114 SNEDIKER AVENUE SITE

221-224 GLENMORE AVENUE
BROOKLYN, NEW YORK

Interim Remedial Measures Work Plan

AKRF Project Number: 220249
NYSDEC BCP Site Number: C224385

Prepared for:

New York State Department of Environmental Conservation
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CERTIFICATION

I, Rebecca Kinal, P.E., certify that I am currently a NYS registered Professional Engineer as defined in 6 NYCRR Part 375 and that this Interim Remedial Measures Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

REBECCA A. KINAL
082046-1

Rebecca Kinal, P.E.		6/2/2023
Name	Signature	Date

1.0 INTRODUCTION

This Interim Remedial Measures (IRM) Work Plan has been prepared by AKRF, Inc. (AKRF) on behalf of Glenmore Owner, LLC (the “Volunteer”) for the property identified as the 114 Snediker Avenue Site (Site) located at 221-224 Glenmore Avenue, Brooklyn, New York. The legal definition of the Site is Brooklyn Tax Block 3697, Lots 1 and 33. The Site is located within a mixed-use neighborhood on the northern side of Glenmore Avenue between Van Sinderen Avenue and Snediker Avenue, in the New Lots sub-section of the East New York neighborhood in Brooklyn, New York. A Site Location Plan is included as Figure 1.

The Volunteer applied to enter the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) in December 2022. On May 27, 2023, a Brownfield Cleanup Agreement (BCA) was executed between the Volunteer and the NYSDEC to complete remediation and investigation activities at the Site under purview of the NYSDEC BCP (BCP Site No. C224385). Prior to submitting the BCP application, the Volunteer conducted a series of investigations at the Site, including a Phase II subsurface investigation and a Remedial Investigation (RI). The investigations identified exceedances of chlorinated solvent-related volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), pesticides, metals, perfluorooctanoic acid (PFOA), and perfluorooctanesulfonic acid (PFOS) in soil, chlorinated solvent-related VOCs, metals, PFOS, and PFOA in groundwater above applicable standards and/or guidance values, and chlorinated solvent-related VOCs in soil vapor. Notably, the solvent-related VOCs present in soil (from 0 to 4 feet below grade site-wide extending to approximately 6 to 21 feet below grade in some locations) were detected at concentrations that exceeded NYSDEC cleanup objectives for restricted residential use and/or groundwater protection, with some hot spot locations containing solvent concentrations consistent with gross contamination. The investigation data indicates the soil contamination is an active, ongoing source of contamination to multiple environmental media. The IRMs described in this Work Plan are being proposed as proactive measures to address the ongoing source of solvent contamination in soil and provide interim indoor air mitigation for the off-site residence prior to completing the remedy phase of the BCP.

2.0 SITE DESCRIPTION AND HISTORY

A complete review of the Site description, surrounding land use, and local geology is included in the BCP Application and Draft Remedial Investigation Report (RIR). For the purpose of this IRM Work Plan, this section includes a summary of the Site details.

2.1 Site History

The Site comprises two tax lots (Lots 1 and 33). The following known or suspected sources of contamination were identified at the Site during previous investigations:

- Historic lighting manufacturing activities on Lots 1 and 33 (221 and 241 Glenmore Avenue) from 1966 through 2022, with the confirmed former use and off-site disposal of spent halogenated solvents used in degreasing, including tetrachloroethene (PCE), trichloroethene (TCE), and methylene chloride, and non-halogenated solvents.
- Previous historical on-site uses including auto repair and junkyard activities, plumbing manufacturing, and a nail polish bottling facility.
- Historic underground storage tanks (USTs) were identified on the southwestern portion of Lot 1 and southeastern portion of Lot 33 in the 1928 Sanborn Fire Insurance Map. Neither tank appeared on the 1950 Sanborn Map or more recent Sanborn images. No documentation regarding the UST removal was identified and it is not known whether the tanks were removed or abandoned in place properly.

2.2 Previous Investigations

Phase I Environmental Site Assessment, 221 & 241 Glenmore Ave, Brooklyn, New York, Impact Environmental Closures, Inc. (IEC), May 28, 2021

A Phase I Environmental Site Assessment (ESA) of the Site was completed by IEC in May 2021. At the time of IEC's assessment, the Site was developed with three adjoining buildings consisting of: a two-story building on Lot 33 utilized as storage and workshop spaces on the first floor and management offices on the second floor (southeastern portion of the Site, 241 Glenmore Avenue), a single-story manufacturing building on the northeastern portion of Lot 1 (northeastern portion of Site, 221 Glenmore Avenue), and a single-story manufacturing building on the western portion of Lot 1 which operated as the light manufacturing area (western portion of the Site, 221 Glenmore Avenue). The three buildings located within the Site were occupied by Legion Lighting Co. Inc., which operated as an industrial light manufacturer until May 2022. A small sub-grade cellar was located in the southwestern corner of Lot 1 (221 Glenmore Avenue) and contained a concrete encased 1,000-gallon No. 2 fuel oil tank and two fuel-oil fired boilers. The Phase I ESA was conducted in conformance with the scope and limitations of American Society for Testing & Materials (ASTM) Practice E1527-13 and included a visual inspection of the Site and a review of regulatory database records and historical records. Based on the findings of the Phase I ESA, the following Recognized Environmental Conditions (RECs) were identified:

