Butyl acetate=1)

Viscosity: 1.02 cP @ 17 deg C

Boiling Point: 80.7 deg C

Freezing/Melting Point:6.5 deg C

Decomposition Temperature: Not available.

Solubility: Practically insoluble in water.

Specific Gravity/Density:0.77 (Water=1)

Molecular Formula:C6H12

Molecular Weight:84.15

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to Avoid: Ignition sources, excess heat, confined spaces.

Incompatibilities with Other Materials: Strong oxidizing agents, nitrogen dioxide.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 110-82-7: GU6300000

LD50/LC50:

CAS# 110-82-7:

Draize test, rabbit, skin: 1548 mg/2D (Intermittent);
Inhalation, mouse: LC50 = 70000 mg/m3/2H;
Oral, mouse: LD50 = 813 mg/kg;
Oral, rat: LD50 = 12705 mg/kg;

.

Carcinogenicity:
CAS# 110-82-7: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No data available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: LC50 = 117.0 mg/L; 96 Hr.; Static conditionsFish: Bluegill/Sunfish: LC50 = 34.72 mg/L; 96 Hr.; 25 degrees CWater flea Daphnia: EC50 = 400.00 mg/L; 48 Hr.; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 = 227.00 mg/L; 5, 30 minutes; Microtox test No data available.
Environmental: Atmospheric Fate: Cyclohexane is expected to partition to the atmosphere where it will rapidly react with hydroxyl radicals. TERRESTRIAL FATE: If released on land, cyclohexane will be lost through volatilization and should leach into the ground. Cyclohexane is resistant to biodegradation but may biodegrade slowly in the presence of other hydrocarbons that are themselves degraded. AQUATIC FATE: Volatilization from water (estimated half-life 2 hr in a model river) should be the most important fate process occuring in aquatic systems.
Physical: ATMOSPHERIC FATE: In the atmosphere, cyclohexane will degrade by reaction with photochemically produced hydroxyl radicals (half-life 52 hr). The half-life is much faster under photochemical smog conditions with half-lives as low as 6 hr being reported.
Other: No experimental data are available on the bioconcentration of cyclohexane in aquatic organisms. Using the octanol/water partition coefficient, 3.44, one can estimate a BCF of 242 using a recommended regression equation.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 110-82-7: waste number U056 (Ignitable waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	CYCLOHEXANE	CYCLOHEXANE
Hazard Class:	3	3
UN Number:	UN1145	UN1145
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 110-82-7 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 110-82-7: Effective 12/19/85, Sunset 12/19/95

Chemical Test Rules

CAS# 110-82-7: 40 CFR 799.5000

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 110-82-7: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 110-82-7: immediate, delayed, fire.

Section 313

This material contains Cyclohexane (CAS# 110-82-7, >99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 110-82-7 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 110-82-7 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN F N

Risk Phrases:

R 11 Highly flammable.
R 38 Irritating to skin.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R 65 Harmful: may cause lung damage if swallowed.
R 67 Vapours may cause drowsiness and dizziness.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.
S 25 Avoid contact with eyes.
S 33 Take precautionary measures against static discharges.
S 9 Keep container in a well-ventilated place.
S 60 This material and its container must be disposed of as hazardous waste.
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.
S 62 If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

WGK (Water Danger / Protection)

CAS# 110-82-7: 1

Canada - DSL / NDSL

CAS# 110-82-7 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 110-82-7 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/04/1999
Revision #7 Date: 12/01/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

SAFETY DATA SHEET

Revision Date 19-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Methylcyclohexane-d14**

Cat No. : **AC300740025**

CAS-No 10120-28-2
Synonyms Cyclohexylmethane-d14; Hexahydrotoluene-d14.

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation

Causes serious eye irritation
May cause drowsiness or dizziness



Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
[2H14]Methylcyclohexane	10120-28-2	100

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention.

Inhalation Remove to fresh air. Get medical attention. Risk of serious damage to the lungs (by aspiration). If not breathing, give artificial respiration.

Ingestion Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.

Most important symptoms and effects Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray, carbon dioxide (CO2), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.

Unsuitable Extinguishing Media No information available

Flash Point -3 °C / 26.6 °F

Method - No information available

Autoignition Temperature 250 °C / 482 °F

Explosion Limits

Upper 6.7%

Lower 1.2%

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical

Flammable. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO_2).

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	4	1	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Keep in suitable, closed containers for disposal. Soak up with inert absorbent material. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame.

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment.

Personal Protective Equipment

Eye/face Protection Tight sealing safety goggles. Face protection shield.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No protective equipment is needed under normal use conditions.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-126.3 °C / -195.3 °F
Boiling Point/Range	No information available 101 °C / 213.8 °F
Flash Point	-3 °C / 26.6 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.7%
Lower	1.2%
Vapor Pressure	46 mmHg @ 25 °C
Vapor Density	3.4 (Air = 1.0)
Specific Gravity	0.880
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	250 °C / 482 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C7 D14
Molecular Weight	112.3

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Excess heat. Incompatible products. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information
Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
[2H14]Methylcyclohexane	10120-28-2	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN2296
Proper Shipping Name METHYLCYCLOHEXANE
Hazard Class 3
Packing Group II

TDG

UN-No UN2296
Proper Shipping Name METHYLCYCLOHEXANE
Hazard Class 3
Packing Group II

IATA

UN-No UN2296
Proper Shipping Name METHYLCYCLOHEXANE
Hazard Class 3
Packing Group II

IMDG/IMO

UN-No UN2296
Proper Shipping Name METHYLCYCLOHEXANE
Hazard Class 3
Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
[2H14]Methylcyclohexane	10120-28-2	-	-	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
[2H14]Methylcyclohexane	10120-28-2	-	-	233-325-3	-	-	-	-	-

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration	Not applicable
CERCLA	Not applicable
California Proposition 65	This product does not contain any Proposition 65 chemicals.
U.S. State Right-to-Know Regulations	Not applicable

U.S. Department of Transportation

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security	This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade	Serious risk, Grade 3

16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Revision Date	19-Jan-2018
Print Date	19-Jan-2018
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

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 a 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

End of SDS

Material Safety Data Sheet
Dichloromethane

ACC# 14930

Section 1 - Chemical Product and Company Identification

MSDS Name: Dichloromethane
Catalog Numbers: AC113460000, AC113460010, AC113460025, AC113460050, AC113460051, AC113460100, AC113460250, AC124050000, AC124050010, AC124050025, AC124050050, AC124050100, AC124050250, AC167770000, AC167770025, AC167775000, AC268330000, AC268330010, AC268330025, AC326600000, AC326600010, AC326600025, AC326760000, AC326760010, AC326760025, AC326850000, AC326850010, AC326850025, AC326851000, AC326852500, AC327870000, AC327870010, AC348460000, AC348460010, AC348460025, AC348461000, AC348465000, AC354800000, AC354800025, AC364230000, AC364230010, AC364230025, AC379130000, AC379130010, AC379130025, AC383780000, AC383780010, AC383780025, AC383780050, AC383780250, AC390700000, AC390700010, AC390700025, AC406910000, AC406910010, AC406910040, AC406910200, AC406920000, AC406930000, AC406935000, AC61030019, AC61030050, AC61030050, AC61030115, AC61030115, AC61030200, 32660-0040, 40692-0010, 40692-0040, 40692-5000, 61005-0040, 61016-0040, 61030-0010, 61030-1000, 61093-1000, BP1186-4, BP1186POP-200, BP1186POP20, BP1186SS-19, BP1186SS-200, BP1186SS-28, BP1186SS-50, BP2608-100, D138-1, D138-4, D138SK-4, D142-4, D142RS-115, D142RS-19, D142RS-50, D142RS200, D142RS28, D142SS-115, D142SS-200, D142SS-28, D142SS-50, D143-1, D143-4, D143-4LC, D143N2-19, D143POP28, D143RS-19, D143RS-200, D143RS-28, D143RS115, D143RS50, D143SK-1, D143SK-4, D143SK4LC, D143SS-115, D143SS-19, D143SS-200, D143SS-28, D143SS-50, D149RS-19, D149RS-200, D149RS-50, D150-1, D150-4, D1504LC, D150SK-1, D150SK-4, D151-1, D151-4, D151-4LC, D151RS-115, D151RS-19, D151RS-200, D151RS-28, D151RS-50, D151SK-4, D151SS-115, D151SS-19, D151SS-200, D151SS-28, D151SS-50, D154-4, D1544LC, D158-4, D35-1, D35-4, D37-1, D37-20, D37-200, D37-4, D37-500, D37FB-115, D37FB-19, D37FB-200, D37FB-50, D37POP19, D37POPB-200, D37POPB-50, D37RB-115, D37RB-19, D37RB-200, D37RB-50, D37RS-115, D37RS-200, D37RS-28, D37RS-50, D37RS19, D37SK-4, D37SS-115, D37SS-200, D37SS-28, D37SS-50, D37SS1350, NC9026865, NC9195811, NC9206961, NC9445086, NC9520903, NC9734652
Synonyms: Methylene chloride; Methane dichloride; Methylene bichloride; Methylene dichloride; Dichloromethane; DCM.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
75-09-2	Methylene chloride	>99.5	200-838-9

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid.
Warning! Methylene chloride is metabolically converted to carbon monoxide after systemic absorption, which yields increased concentrations of carboxyhemoglobin in the blood. Harmful if swallowed. Causes eye, skin, and

respiratory tract irritation. May be harmful if inhaled. Potential cancer hazard. This substance has caused adverse reproductive and fetal effects in animals. May cause central nervous system effects. May cause kidney damage.
Target Organs: Blood, central nervous system.

Potential Health Effects

Eye: Contact with eyes may cause severe irritation, and possible eye burns.
Skin: May be absorbed through the skin. Causes irritation with burning pain, itching, and redness. Prolonged exposure may result in skin burns.
Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause kidney damage. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause carboxyhemoglobinemia.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause narcotic effects in high concentration. Vapors may cause dizziness or suffocation. May cause blood changes. Overexposure may cause an increase in carboxyhemoglobin levels in the blood. Can produce delayed pulmonary edema. Because of its high volatility, airborne concentrations of methylene chloride can accumulate in poorly ventilated areas. Odor is a poor indicator of possibly dangerous air concentrations of methylene chloride.
Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause dermatitis. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects. Chronic exposure may cause lung, liver, and pancreatic tumors. May cause conjunctivitis and/or corneal burns.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. No flash point in conventional closed tester, but forms flammable vapor-air mixtures in larger volumes and may be an explosion hazard in a confined space.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not applicable.
Autoignition Temperature: 556 deg C (1,032.80 deg F)
Explosion Limits, Lower:13 vol %
Upper: 23 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing

precautions in the Protective Equipment section. Remove all sources of ignition. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Keep away from heat, sparks and flame. Use only with adequate ventilation. Avoid breathing vapor or mist.
Storage: Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Store below 40°C. Keep away from active metals.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Methylene chloride	50 ppm TWA	2300 ppm IDLH	25 ppm TWA; 12.5 ppm Action Level; 25 ppm TWA; 125 ppm STEL (15 min, Cancer, cardiac effects , central nervous system effects, liver effects, and skin and eye irritation - See 29 CFR 1910.1052)