- Historic Site operations have included a lumber yard (circa 1908), auto repair activities (circa 1928 and 1966-1996), a factory for metal stamping (circa 1947), plumbing manufacturing (circa 1950), and a nail polish bottling facility (circa 1950). Legion Lighting was identified as a RCRA Large Quantity Generator (LQG) in 1982 for the generation of halogenated solvents (F-listed wastes) and was registered under the USEPA ID: 110001602169 within USEPA's Enforcement and Compliance History Online (ECHO) database with multiple "Action

Numbers" that correspond to "Pollutant Codes", one of which states "PCE on-Site". Other types of chemicals listed on the USEPA database which may be used currently and/or were used for historic operations include, but are not limited to, petroleum and solvent-related compounds. Based on past uses of identified for the Site dating back to at least 1947, the potential for releases or discharges resultant of use, storage and handling of the chemical compounds associated with these types of operations is considered a REC.

- On the 1928 Sanborn Fire Insurance Map, two gasoline tanks are identified at the Site. One tank is located on the 221 Glenmore Avenue portion of the Site (Lot 1), in the southern section of the warehouse, and the other is located at 243 Glenmore Avenue (Lot 33), within what was the former auto repair building. Neither tank appears on the following 1950 Sanborn Map or more recent Sanborn images. No documentation was obtained with respect to the referenced tanks. It is not known whether the tanks were removed or abandoned in-placed properly, and if contamination resultant from the tanks is present in surrounding soil.

Based on the findings of the Phase I ESA, IEC recommended a subsurface investigation to investigate the identified RECs.

Subsurface Investigation Report, 221 and 241 Glenmore Avenue, Brooklyn, New York, Impact Environmental Closures, Inc, July 1, 2022

IEC conducted a subsurface investigation in April and May 2022 on behalf of Camber Property Group, LLC. The scope of work was based on the findings of the May 2021 Phase I ESA prepared by IEC. The subsurface investigation included a private utility survey; the advancement of ten soil borings across the Site and collection of two soil samples from each boring; the installation of three semi-permanent groundwater monitoring wells and collection of three groundwater samples; and the installation of eight soil vapor points with collection of eight soil vapor samples.

Two soil samples were collected from each soil boring for laboratory analysis. One sample was collected from each boring from the 0 to 2-foot interval. A second sample was collected from each boring from the 12 to 14 below grade interval within the proposed cellar footprint and from the 2 to 4-feet below grade interval outside the proposed cellar footprint. Three small diameter semi-permanent polyvinyl chloride (PVC) groundwater monitoring wells were installed within three borings across the Site. Monitoring well MW-3 was installed using 1-inch inner diameter (ID) flush joint schedule 40 PVC, while monitoring wells MW-2 and MW-5 were installed using 2-inch ID flush-joint schedule 40 PVC.

The soil samples were analyzed for the NYSDEC Part 375 List VOCs by USEPA methods 8260C/5035, semi-volatile organic compounds (SVOCs) by USEPA method 8270D, pesticides and herbicides by USEPA methods 8081B and 8151A, polychlorinated biphenyls (PCBs) by USEPA method 8082A, Metals by USEPA Methods 6010C. Nine soil samples and one duplicate sample were also analyzed for Per- and Polyfluoroalkyl Substances (PFAS) by USEPA Method 537 and 1,4-dioxane by USEPA method 8270 SIM isotope dilution.

Groundwater samples were analyzed for the Target Compound List (TCL) VOCs by USEPA methods 8260C/5035, TCL SVOCs by USEPA method 8270D, Pesticides by USEPA method 8081B, PCBs by USEPA method 8082A, Target Analyte List (TAL) Metals by USEPA Method 6010C. Two groundwater samples and one duplicate sample were also analyzed for PFAS/PFOA by USEPA Method 537 and 1,4-dioxane by USEPA method 8270 SIM isotope dilution.

Eight temporary soil vapor points were installed approximately two feet below the building slab, at points SV-3 through SV-8 and 12-feet below grade at points SV-1 and SV-2. Eight soil vapor samples and one duplicate soil vapor sample were analyzed for VOCs by EPA Method TO-15.

The results of the Phase II ESA are included in Section 3.0 as part of a comprehensive summary of data compiled from both the Phase II ESA and the Remedial Investigation (RI),.