OSHA Vacated PELs: Methylene chloride: 500 ppm TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Viton gloves are recommended.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colorless
Odor: ethereal odor - chloroform-like
pH: Not available.
Vapor Pressure: 350 mm Hg @ 20 deg C
Vapor Density: 2.93 (Air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 40 deg C
Freezing/Melting Point:-97 deg C
Decomposition Temperature: Not available.
Solubility: Slightly soluble.
Specific Gravity/Density:1.33 (Water=1)
Molecular Formula:CH2Cl2
Molecular Weight:84.93

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions. May form explosive mixtures in atmospheres having high oxygen content.
Conditions to Avoid: Excess heat, attacks some plastics, rubber, and coatings, confined spaces, When no water is present, dichloromethane is not corrosive to metals. At high temperatures and in the presence of water (causing slow decomposition forming HCl), corrosion of iron, some stainless steels, copper and aluminum can occur..
Incompatibilities with Other Materials: Strong oxidizing agents, strong bases, chemically active metals.
Hazardous Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 75-09-2: PA8050000
LD50/LC50:
CAS# 75-09-2:
Draize test, rabbit, eye: 162 mg Moderate;
Draize test, rabbit, eye: 10 mg Mild;
Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, skin: 810 mg/24H Severe;
Draize test, rabbit, skin: 100 mg/24H Moderate;
Inhalation, mouse: LC50 = 14400 ppm/7H;
Inhalation, mouse: LC50 = 49100 mg/m3/6H;
Inhalation, mouse: LC50 = 54000 mg/m3/2H;
Inhalation, mouse: LC50 = 56220 mg/m3/7H;
Inhalation, rat: LC50 = 52 gm/m3;
Inhalation, rat: LC50 = 76000 mg/m3/4H;
Inhalation, rat: LC50 =
Carcinogenicity:
CAS# 75-09-2:

- **ACGIH:** A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
- **California:** carcinogen, initial date 4/1/88
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

Epidemiology: There are few reports of injury despite widespread use of dichloromethane (ACGIH, 1991). Solvent abuse has led to death (Harbison, 1998).
Teratogenicity: Inhalation, rat: TCLo = 4500 ppm/24H (female 1-17 day(s) after conception) Effects on Newborn - behavioral.; Inhalation, rat: TCLo = 1250 ppm/7H (female 6-15 day(s) after conception) Specific Developmental Abnormalities - musculoskeletal system and urogenital system.
Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.
Mutagenicity: DNA inhibition: Human, Fibroblast = 5000 ppm/1H (Continuous).; Morphological transformation: Rat, Embryo = 160 umol/L.; DNA damage: Oral, rat = 1275 mg/kg.; Inhalation, mouse: TCLo = 2000 ppm/5H/2Y-C (Tumorigenic - Carcinogenic by RTECS criteria--Lungs, Thorax, or Respiration - Tumors).
Neurotoxicity: The neurotoxicity is thought to be due to a direct nonspecific CNS depressant action of dichloromethane and to indirect effects of carbon monoxide. Dichloromethane may exert acute effects on the nervous system by mechanisms related to its lipophilicity.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 230mg/L; 24H; StaticFish: Fathead Minnow: 196mg/L; 96H; This chemical has a

moderate potential to affect some aquatic organisms. It is resistant to biodegradation, and has a low potential to persist in the aquatic environment. 96-hr. EC50 (loss of equilibrium); Fathead minnow: 99mg/L; 96-hr. EC10: 66.3 mg/L. Bluegill sunfish: 96-hr. LC50=220 mg/L; Water flea: 24-hr. LC50=2270 mg/L; No observed effect level:1550 mg/L.
Environmental: Terrestrial: Expected to evaporate from near surface soil into the atmosphere; expected to leach. Aquatic: Primarily lost by evaporation to the atmosphere which should take several hours depending on wind and mixing conditions. Atmospheric: Will degrade by reaction with hydroxyl radicals with a half life of several months. . Dichloromethane is reported to completely biodegrade under aerobic conditions with sewage seed or activated sludge between 6 hours to 7 days. Not expected to bioconcentrate due to its low octanol/water coefficient.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 75-09-2: waste number U080.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	DICHLOROMETHANE	DICHLOROMETHANE
Hazard Class:	6.1	6.1
UN Number:	UN1593	UN1593
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 75-09-2 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 75-09-2: Effective 10/4/82, Sunset 10/4/92
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
CAS# 75-09-2: Section 4, 0.1 % de minimus concentration
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 75-09-2: 1000 lb final RQ; 454 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 75-09-2: immediate, delayed.
Section 313
This material contains Methylene chloride (CAS# 75-09-2, >99.5%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 75-09-2 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA. CAS# 75-09-2 is listed as a Priority Pollutant under the Clean Water Act. CAS# 75-09-2 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 75-09-2 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Methylene chloride, a chemical known to the state of California to cause cancer. California No Significant Risk Level: CAS# 75-09-2: 200 æg/day NSRL (inhalation); 50 æg/day NSRL

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 40 Limited evidence of a carcinogenic effect.

Safety Phrases:

S 23 Do not inhale gas/fumes/vapour/spray.
S 24/25 Avoid contact with skin and eyes.
S 36/37 Wear suitable protective clothing and gloves.

WGK (Water Danger/Protection)

CAS# 75-09-2: 2

Canada - DSL/NDSL

CAS# 75-09-2 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 75-09-2 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 4/20/1999
Revision #10 Date: 9/30/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

SAFETY DATA SHEET

Creation Date 14-Sep-2009 **Revision Date** 23-Jan-2018 **Revision Number** 4

1. Identification

Product Name **N-HEPTANE**

Cat No. : **AC610361000**

CAS-No 142-82-5
Synonyms Normal heptane.; Heptane

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, Blood.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor

May cause drowsiness or dizziness
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause damage to organs through prolonged or repeated exposure



Precautionary Statements
Prevention
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Take precautionary measures against static discharge
Keep cool
Response
Get medical attention/advice if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
If skin irritation occurs: Get medical advice/attention
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
n-Heptane	142-82-5	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention.

Inhalation Remove to fresh air. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Get medical attention. Risk of serious damage to the lungs (by aspiration). If not breathing, give artificial respiration.

Ingestion Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.

Most important symptoms and effects Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media CO_2, dry chemical, dry sand, alcohol-resistant foam. Water mist may be used to cool closed containers.

Unsuitable Extinguishing Media Water may be ineffective

Flash Point -4 °C / 24.8 °F

Method - No information available

Autoignition Temperature 215 °C / 419 °F

Explosion Limits

Upper 6.7 vol %

Lower 1.05 vol %

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Do not allow run-off from fire-fighting to enter drains or water courses.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO_2).

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes or clothing. Ensure adequate ventilation.

Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities

should be advised if significant spillages cannot be contained.

Methods for Containment and Clean Up Remove all sources of ignition. Soak up with inert absorbent material. Use spark-proof tools and explosion-proof equipment. Take precautionary measures against static discharges. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Use only under a chemical fume hood. Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Do not breathe mist/vapors/spray. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Use spark-proof tools and explosion-proof equipment. Take precautionary measures against static discharges. Wash hands before breaks and immediately after handling the product. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
n-Heptane	TWA: 400 ppm STEL: 500 ppm	(Vacated) TWA: 400 ppm (Vacated) TWA: 1600 mg/m^3 (Vacated) STEL: 500 ppm (Vacated) STEL: 2000 mg/m^3 TWA: 500 ppm TWA: 2000 mg/m^3	IDLH: 750 ppm TWA: 85 ppm TWA: 350 mg/m^3 Ceiling: 440 ppm Ceiling: 1800 mg/m^3	TWA: 400 ppm TWA: 1600 mg/m^3 STEL: 500 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures None under normal use conditions.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No protective equipment is needed under normal use conditions.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Petroleum distillates
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-91 °C / -131.8 °F
Boiling Point/Range	98 °C / 208.4 °F

Flash Point	-4 °C / 24.8 °F
Evaporation Rate	2.8 (Butyl Acetate = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.7 vol %
Lower	1.05 vol %
Vapor Pressure	48 mbar @ 20 °C
Vapor Density	3.5
Specific Gravity	0.683
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	215 °C / 419 °F
Decomposition Temperature	No information available
Viscosity	0.4 mPa s at 20 °C
Molecular Formula	C7 H16
Molecular Weight	100.20

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Heat, flames and sparks. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
n-Heptane	>2000 mg/kg (rat)	LD50 = 3000 mg/kg (Rabbit)	LC50 = 103 g/m³ (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
n-Heptane	142-82-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)
STOT - repeated exposure Kidney Liver Blood

Aspiration hazard Aspiration hazard

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
n-Heptane	Not listed	LC50: = 375.0 mg/L, 96h (Cichlid fish)	Not listed	EC50: >10 mg/L/24h

Persistence and Degradability Persistence is unlikely

Bioaccumulation/ Accumulation No information available.

Mobility The product is insoluble and floats on water. Is not likely mobile in the environment due its low water solubility.

Component	log Pow
n-Heptane	4.66

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN1206
Proper Shipping Name HEPTANES
Hazard Class 3
Packing Group II

TDG

UN-No UN1206
Proper Shipping Name HEPTANES
Hazard Class 3
Packing Group II

IATA

UN-No UN1206
Proper Shipping Name Heptanes
Hazard Class 3
Packing Group II

IMDG/IMO

UN-No UN1206
Proper Shipping Name Heptanes
Hazard Class 3
Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
n-Heptane	142-82-5	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
n-Heptane	142-82-5	X	-	205-563-8	X	X	X	X	KE-18271

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
n-Heptane	X	X	X	-	X

U.S. Department of Transportation
Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Serious risk, Grade 3

16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Creation Date	14-Sep-2009
Revision Date	23-Jan-2018
Print Date	23-Jan-2018
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

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 a 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

End of SDS

Material Safety Data Sheet
Hexane

ACC# 10951

Section 1 - Chemical Product and Company Identification

MSDS Name: Hexane
Catalog Numbers: S80032, S800321, S800322MF, BP2615-100, BPH302-4EMW, H291-20, H291-200, H291-4, H291-500, H291FB-115, H291FB-19, H291FB-200, H291FB-50, H291RB-115, H291RB-19, H291RB-200, H291RB-50, H291RS-115, H291RS-19, H291RS-200, H291RS-28, H291RS-50, H291S-4, H291SS-115, H291SS-200, H291SS-28, H291SS-50, H292-1, H292-20, H292-200, H292-20LC, H292-4, H292-500, H292200LC, H292FB-115, H292FB-19, H292FB-200, H292FB-50, H292J-4, H292J-500, H292POPB-50, H292RB-115, H292RB-19, H292RB-200, H292RB-50, H292RS-19, H292RS-200, H292RS-50, H292RS115, H292RS28, H292SK-4, H292SS-115, H292SS-1350, H292SS-200, H292SS-28, H292SS-50, H300-4, H302-1, H302-4, H302-4LC, H302J-1, H302J-4, H302ME, H302N1-19, H302N119LC, H302N2-19, H302POP-19, H302POP-50, H302RS-115, H302RS-19, H302RS-200, H302RS-28, H302RS-50, H302SK-1, H302SK-4, H302SS-115, H302SS-19, H302SS-200, H302SS-28, H302SS-50, H303-1, H303-4, H303-4LC, H303J-1, H303J-4, H303RS-115, H303RS-19, H303RS-200, H303RS-28, H303RS-50, H303SK-4, H303SS-115, H303SS-19, H303SS-200, H303SS-28, H303SS-50, H307-4, H307-4LC, H334-1, H334-4, N3-20, N3-200, N3S-4, NC9173152, NC9321642, NC9321646, NC9321654, NC9321658, NC9323196, NC9394242, NC9410668, O3386-20, S800322, S80032HPLC, S93257
Synonyms: n-Hexane; Hexyl hydride; Dipropyl; normal-Hexane; Hex.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
110-54-3	Hexane (contains a mixture of isomers)	100	203-777-6

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear colorless liquid.
Danger! Extremely flammable liquid and vapor. Vapor may cause flash fire. Breathing vapors may cause drowsiness and dizziness. Causes eye, skin, and respiratory tract irritation. May be harmful if absorbed through the skin. Aspiration hazard if swallowed. Can enter lungs and cause damage. Possible risk of impaired fertility. Long-term exposure may cause damage to the nervous system of the extremities (the hands, arms, legs and feet). Dangerous for the environment.
Target Organs: Central nervous system, respiratory system, eyes, skin, peripheral nervous system, testes.

Potential Health Effects

Eye: Causes mild eye irritation.
Skin: Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. Causes irritation with burning pain, itching, and redness. Absorbed through the skin. There have been no reports of skin sensitization in

people occupationally exposed to n-hexane. Skin sensitization was not observed in a maximization test using 25 volunteers.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May cause central nervous system depression.
Inhalation: Causes respiratory tract irritation. Exposure produces central nervous system depression. Vapors may cause dizziness or suffocation. n-Hexane vapor concentrations can become so high that oxygen is displaced, especially in confined spaces.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis. Prolonged or repeated exposure may cause adverse reproductive effects. Chronic exposure may cause visual disturbances. Laboratory experiments have resulted in mutagenic effects. Peripheral neuropathy symptoms include: muscular weakness, paresthesia, numbing of the hands, feet, legs and arms, unsteadiness, and difficulty in walking and standing. Repeated exposure may cause nervous system abnormalities with muscle weakness and damage, motor incoordination, and sensation disturbances. Chronic exposure produces peripheral neuropathy.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively. For ingestion, the stomach sould be intubated, aspirated, and lavaged with a slurry of activated charcoal--protect the airway from aspiration of gastric contents. Monitor arterial blood gases in cases of severe aspiration.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. May accumulate static electrical charges, and may cause ignition of its own vapors. Extremely flammable liquid and vapor. Vapor may cause flash fire. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire.
Extinguishing Media: Use dry chemical, carbon dioxide, or appropriate foam. Solid streams of water may be ineffective and spread material. Water may be ineffective because it will not cool material below its flash point.
Flash Point: -22 to -26.1 de
Autoignition Temperature: 225 deg C (437.00 deg F)
Explosion Limits, Lower:1.2 vol %
Upper: 7.7 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Use only non-sparking tools and equipment.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep away from heat, sparks and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Avoid breathing vapor or mist.
Storage: Keep away from heat and flame. Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Hexane (contains a mixture of isomers)	50 ppm TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	50 ppm TWA; 180 mg/m3 TWA 1100 ppm IDLH	500 ppm TWA; 1800 mg/m3 TWA

OSHA Vacated PELs: Hexane (contains a mixture of isomers): 50 ppm TWA; 180 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear colorless
Odor: gasoline-like
pH: Not available.
Vapor Pressure: 151 mm Hg @ 25 deg C
Vapor Density: 2.97(Air = 1)
Evaporation Rate: Not available.
Viscosity: 0.31 mPas 20 deg C
Boiling Point: 62 - 69 deg C @ 760 mmHg
Freezing/Melting Point:-95 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:0.678
Molecular Formula:C6H14
Molecular Weight:86.18

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Ignition sources, excess heat, electrical sparks, confined spaces.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 110-54-3: MN9275000
LD50/LC50:
CAS# 110-54-3:
Draize test, rabbit, eye: 10 mg Mild;
Inhalation, mouse: LC50 = 150000 mg/m3/2H;
Inhalation, rat: LC50 = 48000 ppm/4H;
Inhalation, rat: LC50 = 627000 mg/m3/3M;
Oral, rat: LD50 = 25 gm/kg;
.

Carcinogenicity:
CAS# 110-54-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Occupational polyneuropathy has resulted from hexane exposures as low as 500 ppm, but the minimum levels of n-hexane that are neurotoxic in humans haven't been established. Nearly continuous exposure of animals at 250 ppm has caused neurotoxic effects.
Teratogenicity: No evidence of teratogenicity or embryotoxicity in anmial studies with hexane. Fetotoxicity has been observed in the presence of maternal toxicity.
Reproductive Effects: Severe testicular damage has been observed in rats exposed to hexane at concentrations which have produced other significant toxicity. Although subneurotoxic doses of its principle toxic metabolite, 2,5-hexanedione, can induce progressive testiculartoxicity in rats, there have been no reports of human sterility or other reproductive toxicity associated with n-hexane exposures.
Mutagenicity: Positive results (chromosomal damage in the bone marrow cells) obtained for rats exposed by inhalation to n-hexane.
Neurotoxicity: n-Hexane is a mild irritant and CNS depressant in acute exposure, but its principal effects are damage to the sensory and motor peripheral nerves, particularly in chronic exposure.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. Estimated BCF values = 2.24 and 2.89. These values suggest that hexane will show low bioconcentration in aquatic organisms. Estimated Koc value = 4.11. This product will show slight soil mobility and is expected to rapidly volatilize from moist surface soils.
Environmental: Terrestrial: Volatilization and adsorption are expected to be the most important fate processes. Aquatic: Photolysis or hydrolysis are not expected to be important. Atmospheric: Expected to exist entirely in the vapor phase in ambient air, expected half life 2.8 days. Expected to biodegrade but not bioconcentrate.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	HEXANES	HEXANES
Hazard Class:	3	3
UN Number:	UN1208	UN1208
Packing Group:	II	II
Additional Info:		FLASHPOINT -22C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 110-54-3 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 110-54-3: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 110-54-3: immediate, delayed, fire.
Section 313
This material contains Hexane (contains a mixture of (CAS# 110-54-3, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR
Clean Air Act:
CAS# 110-54-3 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 110-54-3 can be found on the following state right to know lists: New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:

XN F N

Risk Phrases:

R 11 Highly flammable.
R 38 Irritating to skin.
R 48/20 Harmful : danger of serious damage to health by prolonged exposure through inhalation.
R 62 Possible risk of impaired fertility.
R 51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R 65 Harmful: may cause lung damage if swallowed.
R 67 Vapours may cause drowsiness and dizziness.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.
S 29 Do not empty into drains.
S 33 Take precautionary measures against static discharges.
S 36/37 Wear suitable protective clothing and gloves.
S 9 Keep container in a well-ventilated place.
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.
S 62 If swallowed, do not induce vomiting: seek medical advice immed iately and show this container or label.

WGK (Water Danger/Protection)

CAS# 110-54-3: 1

Canada - DSL/NDSL

CAS# 110-54-3 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 110-54-3 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/03/1999
Revision #14 Date: 10/25/2007

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet
m-Xylene

ACC# 95260

Section 1 - Chemical Product and Company Identification

MSDS Name: m-Xylene
Catalog Numbers: AC180860000, AC180860010, AC180860025, AC180860100, AC180862500, AC422660000, AC422665000, 61047-1000, AC18086N219, AC18086NB21, AC18086POPN, BP2627100, O5078-1, O5079-4
Synonyms: 1,3-Dimethylbenzene.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
108-38-3	m-Xylene	> 99	203-576-3

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 25 deg C.
Warning! Flammable liquid and vapor. Causes eye, skin, and respiratory tract irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. May be harmful if absorbed through skin or if inhaled. May cause central nervous system depression.
Target Organs: Central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye: Splashes of xylene in human eyes generally cause transient superficial injury. The liquid is probably a mild irritant, based on animal information for mixed xylene isomers.
Skin: May be harmful if absorbed through the skin. Xylene contact causes defatting of the skin with irritation, dryness, and cracking. Blistering may occur, particularly if exposure to concentrated xylene is prolonged and the exposed area of skin is occluded. Xylene liquid or vapor can be absorbed through the skin, but not as readily as when inhaled or ingested. Skin absorption has been reported to be slow and significant harmful effects are not expected by this route. There is one case report of a person developing an allergic skin reaction (contact urticaria) following exposure to xylene (unspecified composition) vapor. The person subsequently tested positive in a patch test. No information was provided regarding previous history of allergies. No conclusions can be drawn regarding the potential for xylene to produce allergic skin reactions, based on this single case report.
Ingestion: Aspiration hazard. May cause irritation of the digestive tract. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation: Causes respiratory tract irritation. Irritation may lead to chemical pneumonitis and pulmonary edema. Odor thresholds ranging from 0.07 to 40 ppm have been reported for xylenes. Inhalation overexposure may lead to

central nervous system depression, producing effects such as dizziness, headache, confusion, incoordination, nausea, weakness, and loss of consciousness. Extreme exposures may cause other CNS effects including death. Reversible liver and kidney damage has been reported in cases of severe xylene exposure. Industrial fatalities due to gross inhalation exposure have been described.
Chronic: Chronic exposure to xylene may cause defatting dermatitis, reversible eye damage, dyspnea (labored breathing), confusion, dizziness, apprehension, memory loss, headache, tremors, weakness, anorexia, nausea, ringing in the ears, irritability, thirst, mild changes in liver function, kidney impairment, anemia, and hyperplasia, but not destruction, of the bone marrow.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Vapors may form an explosive mixture with air. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.
Extinguishing Media: Water may be ineffective. This material is lighter than water and insoluble in water. The fire could easily be spread by the use of water in an area where the water cannot be contained. Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: 25 deg C (77.00 deg F)
Autoignition Temperature: 527 deg C (980.60 deg F)
Explosion Limits, Lower:1.1%
Upper: 7.0%
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces. U.S. regulations require reporting spills and releases to soil, water and air in excess of reportable quantities. This material creates a fire hazard because it floats on water. If possible, try to contain floating material.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or

expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor or mist.
Storage: Keep away from sources of ignition. Keep container closed when not in use. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Ventilation fans and other electrical service must be non-sparking and have an explosion-proof design.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
m-Xylene	100 ppm TWA; 150 ppm STEL	100 ppm TWA; 435 mg/m3 TWA 900 ppm IDLH	100 ppm TWA; 435 mg/m3 TWA (listed under Xylenes (o-, m-, p- isomers)).

OSHA Vacated PELs: m-Xylene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: aromatic odor
pH: Not applicable.
Vapor Pressure: 8.29 mm Hg @ 25 deg C
Vapor Density: 3.66 (air=1)
Evaporation Rate:0.7 (butyl acetate=1)
Viscosity: <32.6 SUS
Boiling Point: 139 deg C
Freezing/Melting Point:-48 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:0.86 (water=1)
Molecular Formula:C8H10
Molecular Weight:106.17

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, ignition sources.
Incompatibilities with Other Materials: Strong oxidizing agents, nitric acid.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 108-38-3: ZE2275000
LD50/LC50:
CAS# 108-38-3:
Draize test, rabbit, eye: 5 mg/24H Severe;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, mouse: LC50 = 5267 ppm/6H;
Oral, rat: LD50 = 4988 mg/kg;
Skin, rabbit: LD50 = 14100 uL/kg;
.

Carcinogenicity:
CAS# 108-38-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: 175 workers were exposed to 21 ppm of xylene for 7 years. Subjective symptoms such as anxiety, forgetfulness, inability to concentrate and dizziness were reported. Xylenes accounted for >70% of the total exposure. Liver & kidney effects were not reported
Teratogenicity: No increased incidence of birth defects was reported in a study of lab workers exposed to xylene during early pregnancy. Exposure to other solvents and chemicals also occurred. An increased incidence of spontaneous abortions was reported.Animal information suggests that xylene is not teratogenic or embryotoxic at exposure levels that are not harmful to the mother.
Reproductive Effects: An increase in menstrual disorders has been reported in women exposed to organic solvents such as benzene, toluene, and xylenes. It is not possible to attribute these effects to xylenes in particular.
Mutagenicity: Xylene does not appear to be a mutagen.
Neurotoxicity: Xylene may be ototoxic (damages hearing or enhances sensitivity to noise) in chronic occupational exposures, probably from a neurotoxic mechanism.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 13.5 mg/L; 96 Hr; UnspecifiedFish: Goldfish: LD50 = 13 mg/L; 24 Hr; UnspecifiedFish: Fathead Minnow: LC50 = 46 mg/L; 1 Hr; Static bioassay Acute and long-term toxicity to fish and invertebrates: LD50 for goldfish is 13 mg/L/24 Hr.Cas#1330-20-7:LC50(96Hr.) rainbow trout = 8.05 mg/L, Static condition;LC50(96Hr.) fathead minnow = 16.1 mg/L, flow-through conditions; LC50(96Hr.) bluegill = 16.1 mg/L, flow-through;EC50 (48 Hr.) water flea = 3.82 mg/L, flow-through conditions;EC50(24 Hr.) photobacterium phosphoreum = 0.0084 mg/L, Microtox test.
Environmental: In air, xylenes degrade by reacting with photochemically produced hydroxyl radicals. In soil it will volatilize and leach into groundwater. Little bioconcentration is expected.
Physical: ATMOSPHERIC FATE: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere, xylene, which has an experimental vapor pressure of 7.99 mm Hg at 25 deg C, will exist solely as a vapor in the ambient atmosphere. Vapor-phase xylene is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the atmospheric lifetime of xylene is about 14-26 hours. Ambient levels of xylene are detected in the atmosphere due to large emissions of this compound.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	XYLENES	XYLENES
Hazard Class:	3	3
UN Number:	UN1307	UN1307
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 108-38-3 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 108-38-3: Effective 10/4/82, Sunset 10/4/92

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 108-38-3: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 108-38-3: immediate, delayed, fire.

Section 313

This material contains m-Xylene (CAS# 108-38-3, > 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 108-38-3 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 108-38-3 is listed as a Hazardous Substance under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 108-38-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Xylenes (o-, m-, p- isomers)), Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 10 Flammable.

R 20/21 Harmful by inhalation and in contact with skin.
R 36/38 Irritating to eyes and skin.

Safety Phrases:
S 25 Avoid contact with eyes.

WGK (Water Danger/Protection)
CAS# 108-38-3: No information available.
Canada - DSL/NDSL
CAS# 108-38-3 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of B2, D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 108-38-3 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 12/09/1997
Revision #13 Date: 7/30/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

p-XYLENE CAS NO 106-42-3	MATERIAL SAFETY DATA SHEET SDS/MSDS

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : p-Xylene

CAS-No. : 106-42-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Industrial & for professional use only.

1.3 Details of the supplier of the safety data sheet

Company : Central Drug House (P) Ltd
7/28 Vardaan House
New Delhi -110002
INDIA

Telephone : +91 11 49404040
Email : care@cdhfinechemical.com

1.4 Emergency telephone number

Emergency Phone # : +91 11 49404040 (9:00am - 6:00 pm) [Office hours]

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008
Flammable liquids (Category 3), H226
Acute toxicity, Inhalation (Category 4), H332
Acute toxicity, Dermal (Category 4), H312
Skin irritation (Category 2), H315

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008

Pictogram



Signal word Warning

Hazard statement(s)

H226	Flammable liquid and vapour.
H312 + H332	Harmful in contact with skin or if inhaled
H315	Causes skin irritation.

Precautionary statement(s)

P280	Wear protective gloves/ protective clothing.

Supplemental Hazard Statements	none

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	1,4-Dimethylbenzene
Formula	:	C_8H_{10}
Molecular weight	:	106.17 g/mol
CAS-No.	:	106-42-3
EC-No.	:	203-396-5
Index-No.	:	601-022-00-9

Hazardous ingredients according to Regulation (EC) No 1272/2008

Component		Classification	Concentration
p-Xylene			
CAS-No.	106-42-3	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; H226, H332, H312, H315	<= 100 %
EC-No.	203-396-5		
Index-No.	601-022-00-9		

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Storage class (TRGS 510): Flammable Liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove’s outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use (US) or type ABEK (EN 14387) respirator cartridges as a backup to enginee protection, use a full-face supplied air respirator.

Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	13.0 °C
f)	Initial boiling point and boiling range	137.0 - 138.0 °C
g)	Flash point	25.0 °C - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 7 %(V) Lower explosion limit: 1.1 %(V)
k)	Vapour pressure	16.0 mmHg at 37.7 °C 9.0 mmHg at 20.0 °C
l)	Vapour density	No data available
m)	Relative density	0.86 g/cm3
n)	Water solubility	0.2 g/l
o)	Partition coefficient: n-octanol/water	log Pow: 3.15
p)	Auto-ignition temperature	529.0 °C
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	28.3 mN/m at 20.0 °C

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 5,000 mg/kg(p-Xylene)
LD50 Oral - Rat - male - 3,523 mg/kg(p-Xylene)
LC50 Inhalation - Rat - 4 h - 4550 ppm(p-Xylene)
Remarks: Lungs, Thorax, or Respiration:Chronic pulmonary edema. Liver:Other changes. Blood:Changes in cell count (unspecified).

Skin corrosion/irritation
Skin - Rabbit(p-Xylene)
Result: Moderate skin irritation - 4 h

Serious eye damage/eye irritation
No data available(p-Xylene)

Respiratory or skin sensitisation
No data available(p-Xylene)

Germ cell mutagenicity

No data available(p-Xylene)

Carcinogenicity

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (p-Xylene)

Reproductive toxicity

May cause reproductive disorders.(p-Xylene)

Specific target organ toxicity - single exposure
No data available(p-Xylene)

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available(p-Xylene)

Additional Information
RTECS: ZE2625000

narcosis, Lung irritation, chest pain, pulmonary edema, Central nervous system depression, Gastrointestinal disturbance, Liver injury may occur., Kidney injury may occur., Blood disorders(p-Xylene)

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 2.60 mg/l - 96 h(p-Xylene)
	LC50 - Carassius auratus (goldfish) - 18.00 mg/l - 24 h(p-Xylene)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 35.50 - 63.10 mg/l - 48 h(p-Xylene)

Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 3.20 - 4.40 mg/l - 72 h(p-Xylene)

12.2 Persistence and degradability

Biodegradability	Result: 87.8 % - Readily biodegradable

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(p-Xylene)

12.5 Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects

Toxic to aquatic life.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number

ADR/RID: 1307	IMDG: 1307	IATA: 1307

14.2 UN proper shipping name

ADR/RID:	XYLENES
IMDG:	XYLENES
IATA:	Xylenes

14.3 Transport hazard class(es)

ADR/RID: 3	IMDG: 3	IATA: 3

14.4 Packaging group

ADR/RID: III	IMDG: III	IATA: III

14.5 Environmental hazards

ADR/RID: no	IMDG Marine pollutant: no	IATA: no

14.6 Special precautions for user

No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.2 Chemical safety assessment

For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3.

H226	Flammable liquid and vapour.
H312	Harmful in contact with skin.
H312 + H332	Harmful in contact with skin or if inhaled

H315	Causes skin irritation.
H332	Harmful if inhaled.

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Central Drug House (P) Ltd and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.cdhfinechemical.com for additional terms and conditions of sale.

SAFETY DATA SHEET

Creation Date 15-Jun-2010 **Revision Date** 31-Jul-2019 **Revision Number** 7

1. Identification

Product Name **o-Xylene**

Cat No. : **O5081-4; O5081-4LC; O5081-500; O5081FB-200; DO5081-500**

CAS-No 95-47-6
Synonyms 1,2-Dimethylbenzene (Certified)

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA:
800-424-9300
CHEMTREC®, Outside the USA:
001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 3
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Liver.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
May be fatal if swallowed and enters airways
Harmful in contact with skin
Causes skin irritation
Causes serious eye irritation
Harmful if inhaled
May cause respiratory irritation
May cause drowsiness or dizziness
May cause damage to organs through prolonged or repeated exposure



Precautionary Statements
Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Wash face, hands and any exposed skin thoroughly after handling
Do not breathe dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
Response
Get medical attention/advice if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
Call a POISON CENTER or doctor/physician if you feel unwell
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Harmful to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
o-Xylene	95-47-6	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

Inhalation Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. Risk of serious damage to the lungs.

Ingestion Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting. Call a physician or Poison Control Center immediately. If vomiting occurs naturally, have victim lean forward.

Most important symptoms and effects Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

Unsuitable Extinguishing Media Do not use a solid water stream as it may scatter and spread fire

Flash Point 31 °C / 87.8 °F

Method - No information available

Autoignition Temperature 465 °C / 869 °F

Explosion Limits

Upper 6.7 vol %

Lower 0.9 vol %

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products

Carbon monoxide (CO) Carbon dioxide (CO_2)

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Should not be released into the environment. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage. Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
o-Xylene	TWA: 100 ppm STEL: 150 ppm		IDLH: 900 ppm TWA: 100 ppm TWA: 435 mg/m^3 STEL: 150 ppm STEL: 655 mg/m^3	TWA: 100 ppm STEL: 150 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available

pH	Not applicable
Melting Point/Range	-25 °C / -13 °F
Boiling Point/Range	143 - 145 °C / 289.4 - 293 °F
Flash Point	31 °C / 87.8 °F
Evaporation Rate	0.7
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.7 vol %
Lower	0.9 vol %
Vapor Pressure	882 Pa @ 25 °C
Vapor Density	3.7
Specific Gravity	0.884
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	465 °C / 869 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C8 H10
Molecular Weight	106.17

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents, Strong acids

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
o-Xylene	LD50 = 3608 mg/kg (Rat)	14100 mg/kg (Rabbit)	LC50 = 4330 ppm (Rat) 6 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
o-Xylene	95-47-6	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system Central nervous system (CNS)
STOT - repeated exposure Liver

Aspiration hazard Category 1

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Do not empty into drains. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
o-Xylene	EC50: = 4.2 mg/L, 192h (Pseudokirchneriella subcapitata) EC50: = 4.7 mg/L, 72h static (Pseudokirchneriella subcapitata)	LC50: 16.1 mg/L/96h (Lepomis macrochirus) LC50: 13 mg/L/24h (Carassius auratus)	EC50 = 0.0084 mg/L 24 h	EC50: 2.61 - 5.59 mg/L, 48h Flow through (Daphnia magna) EC50: 0.78 - 2.51 mg/L, 48h Static (Daphnia magna) EC50: = 3.2 mg/L, 48h (Daphnia magna)

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
o-Xylene	3.12

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

TDG

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

IATA

UN-No UN1307
Proper Shipping Name Xylenes
Hazard Class 3

Packing Group III

IMDG/IMO

UN-No UN1307
Proper Shipping Name Xylenes
Hazard Class 3
Packing Group III

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
o-Xylene	95-47-6	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
o-Xylene	95-47-6	X	-	202-422-2	X	X	X	X	KE-35429

U.S. Federal Regulations

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
o-Xylene	95-47-6	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
o-Xylene	X	-	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
o-Xylene	X		-

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
o-Xylene	1000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island

o-Xylene	X	X	X	X	-

U.S. Department of Transportation
Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 15-Jun-2010
Revision Date 31-Jul-2019
Print Date 31-Jul-2019
Revision Summary SDS sections updated. 11. 16.

Disclaimer
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 a 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

End of SDS

Material Safety Data Sheet
Trichloroethylene

ACC# 23850

Section 1 - Chemical Product and Company Identification

MSDS Name: Trichloroethylene
Catalog Numbers: AC158310000, AC158310025, AC421520000, AC421520040, AC421520200, AC421525000, 15831-0010, S80327ACS-1, S80327ACS-2, T340-4, T341-20, T341-4, T341-500, T341J4, T403-4
Synonyms: Ethylene trichloride; 1,1,2-Trichloroethylene; TCE.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
79-01-6	Trichloroethylene	99+	201-167-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: APHA: 15 max liquid.
Warning! Harmful to aquatic organisms; may cause long-term adverse effects in the aquatic environment. Breathing vapors may cause drowsiness and dizziness. Possible risks of irreversible effects. Cancer hazard. Causes eye and skin irritation. May cause respiratory tract irritation. May cause liver and kidney damage. May cause central nervous system effects.
Target Organs: Kidneys, central nervous system, liver, spleen, respiratory system, eyes, skin.

Potential Health Effects
Eye: Causes eye irritation. Contact with trichloroethylene causes pain but no permanent injury to the eyes. (Doc of TLV)
Skin: Causes skin irritation. May be harmful if absorbed through the skin.
Ingestion: May cause irritation of the digestive tract. May be harmful if swallowed. May cause central nervous system effects.
Inhalation: May cause respiratory tract irritation. May cause liver and kidney damage. May be harmful if inhaled. May cause central nervous system effects. The chief symptoms of TCE exposure were found to be abnormal fatigue, irritability, headache, gastric disturbances, and intolerance to alcohol. (Doc to TLV)
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis. May cause liver and kidney damage. May cause cancer in humans. Repeated exposure may cause damage to the spleen. Adverse reproductive effects have been reported in animals. Laboratory experiments have resulted in mutagenic effects. Possible risk of irreversible effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do not induce vomiting. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: 410 deg C (770.00 deg F)
Explosion Limits, Lower:7.9 Vol %
Upper: 90 Vol %
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Use a spark-proof tool. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Do not get in eyes, on skin, or on clothing. Keep away from heat, sparks and flame. Do not ingest or inhale. Use only in a chemical fume hood.
Storage: Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Store protected from light.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Trichloroethylene	10 ppm TWA; 25 ppm STEL	1000 ppm IDLH	100 ppm TWA; 200 ppm Ceiling

OSHA Vacated PELs: Trichloroethylene: 50 ppm TWA; 270 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless - APHA: 15 max
Odor: chloroform-like
pH: Not available.
Vapor Pressure: 77.3 mbar @ 20 deg C
Vapor Density: 4.5 (air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 87 deg C @ 760 mmHg
Freezing/Melting Point:-86 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:1.460
Molecular Formula:C2HCl3
Molecular Weight:131.39

Section 10 - Stability and Reactivity

Chemical Stability: Moisture sensitive. Light sensitive.
Conditions to Avoid: Incompatible materials, light, ignition sources, excess heat, exposure to moist air or water.
Incompatibilities with Other Materials: Strong oxidizing agents, strong reducing agents, bases, active metals, metals and metal compounds (toxic, e.g. beryllium, lead acetate, nickel carbonyl, tetraethyl lead).
Hazardous Decomposition Products: Hydrogen chloride, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 79-01-6: KX4550000
LD50/LC50:
CAS# 79-01-6:
Draize test, rabbit, eye: 20 mg/24H Moderate;
Draize test, rabbit, skin: 2 mg/24H Severe;
Inhalation, mouse: LC50 = 8450 ppm/4H;
Inhalation, mouse: LC50 = 220000 mg/m3/20M;
Inhalation, mouse: LC50 = 262000 mg/m3/30M;
Inhalation, mouse: LC50 = 40000 mg/m3/4H;
Inhalation, rat: LC50 = 140700 mg/m3/1H;
Oral, mouse: LD50 = 2402 mg/kg;
Oral, mouse: LD50 = 2400 mg/kg;
Oral, rat: LD50 = 4920 mg/kg;
Skin, rabbit: LD50 = >20 gm/kg;
Skin, rabbit: LD50 = 20 mL/kg;
.

Carcinogenicity:
CAS# 79-01-6:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 4/1/88
- **NTP:** Suspect carcinogen
- **IARC:** Group 2A carcinogen

Epidemiology: Tumorigenic effects have been reported in experimental animals.
Teratogenicity: Teratogenic effects have occurred in experimental animals.
Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.
Mutagenicity: Mutagenic effects have occurred in humans.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: 41-67 mg/L; 96 hrs.; LC50Daphnia: Daphnia: 2.2-100 mg/L; 48 hrs.; LC50Mollusk Shrimp: 2 mg/L; 96 hrs.; LC50 Bluegill sunfish, LD50= 44,700 ug/L/96Hr. Fathead minnow, LC50=40.7 mg/L/96Hr.
Environmental: In air, substance is photooxidized and is reported to form phosgene, dichloroacetyl chloride, and formyl chloride. In water, it evaporates rapidly. Potential for mobility in soil is high.
Physical: No information available.
Other: Bioconcentration potential is low (BCF less than 100).

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 79-01-6: waste number U228.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	TRICHLOROETHYLENE	TRICHLOROETHYLENE
Hazard Class:	6.1	6.1
UN Number:	UN1710	UN1710
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 79-01-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 79-01-6: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 79-01-6: immediate, delayed, reactive.

Section 313

This material contains Trichloroethylene (CAS# 79-01-6, 99+%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

CAS# 79-01-6 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 79-01-6 is listed as a Hazardous Substance under the CWA. CAS# 79-01-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 79-01-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 79-01-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Trichloroethylene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 79-01-6: 50 æg/day NSRL (oral); 80 æg/day NSRL (inhalation)

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 36/38 Irritating to eyes and skin.

R 45 May cause cancer.

R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

R 67 Vapours may cause drowsiness and dizziness.

R 68 Possible risk of irreversible effects.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 53 Avoid exposure - obtain special instructions before use.

S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)

CAS# 79-01-6: 3

Canada - DSL/NDSL

CAS# 79-01-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1B, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 79-01-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 2/01/1999
Revision #9 Date: 6/03/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

SAFETY DATA SHEET: PERCHLOROETHYLENE

IN CASE OF TRANSPORTATION EMERGENCY CONTACT:
CHEMTREC:(800) 424-9300

ALL OTHER INQUIRIES:
(770) 904-7042 // www.ciscochem.com
266 Rue Cezzan Lavonia, GA 30553



1. IDENTIFICATION
SUBSTANCE: TETRACHLOROETHYLENE

TRADE NAMES/SYNONYMS:
PERCHLOROETHYLENE; 1,1,2,2-TETRACHLOROETHYLENE; ETHYLENE TETRACHLORIDE; PERC; TETRACHLORETHYLENE; PERCHLORETHYLENE; TETRACHLOROETHENE

CHEMICAL FAMILY: halogenated, aliphatic

2. HAZARDS IDENTIFICATION
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: volatile liquid
ODOR: faint odor, sweet odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression, cancer hazard (in humans)

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, mood swings, loss of coordination, blurred vision, lung congestion, kidney damage, liver damage
LONG TERM EXPOSURE: irritation, nausea, stomach pain, loss of appetite, headache, drowsiness, dizziness, disorientation, sleep disturbances, pain in extremities, loss of coordination, blurred vision, hormonal disorders, internal bleeding, heart damage, liver damage, birth defects, brain damage, tumors, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: irritation
EYE CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: irritation
INGESTION:
SHORT TERM EXPOSURE: same as effects reported in short term inhalation
LONG TERM EXPOSURE: same as effects reported in long term inhalation

3. COMPOSITION
COMPONENT: TETRACHLOROETHYLENE
CAS NUMBER: 127-18-4
PERCENTAGE: 100.0

Hazardous: YES

4. FIRST AID MEASURES

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:
Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard.

EXTINGUISHING MEDIA: carbon dioxide, regular dry chemical
Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For tank, rail car or tank truck, evacuation radius: 800 meters (1/2 mile).

FLASH POINT: No data available.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode

6. ACCIDENTAL RELEASE MEASURES

SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

WATER RELEASE:
Absorb with activated carbon. Remove trapped material with suction hoses. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Small liquid spills: Absorb with sand or other non-combustible material. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

Store in a cool, dry, ventilated area away from sources of heat or ignition. Isolate from flammable materials. Protect from direct sunlight. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or

smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. EXPOSURE CONTROLS AND PERSONAL PROECTION

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL): 100 ppm (TWA), 200 ppm (ceiling),
300 ppm/5min/3-hour (max)
-ACGIH Threshold Limit Value (TLV):
25 ppm (TWA), 100 ppm (STEL); listed as A3, animal carcinogen

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

CLOTHING: Wear appropriate chemical resistant clothing. GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

At any detectable concentration -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive- pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure- demand or other positive-pressure mode.

Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive- pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure- demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
APPEARANCE: clear
COLOR: colorless
PHYSICAL FORM: volatile liquid
ODOR: faint odor, sweet odor
MOLECULAR WEIGHT: 165.83
MOLECULAR FORMULA: Cl2-C-C-Cl2
BOILING POINT: 250 F (121 C)
FREEZING POINT: -2 F (-19 C)
VAPOR PRESSURE: 14 mmHg @ 20 C

VAPOR DENSITY (air=1): 5.83
SPECIFIC GRAVITY (water=1): 1.6227
WATER SOLUBILITY: 0.015%
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: 50 ppm
EVAPORATION RATE: 2.8 (butyl acetate=1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, benzene, chloroform, oils

10. STABILITY AND REACTIVITY

Stability:
Stable under ordinary conditions of use and storage. Slowly decomposed by light. Deteriorates rapidly in warm, moist climates.

Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition. Hydrogen chloride gas and phosgene gas may be formed upon heating. Decomposes with moisture to yield trichloroacetic acid and hydrochloric acid.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Strong acids, strong oxidizers, strong alkalis, especially NaOH, KOH; finely divided metals, especially zinc, barium, lithium. Slowly corrodes aluminum, iron and zinc.

Conditions to Avoid:
Moisture, light, heat and incompatibles.

11. TOXICOLOGICAL INFORMATION

TETRACHLOROETHYLENE:
IRRITATION DATA: 810 mg/24 hour(s) skin-rabbit severe; 500 mg/24 hour(s) skin-rabbit mild; 162 mg eyes-rabbit mild; 500 mg/24 hour(s) eyes-rabbit mild

TOXICITY DATA: 4100 ppm/6 hour(s) inhalation-rat LC50; >10000 mg/kg skin-rabbit LD50 (Dow); 2629 mg/kg oral-rat LD50

CARCINOGEN STATUS: NTP: Anticipated Human Carcinogen; IARC: Human Limited Evidence, Animal Sufficient Evidence, Group 2A; ACGIH: A3 -Confirmed Animal Carcinogen; EC: Category 2

LOCAL EFFECTS:
Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL:
Moderately Toxic: ingestion
Slightly Toxic: inhalation

TARGET ORGANS: central nervous system

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: eye disorders, heart or cardiovascular disorders, kidney disorders, liver disorders, nervous system disorders, skin disorders and allergies

TUMORIGENIC DATA: Available.

MUTAGENIC DATA: Available.

REPRODUCTIVE EFFECTS DATA: Available.

ADDITIONAL DATA: May be excreted in breast milk. Alcohol may enhance the toxic effects. Stimulants such as epinephrine may induce ventricular fibrillation.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:

FISH TOXICITY: 8430 ug/L 96 hour(s) LC50 (Mortality) Flagfish (Jordanella floridae)

INVERTEBRATE TOXICITY: 7500 ug/L 48 hour(s) EC50 (Immobilization) Water flea (Daphnia magna)

ALGAL TOXICITY: 509000 ug/L 96 hour(s) EC50 (Photosynthesis) Diatom (Skeletonema costatum)

FATE AND TRANSPORT:

BIOCONCENTRATION: 49 ug/L 1-21 hour(s) BCF (Residue) Bluegill (Lepomis macrochirus) 3.43 ug/L

Environmental Fate:
When released into the soil, this material is expected to quickly evaporate. When released into the soil, this material may leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into water, this material is not expected to biodegrade. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals.

Environmental Toxicity:
The LC50/96-hour values for fish are between 1 and 10 mg/l. The LC50/96-hour values for fish are between 10 and 100 mg/l. This material is expected to be toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. TRANSPORT INFORMATION

Domestic (Land, D.O.T.)

Proper Shipping Name: TETRACHLOROETHYLENE Hazard Class: 6.1
UN/NA: UN1897
Packing Group: III
Information reported for product/size: 20L
International (Water, I.M.O.)

Proper Shipping Name: TETRACHLOROETHYLENE Hazard Class: 6.1
UN/NA: UN1897
Packing Group: III
Information reported for product/size: 20L

Proper shipping paperwork:

UN 1897, Tetrachoroethylene, 6.1, PG III

Marine Pollutant

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): TETRACHLOROETHYLENE (PERCHLOROETHYLENE): 100 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES

(40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES
(40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: Yes
FIRE: No
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65): TETRACHLOROETHYLENE (PERCHLOROETHYLENE)

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.
STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following: TETRACHLOROETHYLENE (PERCHLOROETHYLENE) Cancer (Apr 01, 1988)

CANADIAN REGULATIONS: WHMIS CLASSIFICATION: D2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed. CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION

NFPA Ratings: Health: 2 Flammability: 0 Reactivity: 0

Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends
on level and duration of exposure.

Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.

Label First Aid:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician.

Product Use:
Laboratory Reagent.

CISCO provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product.
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Date Created: 5/18/2015
Date Updated: 6/11/2015

Material Safety Data Sheet
Carbon tetrachloride

ACC# 90116

Section 1 - Chemical Product and Company Identification

MSDS Name: Carbon tetrachloride
Catalog Numbers: AC148170000, AC148170250, AC167720000, AC167720010, AC167720025, AC167720100, AC167721000, AC258530000, AC269370000, AC269370010, AC269371000, AC326580000, AC326580010, AC326580025, AC600220000, AC600220010, AC600220025, AC600230000, AC600230010, AC600230025, 14817-0010, 14817-0025, 16772-5000, 25853-0010, 25853-0025, C1874, C1994, NC9267677, NC9472507, NC9596627
Synonyms: Tetrachloromethane; Carbon tet; Carbona; Carbon chloride; Methane tetrachloride.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
56-23-5	Carbon tetrachloride	99-100	200-262-8

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid.
Danger! May be fatal if inhaled, absorbed through the skin or swallowed. Causes eye, skin, and respiratory tract irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Cancer suspect agent. May cause liver and kidney damage. May cause central nervous system effects. This is a CFC substance which destroys ozone in the upper atmosphere. Destruction of the ozone layer can lead to increased ultraviolet radiation which, with excess exposure to sunlight, can lead to an increase in skin cancer and eye cataracts. Marine pollutant.
Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye: Causes eye irritation. Vapors cause eye irritation.
Skin: Causes skin irritation. May be absorbed through the skin in harmful amounts. Contact with the skin defats the skin.
Ingestion: May cause liver and kidney damage. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Substance is a hepatotoxin and is capable of producing a toxic effect on the liver.
Inhalation: Causes respiratory tract irritation. May cause liver and kidney damage. Exposure produces central nervous system depression. May be harmful if inhaled.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic ingestion may cause effects similar to those of acute ingestion. May cause liver and kidney damage. May cause cancer according to animal studies. Chronic exposure may cause visual disturbances. Carbon tetrachloride is a CNS depressant.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: POISON material. If inhaled, get medical aid immediately. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Material will not burn. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.
Flash Point: Not applicable.
Autoignition Temperature: > 982 deg C (> 1,799.60 deg F)
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Isolate area and deny entry. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Do not breathe vapor. Use only with adequate ventilation.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs

Carbon tetrachloride	5 ppm TWA; 10 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	200 ppm IDLH	10 ppm TWA; 25 ppm Ceiling

OSHA Vacated PELs: Carbon tetrachloride: 2 ppm TWA; 12.6 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: chloroform-like
pH: Not available.
Vapor Pressure: 91 mm Hg @ 20 deg C
Vapor Density: 5.31 (air=1)
Evaporation Rate:12.8 (butyl acetate=1)
Viscosity: 0.97 PAS 20 deg C
Boiling Point: 76 deg C @ 760 mm Hg
Freezing/Melting Point:-23 deg C
Decomposition Temperature:> 100 deg C
Solubility: Insoluble.
Specific Gravity/Density:1.5900 g/cm3
Molecular Formula:CCl4
Molecular Weight:153.82

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Light, excess heat.
Incompatibilities with Other Materials: Alkali metals, powdered aluminum, powdered magnesium, zinc powder, ethylene, allyl alcohol, barium, fluorine, dimethylformamide, powered beryllium, decaborane, potassium tert-butoxide.
Hazardous Decomposition Products: Hydrogen chloride, chlorine, phosgene, carbon monoxide, carbon dioxide, chlorine dioxide, which may be spontaneously explosive.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 56-23-5: FG4900000
LD50/LC50:
CAS# 56-23-5:
Dermal, guinea pig: LD50 = >9400 uL/kg;
Draize test, rabbit, eye: 2200 ug/30S Mild;

Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, skin: 4 mg Mild;
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, mouse: LC50 = 9526 ppm/8H;
Inhalation, mouse: LC50 = 34500 mg/m3/2H;
Inhalation, rat: LC50 = 8000 ppm/4H;
Inhalation, rat: LC50 = 46000 mg/m3/6H;
Oral, mouse: LD50 = 7749 mg/kg;
Oral, rabbit: LD50 = 5760 mg/kg;
Oral, rat: LD50 = 2350 mg/kg;
Skin, rabbit: LD50 = >20 Carbon tetrachloride is harmful to the liver and a CNS depressant following short-term inhalation, skin contact or ingestion. The liver effects have been observed at concentrations lower than those required to produce CNS effects. Two reviews indicate that ingestion of 14-20 ml or 50-150 ml could be fatal. Although, 1.5 ml (34 mg/kg) has caused death in a few cases.

Carcinogenicity:
CAS# 56-23-5:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 10/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

Epidemiology: No data available.
Teratogenicity: Animal studies have only shown harmful effects in the offspring of animals exposed to doses which also produced significant maternal toxicity.
Reproductive Effects: There is no human information available. There is insufficient animal information available to draw any conclusions about potential reproductive toxicity.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: LC50 = 20.8-41.4 mg/L; 96 Hr.; Flow-through; 21.7 degrees CFish: Bluegill/Sunfish: LC50 = 27-125 mg/L; 96 Hr.; Static Conditions; 23 degrees CBacteria: Phytobacterium phosphoreum: EC50 = 6.0 mg/L; Not available; Microtox testBacteria: Phytobacterium phosphoreum: EC50 = 33.0 mg/L; 30 minutes; Microtox test No data available.
Environmental: Terrestrial: Evaporates rapidly and migrates into groundwater. Aquatic: Rapidly evaporates, biodegradation an important fate process.
Physical: Atmospheric:Very stable in troposphere with a residence time of 30-50 years.
Other: Carbon tetrachloride has a low potential to bioconcentrate. Log of the bioconcentration factor in trout is 1.24, in bluegill sunfish - 1.48. Bioconcentration factor predicted from water solubility = 14.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 56-23-5: waste number U211.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	CARBON TETRACHLORIDE	CARBON TETRACHLORIDE
Hazard Class:	6.1	6.1(9.2)
UN Number:	UN1846	UN1846
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 56-23-5 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 56-23-5: 10 lb final RQ; 4.54 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 56-23-5: immediate, delayed.

Section 313

This material contains Carbon tetrachloride (CAS# 56-23-5, 99-100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

CAS# 56-23-5 is listed as a hazardous air pollutant (HAP). CAS# 56-23-5 is listed as a Class 1 ozone depletor with an 1.1 ODP

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 56-23-5 is listed as a Hazardous Substance under the CWA. CAS# 56-23-5 is listed as a Priority Pollutant under the Clean Water Act. CAS# 56-23-5 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 56-23-5 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Carbon tetrachloride, a chemical known to the state of California to cause cancer. California No Significant Risk Level: CAS# 56-23-5: 5 æg/day NSRL

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T N

Risk Phrases:

R 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.

R 40 Limited evidence of a carcinogenic effect.

R 59 Dangerous for the ozone layer.

R 48/23 Toxic : danger of serious damage to health by prolonged

exposure through inhalation.
R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 23 Do not inhale gas/fumes/vapour/spray.
S 36/37 Wear suitable protective clothing and gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 59 Refer to manufacturer/supplier for information on recovery/recycling.
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)

CAS# 56-23-5: 3

Canada - DSL/NDSL

CAS# 56-23-5 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1A, D2A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 56-23-5 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 7/20/1999
Revision #7 Date: 2/06/2008

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SECTION 1: Identification of the substance / mixture and of the company / undertaking

1.1 Product identifier

Product name: Vinyl chloride, stabilized

Additional identification

Chemical name: Chloroethylene

Chemical formula: C2H3Cl
INDEX No. 602-023-00-7
CAS-No. 75-01-4
EC No. 200-831-0
REACH Registration No. 01-2119458772-30

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Industrial and professional. Perform risk assessment prior to use.
Use as an Intermediate (transported, on-site isolated).
Using gas alone or in mixtures for the calibration of analysis equipment.
Using gas as feedstock in chemical processes.
Formulation of mixtures with gas in pressure receptacles.

Uses advised against Consumer use.

1.3 Details of the supplier of the safety data sheet

Supplier

Linde Gas GmbH
Carl-von-Linde-Platz 1
A-4651 Stadl-Paura

Telephone: +43 50 4273

E-mail: office@at.linde-gas.com

1.4 Emergency telephone number: Emergency number Linde: + 43 50 4273 (during business hours), Poisoning Information Center: +43 1 406 43 43

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Directive 67 / 548 / EEC or 1999 / 45 / EC as amended.

F+; R12 Carc. 1; R45

The full text for all R-phrases is displayed in section 16.

Classification according to Regulation (EC) No 1272 / 2008 as amended.

Physical Hazards

Flammable gas	Category 1	H220: Extremely flammable gas.
Gases under pressure	Liquefied gas	H280: Contains gas under pressure; may explode if heated.
Chemically unstable gases	Category B	H231: May react explosively even in the absence of air at elevated pressure and / or temperature.

Health Hazards

Carcinogenicity	Category 1A	H350: May cause cancer.

2.2 Label Elements

Contains: Chloroethylene



Signal Words: Danger

Hazard Statement(s):
H220: Extremely flammable gas.
H231: May react explosively even in the absence of air at elevated pressure and / or temperature.
H280: Contains gas under pressure; may explode if heated.
H350: May cause cancer.

Precautionary Statement

Prevention:
P202: Do not handle until all safety precautions have been read and understood.
P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280: Wear protective gloves / protective clothing / eye protection / face protection.

Response: P308+P313: IF exposed or concerned: Get medical advice / attention.
P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381: Eliminate all ignition sources if safe to do so.

Storage: P403: Store in a well-ventilated place.

Disposal: None.

Supplemental label information
Restricted to professional users.

2.3 Other hazards: Contact with evaporating liquid may cause frostbite or freezing of skin.

SECTION 3: Composition / information on ingredients

3.1 Substances

Chemical name	Chloroethylene
INDEX No.:	602-023-00-7
CAS-No.:	75-01-4
EC No.:	200-831-0
REACH Registration No.:	01-2119458772-30
Purity:	100% The purity of the substance in this section is used for classification only, and does not represent the actual purity of the substance as supplied, for which other documentation should be consulted.
Trade name:	-

SECTION 4: First aid measures

General: In high concentrations may cause asphyxiation. Symptoms may include loss of mobility / consciousness. Victim may not be aware of asphyxiation. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

4.1 Description of first aid measures

Inhalation: In high concentrations may cause asphyxiation. Symptoms may include loss of mobility / consciousness. Victim may not be aware of asphyxiation. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

Eye contact: Rinse the eye with water immediately. Remove contact lenses, if present and easy to do. Continue rinsing. Flush thoroughly with water for at least 15 minutes. Get immediate medical assistance. If medical assistance is not immediately available, flush an additional 15 minutes.

Skin Contact: Contact with evaporating liquid may cause frostbite or freezing of skin. In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Get medical attention.

Ingestion: Ingestion is not considered a potential route of exposure.

4.2 Most important symptoms and effects, both acute and delayed: Respiratory arrest. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.

4.3 Indication of any immediate medical attention and special treatment needed

Hazards: Respiratory arrest. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.

Treatment: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice / attention.

SECTION 5: Firefighting measures

General Fire Hazards: Heat may cause the containers to explode.

5.1 Extinguishing media

Suitable extinguishing media: Water Spray or Fog. Dry powder. Foam.

Unsuitable extinguishing media: Carbon Dioxide.

5.2 Special hazards arising from the substance or mixture: No data available.

Hazardous Combustion Products: If involved in a fire the following toxic and / or corrosive fumes may be produced by thermal decomposition: carbon monoxide
; phosgene; carbonyl chloride
; Hydrogen chloride

5.3 Advice for firefighters

Special fire fighting procedures: In case of fire: Stop leak if safe to do so. Do not extinguish flames at leak because possibility of uncontrolled explosive reignition exists. Continue water spray from protected position until container stays cool. Use extinguishants to contain the fire. Isolate the source of the fire or let it burn out.

Special protective equipment for fire-fighters:	Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Guideline: EN 469 Protective clothing for firefighters. Performance requirements for protective clothing for firefighting. EN 15090 Footwear for firefighters. EN 659 Protective gloves for firefighters. EN 443 Helmets for fire fighting in buildings and other structures. EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:	Evacuate area. Provide adequate ventilation. Consider the risk of potentially explosive atmospheres . Eliminate all ignition sources if safe to do so. Monitor the concentration of the released product. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.
6.2 Environmental Precautions:	Prevent further leakage or spillage if safe to do so.
6.3 Methods and material for containment and cleaning up:	Provide adequate ventilation. Eliminate sources of ignition.
6.4 Reference to other sections:	Refer to sections 8 and 13.

SECTION 7: Handling and storage:

7.1 Precautions for safe handling:

Only experienced and properly instructed persons should handle gases under pressure. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Purge air from system before introducing gas. Containers, which contain or have contained flammable or explosive substances, must not be inerted with liquid carbon dioxide. Assess the risk of a potentially explosive atmosphere and the need for suitable equipment i.e. explosion-proof. Take precautionary measures against static discharges. Keep away from ignition sources (including static discharges). Provide electrical earthing of equipment and electrical equipment usable in explosive atmospheres. Use only non-sparking tools. Refer to supplier's handling instructions. The substance must be handled in accordance with good industrial hygiene and safety procedures. Ensure the complete system has been (or is regularly) checked for leaks before use. Protect containers from physical damage; do not drag, roll, slide or drop. Do not remove or deface labels provided by the supplier for the identification of the container contents. When moving containers, even for short distances, use appropriate equipment eg. trolley, hand truck, fork truck etc. Secure cylinders in an upright position at all times, close all valves when not in use. Provide adequate ventilation. Suck back of water into the container must be prevented. Do not allow backfeed into the container. Avoid suckback of water, acid and alkalis. Keep container below 50°C in a well ventilated place. Observe all regulations and local requirements regarding storage of containers. When using do not eat, drink or smoke. Store in accordance with local / regional / national / international regulations. Never use direct flame or electrical heating devices to raise the pressure of a container. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Damaged valves should be reported immediately to the supplier Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Keep container valve outlets clean and free from contaminates particularly oil and water. If user experiences any difficulty operating container valve discontinue use and contact supplier. Never attempt to transfer gases from one container to another. Container valve guards or caps should be in place.

7.2 Conditions for safe storage, including any incompatibilities:

All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere. Segregate from oxidant gases and other oxidants being stored. Containers should not be stored in conditions likely to encourage corrosion. Stored containers should be periodically checked for general conditions and leakage. Container valve guards or caps should be in place. Store containers in location free from fire risk and away from sources of heat and ignition. Keep away from combustible material.

7.3 Specific end use(s):

None.

SECTION 8: Exposure controls / personal protection

8.1 Control Parameters

Occupational Exposure Limits

Chemical name	type	Exposure Limit Values	Source
Chloroethylene	TWA	3 ppm 7,77 mg/m3	EU. OELs, Directive 2004/37/EC on carcinogen and mutagens from Annex III, Part A (08 2007)
	TRK	2 ppm 5 mg/m3	Austria. TRK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001 (12 2011)
	TRK STEL	8 ppm 20 mg/m3	Austria. TRK List, OEL Ordinance (GwV), BGBl. II, no. 184/2001 (12 2011)

DNEL-Values

Critical component	type	Value	Remarks
Chloroethylene	Worker - inhalative, long-term - systemic	7,7	-

PNEC-Values

Critical component	type	Value	Remarks
Chloroethylene	Aquatic (marine water)	0,1 mg / l	-
	freshwater	0,077 mg / l	-
	Soil	0,103 mg / kg	-
	marine water	0,0077 mg / l	-
	Sediment (marine water)	125 µg / kg	-
	freshwater - intermittent	0,77 mg / l	-
	Sediment (freshwater)	125 µg / kg	-
	STP	0,4 mg / l	-
	Sewage treatment plant	0,4 mg / l	-
	freshwater sediment	0,708 mg / kg dry weight	-
	Aquatic (freshwater)	0,077 mg / l	-
	marine sediment	0,078 mg / kg dry weight	-
	Sediment (freshwater)	0,708 mg / kg	-
	Sediment (marine water)	0,0708 mg / kg	-
	Predator	43,3 µg / kg	-
	Aquatic (intermit. releases)	0,77 mg / l	-
	Aquatic (marine water)	0,0077 mg / l	-
	Soil	85 µg / kg	-
	Aquatic (freshwater)	0,1 mg / l	-

8.2 Exposure controls

Appropriate engineering controls:

Consider a work permit system e.g. for maintenance activities. Ensure adequate air ventilation. Provide adequate general and local exhaust ventilation. Keep concentrations well below lower explosion limits. Gas detectors should be used when quantities of flammable gases or vapours may be released. Provide adequate ventilation, including appropriate local extraction, to ensure that the defined occupational exposure limit is not exceeded. Systems under pressure should be regularly checked for leakages. Product to be handled in a closed system. Only use permanent leak tight installations (e.g. welded pipes). Take precautionary measures against static discharges.

Individual protection measures, such as personal protective equipment

General information:	A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered. Keep self contained breathing apparatus readily available for emergency use. Personal protective equipment for the body should be selected based on the task being performed and the risks involved. Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment. Do not eat, drink or smoke when using the product.
Eye / face protection:	Safety eyewear, goggles or face-shield to EN166 should be used to avoid exposure to liquid splashes. Wear eye protection to EN 166 when using gases. Guideline: EN 166 Personal Eye Protection.
Skin protection	
Hand Protection:	Wear working gloves while handling containers Guideline: EN 388 Protective gloves against mechanical risks. Material: Fluoroelastomer. Material: Nitrile butyl rubber (NBR).
Body protection:	Wear fire / flame resistant / retardant clothing. Guideline: ISO / TR 2801:2007 Clothing for protection against heat and flame -- General recommendations for selection, care and use of protective clothing.
Other:	Wear safety shoes while handling containers Guideline: ISO 20345 Personal protective equipment - Safety footwear.
Respiratory Protection:	Not required. Material: Filter AX Guideline: EN 14387 Respiratory protective devices. Gas filter(s) and combined filter(s). Requirements, testing, marking. Guideline: EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking. Guideline: EN 136 Respiratory protective devices. Full face masks. Requirements, testing, marking.
Thermal hazards:	No precautionary measures are necessary.
Hygiene measures:	Specific risk management measures are not required beyond good industrial hygiene and safety procedures. Do not eat, drink or smoke when using the product.
Environmental exposure controls:	For waste disposal, see section 13 of the SDS.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	
Physical state:	Gas
Form:	Liquefied gas
Color:	Colorless
Odor:	Ethereal
Odor Threshold:	Odor threshold is subjective and is inadequate to warn of over exposure.
pH:	not applicable.
Melting Point:	-153,8 °C Experimental result, Key study
Boiling Point:	-13,4 °C (101,3 kPa) Experimental result, Key study
Sublimation Point:	not applicable.
Critical Temp. (°C):	158,9 °C
Flash Point:	-78 °C (Open Cup)
Evaporation Rate:	Not applicable to gases and gas mixtures.
Flammability (solid, gas):	Flammable gas
Flammability Limit - Upper (%):	29,3 %(V) Experimental result, Key study
Flammability Limit - Lower (%):	3,8 %(V)
Vapor pressure:	1.150 hPa (-10 °C) Experimental result, Supporting study 2.430 hPa (10 °C) Experimental result, Supporting study
Vapor density (air=1):	2,15 AIR=1
Relative density:	0,9106 (20 °C)
Solubility(ies)	
Solubility in Water:	2.700 mg/l
Partition coefficient (n-octanol/water):	1,52
Autoignition Temperature:	+/- 472 °C Experimental result, Key study 435 °C
Decomposition Temperature:	Decomp on burning producing toxic and corrosive fumes (hydrogen chloride and phosgene). When heated to decomp, it emits highly toxic fumes of hydrogen chloride. srp: and possibly phosgene.
Viscosity	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,011 mPa.s (20 °C)
Explosive properties:	Not applicable.
Oxidizing properties:	not applicable.

9.2 Other information: Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

Molecular weight: 62,5 g/mol (C_2H_3Cl)

SECTION 10: Stability and reactivity

10.1 Reactivity: No reactivity hazard other than the effects described in sub-section below.

10.2 Chemical Stability: Stable under normal conditions.

10.3 Possibility of hazardous reactions: Can form a potentially explosive atmosphere in air. May react violently with oxidants.

10.4 Conditions to avoid: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

10.5 Incompatible Materials: Air and oxidizers. For material compatibility see latest version of ISO-11114.

10.6 Hazardous Decomposition Products: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

General information: None.

11.1 Information on toxicological effects

Acute toxicity - Oral

Product	Based on available data, the classification criteria are not met.
Chloroethylene	LD 50 (Rat): > 500 mg / kg Remarks: Experimental result, Key study

Acute toxicity - Dermal

Product	Based on available data, the classification criteria are not met.

Acute toxicity - Inhalation

Product	Based on available data, the classification criteria are not met.
Chloroethylene	LC 50 (Rat, 2 h): 390 mg / l Remarks: Gas Experimental result, Key study

Repeated dose toxicity

Chloroethylene	LOAEL (Rat, Inhalation, 3 - 6 Months): 260 mg / m3 Inhalation Experimental result, Weight of Evidence study

Skin Corrosion / Irritation

Product	Based on available data, the classification criteria are not met.

Serious Eye Damage / Eye Irritation
Product Based on available data, the classification criteria are not met.

Respiratory or Skin Sensitization
Product Based on available data, the classification criteria are not met.

Germ Cell Mutagenicity
Product Based on available data, the classification criteria are not met.

Carcinogenicity
Product May cause cancer.

Reproductive toxicity
Product Based on available data, the classification criteria are not met.

Specific Target Organ Toxicity - Single Exposure
Product Based on available data, the classification criteria are not met.

Specific Target Organ Toxicity - Repeated Exposure
Product Based on available data, the classification criteria are not met.

Aspiration Hazard
Product Not applicable to gases and gas mixtures..

SECTION 12: Ecological information

12.1 Toxicity

Acute toxicity
Product No ecological damage caused by this product.

Acute toxicity - Fish
Chloroethylene LC 50 (Danio rerio, 96 h): 210 mg / l (semi-static) Remarks: Experimental result, Key study
LC 50 (Fish, 96 h): 115 mg / l

Acute toxicity - Aquatic Invertebrates
Chloroethylene LC 50 (48 h): 196 mg / l (Static) Remarks: Experimental result, Key study
LC 50 (Water flea (Daphnia magna), 48 h): 119 mg / l

Chronic Toxicity - Aquatic Invertebrates
Chloroethylene NOAEL (Daphnia sp., 21 d): 2,382 mg / l (QSAR) QSAR QSAR, Weight of Evidence study

Toxicity to Aquatic Plants
Chloroethylene EC 50 (Alga, 96 h): 77 mg / l

12.2 Persistence and Degradability

Product Not applicable to gases and gas mixtures..

12.3 Bioaccumulative Potential

Product The product is expected to biodegrade and is not expected to persist for long periods in an aquatic environment.

Bioconcentration Factor (BCF)

Chloroethylene Bioconcentration Factor (BCF): 5,47 Aquatic sediment QSAR, Weight of Evidence study

12.4 Mobility in Soil

Product Because of its high volatility, the product is unlikely to cause ground or water pollution.

Chloroethylene Henry's Law Constant: 155,9 MPa (25 °C)

12.5 Results of PBT and vPvB assessment

Product Not classified as PBT or vPvB.

12.6 Other Adverse Effects: No ecological damage caused by this product.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

General information: Do not discharge into any place where its accumulation could be dangerous. Consult supplier for specific recommendations. Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with flash back arrestor.

Disposal methods: Refer to the EIGA code of practice (Doc.30 "Disposal of Gases", downloadable at http: / / www.eiga.org) for more guidance on suitable disposal methods. Dispose of container via supplier only. Discharge, treatment, or disposal may be subject to national, state, or local laws.

European Waste Codes

Container: 16 05 04*: Gases in pressure containers (including halons) containing dangerous substances.

SECTION 14: Transport information

ADR

14.1 UN Number:	UN 1086
14.2 UN Proper Shipping Name:	VINYL CHLORIDE, STABILIZED
14.3 Transport Hazard Class(es)	
Class:	2
Label(s):	2.1
Hazard No. (ADR):	239
Tunnel restriction code:	(B / D)
14.4 Packing Group:	–
14.5 Environmental hazards:	not applicable
14.6 Special precautions for user:	–

RID

14.1 UN Number:	UN 1086
14.2 UN Proper Shipping Name	VINYL CHLORIDE, STABILIZED
14.3 Transport Hazard Class(es)	
Class:	2
Label(s):	2.1
14.4 Packing Group:	–
14.5 Environmental hazards:	not applicable
14.6 Special precautions for user:	–

IMDG

14.1 UN Number:	UN 1086
14.2 UN Proper Shipping Name:	VINYL CHLORIDE, STABILIZED
14.3 Transport Hazard Class(es)	
Class:	2.1
Label(s):	2.1
EmS No.:	F-D, S-U
14.3 Packing Group:	–
14.5 Environmental hazards:	not applicable
14.6 Special precautions for user:	–

IATA

14.1 UN Number:	UN 1086
14.2 Proper Shipping Name:	Vinyl chloride, stabilized
14.3 Transport Hazard Class(es):	
Class:	2.1
Label(s):	2.1
14.4 Packing Group:	–
14.5 Environmental hazards:	not applicable
14.6 Special precautions for user:	–
Other information	
Passenger and cargo aircraft:	Forbidden.
Cargo aircraft only:	Allowed.

14.7 Transport in bulk according to Annex II of MARPOL73 / 78 and the IBC Code: not applicable

Additional identification: 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 that they are firmly secured. Ensure that the container valve is closed and not leaking. Container valve guards or caps should be in place. Ensure adequate air ventilation.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations / legislation specific for the substance or mixture:

EU Regulations

Regulation (EC) No. 1907 / 2006 Annex XVII Substances subject to restriction on marketing and use:

The packaging shall be visibly, legibly and indelibly marked as follows:
Restricted to professional users.

Chemical name	CAS-No.	Concentration
Chloroethylene	75-01-4	100%

Directive 2004 / 37 / EC on the protection of workers from the risks related to exposure to carcinogens and mutagens at work.:

Chemical name	CAS-No.	Concentration
Chloroethylene	75-01-4	100%

Directive 92 / 85 / EEC: on the safety and health of pregnant workers and workers who have recently given birth or are breast feeding.:

Chemical name	CAS-No.	Concentration
Chloroethylene	75-01-4	100%

Directive 96 / 61 / EC: concerning integrated pollution prevention and control (IPPC): Article 15, European Pollution Emission Registry (EPER):

Chemical name	CAS-No.	Concentration
Chloroethylene	75-01-4	100%

Directive 96 / 82 / EC (Seveso II): on the control of major accident hazards involving dangerous substances:

Chemical name	CAS-No.	Concentration
Chloroethylene	75-01-4	100%

Directive 98 / 24 / EC on the protection of workers from the risks related to chemical agents at work:

Chemical name	CAS-No.	Concentration
Chloroethylene	75-01-4	100%

National Regulations

Council Directive 89 / 391 / EEC on the introduction of measures to encourage improvements in the safety and health of workers at work Directive 89 / 686 / EEC on personal protective equipment Directive 94 / 9 / EC on equipment and protective systems intended for use in potentially explosive atmospheres (ATEX) Only products that comply with the food regulations (EC) No. 1333 / 2008 and (EU) No. 231 / 2012 and are labelled as such may be used as food additives.
This Safety Data Sheet has been produced to comply with Regulation (EU) 453 / 2010.

15.2 Chemical safety assessment: CSA has been carried out.

SECTION 16: Other information

Revision Information: Not relevant.

Key literature references and sources for data:

Various sources of data have been used in the compilation of this SDS, they include but are not exclusive to:
Agency for Toxic Substances and Diseases Registry (ATSDR) (http://www.atsdr.cdc.gov/).
European Chemical Agency: Guidance on the Compilation of Safety Data Sheets.
European Chemical Agency: Information on Registered Substances http://apps.echa.europa.eu/registered/registered-sub.aspx#search
European Industrial Gases Association (EIGA) Doc. 169 Classification and Labelling guide.
International Programme on Chemical Safety (http://www.inchem.org/)
ISO 10156:2010 Gases and gas mixtures - Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets.
Matheson Gas Data Book, 7th Edition.
National Institute for Standards and Technology (NIST) Standard Reference Database Number 69.
The ESIS (European chemical Substances 5 Information System) platform of the former European Chemicals Bureau (ECB) ESIS (http://ecb.jrc.ec.europa.eu/esis/).
The European Chemical Industry Council (CEFIC) ERICards.
United States of America's National Library of Medicine's toxicology data network TOXNET (http://toxnet.nlm.nih.gov/index.html)
Threshold Limit Values (TLV) from the American Conference of Governmental Industrial Hygienists (ACGIH).
Substance specific information from suppliers.
Details given in this document are believed to be correct at the time of publication.

Wording of the R-phrases and H-statements in section 2 and 3

H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H350	May cause cancer.
R12	Extremely flammable.
R45	May cause cancer.

Training information:

Users of breathing apparatus must be trained. Ensure operators understand the flammability hazard.

Classification according to Regulation (EC) No 1272/2008 as amended.

Flam. Gas 1, H220
Press. Gas Liq. Gas, H280
Chem. Unst. Gas B, H231
Carc. 1A, H350

Other information:

Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. Ensure adequate air ventilation. Ensure all national/local regulations are observed. Ensure equipment is adequately earthed. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

Last revised date: 24.08.2016

Disclaimer: This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

Appendix E:
Accident Report Form

Employee Accident Report

EMPLOYEE

Name_____ SS#_____ Emp ID#_____

Home Address_____
Street city zip code phone

Sex: M F Birth Date_____ Age:_____ Employment Status: Full time _____ Part time _____%_____

Job Title _____ Time in Present Position _____ Yrs _____Months

Department _____ Work Address_____
building/room # phone

Supervisor_____
name building/room # phone

Accident Date_____ Time _____am/pm Location_____

What were you doing and using (tools, chemicals, equipment, etc.) when the accident occurred? Describe what happened.

_____

_____

_____

Was this part of your normal job duty? _____ Yes _____No

Parts of body affected or injured_____

Witnesses:_____/_____

name phone name phone

Report prepared by (if different from the injured employee)_____
name phone

I understand that it is my right to apply for Workers' Compensation benefits and that I have two years from the date of this accident to do so. For more information regarding workers' compensation, call the New York State Department of Labor. I also authorize release of medical information regarding this accident to the Prime Contractors claim administrators.

EMPLOYEE SIGNATURE:_____ DATE:_____

SUPERVISOR/CHARGE PERSON

This accident was reported to me on _____at_____ Cost Center/Dept # _____
(date) (time)

IS FURTHER INVESTIGATION REQUIRED? ___Yes ___No _____
Supervisor/Charge Person Signature Date

HEALTH CARE PROVIDER

Treated by:_____
print name signature

Address_____
name of facility street city state zip code phone

Hospitalized overnight as inpatient? _____yes _____no (if emergency room only mark no)

Diagnosis/Assessment_____

Parts of body affected_____

Reaggravation of previous work injury? _____yes _____no Date of initial injury_____