Geotechnical Evaluation Report, 221 Glenmore Avenue, Brooklyn, New York, GEODesign, Inc. P.C., July 2022

GEODesign, Inc. (GDI) performed a geotechnical investigation in April and May 2022 on behalf of Camber Property Group, LLC. The objective of the investigation was to evaluate the subsurface conditions at the Site and provide geotechnical recommendations for the design and construction of the proposed building. The scope of work was based on the April 4, 2022 architectural drawings which included proposed demolition of the existing buildings and construction of a new 5-story building with one cellar level (“Cellar Option #2”) with an assumed cellar height of 10 feet. The geotechnical investigation included advancement of six test borings (B-1 through B-6) using a track mounted Fordia 300 drilling rig and a track mounted Geoprobe 7822DT drilling rig. Borings were advanced using mud rotary drilling techniques. Subsurface conditions generally consisted of approximately 5 to 10 feet of uncontrolled sandy fill (Stratum 1), 15 to 25 feet of very dense sand and gravel (Stratum 2), and very dense sand that extends to a depth of at least 100 feet (Stratum 3).

One groundwater observation well was installed at Boring B-3 and constructed with 2-inch diameter schedule 25 PVC pipe with a 20-foot-long screen between depths of approximately 20 and 40 feet, and 20 feet of riser pipe. Two environmental wells were installed in Borings B-1B and PT-1B and were constructed with a 10-foot-long screen between the depths of 40 to 50 feet, and 40 feet of rise pipe. The groundwater observation well was dry on May 18, 2022 and groundwater is estimated to be deeper than 40 feet. Groundwater measurements were not taken over an extended period of time; therefore, the measurements likely do not adequately reflect seasonal or other time dependent variations that may occur.

Draft Remedial Investigation Report, 221 and 241 Glenmore Avenue, Brooklyn, New York, AKRF, Inc., May 2023

A RI was conducted at the Site by AKRF from September 29, 2022 to October 20, 2022 and between February 13 and April 5, 2023. The soil, groundwater, and soil vapor data documented in IEC’s May 2022 Phase II SIR (described above) was used as a foundation to identify data gaps and direct the rationale for the RI sampling plan. The RI included the following scope of work: a geophysical survey, the advancement of 72 soil borings with continuous soil sampling, the installation, development, and sampling of 25 two-inch-diameter permanent groundwater monitoring wells and two four-inch diameter permanent groundwater monitoring wells, the installation of 12 temporary sub-slab soil vapor points, installation of 24 nested soil vapor points, and the laboratory analysis of 418 soil samples, 33 groundwater samples, 12 sub-slab soil vapor samples, and 94 soil vapor samples. The sample collection and laboratory analysis included NYSDEC’s requirements for quality assurance/quality control (QA/QC), including Category B Reporting.

Soil from each continuous sampling interval was observed for evidence (i.e., staining, odors) of contamination, field screened using a photoionization detector (PID), and logged using the modified Burmister soil classification system. Field evidence of contamination, including solvent-like odors, staining, and/or elevated PID readings, were observed at various depths from 2 to 21 feet below grade in one or more soil borings. Evidence of free phase product [non-aqueous phase liquid (NAPL)] was identified in two soil borings installed during the RI (PDI-SB-39 and PDI-SB-47) at depths ranging from 15 to 20 feet bg.

Soil from each of the continuous sampling intervals was placed into laboratory supplied containers and was either placed on hold or designated for analysis using a varying set of parameters based on location, depth, initial laboratory results, what contaminants were present, and delineation needs.

During the October 2022 sampling activities, at each soil boring location, one shallow grab soil sample was collected for analysis from grade to two feet bgs; a second sample was collected for analysis from the 2 to 4 feet bgs interval; a third grab sample was collected for analysis from borings on the eastern portion of the Site from either 8 to 10 feet bgs, 12 to 14 feet bgs, or 14 to 16 feet bgs; and, a fourth grab soil sample was collected for analysis at locations where groundwater monitoring wells were installed from the two-foot interval directly above the apparent groundwater interface, which varied between approximately 38 and 42 feet bgs depending on the location. The first, third, and fourth soil samples were analyzed for Target Compound List (TCL) VOCs by EPA Method 8260D, TCL SVOCs by EPA Method 8270E, PCBs by EPA Method 8082A, TCL pesticides by EPA Method 8081B, herbicides by EPA Method 8151A, TAL metals by EPA Method 6000/7000 series, cyanide by EPA Method 9012B, trivalent and hexavalent chromium by EPA Method 7196A, PFAS by EPA Method 537 (modified), and 1,4-dioxane by EPA Method 8270E SIM. The second soil sample was analyzed for CVOCs only.

Additional grab samples were collected from all soil borings in two-foot increments from two feet bgs to the terminus of the boring to vertically delineate the extent of CVOC contamination. These samples were initially placed on hold pending analysis of the sample from the previous interval. Additionally, a sample was collected at RI-SB-02 from 12 to 14 feet bgs, which was analyzed for CVOCs and TAL metals only, corresponding to a hotspot identified during IEC’s April and May 2022 subsurface investigation. The soil samples collected also coincided with depth intervals where the highest levels of field contamination were observed (staining, odors, and/or PID readings).

During the February through April 2023 sampling activities, at each soil boring location, one grab sample was collected for analysis at every two-foot interval between 0, 2, or 4 and 14 feet bgs, and at 14 to 15 feet bgs. The samples were analyzed for CVOCs by EPA Method 8260D with select boring locations also analyzed for polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270E and TAL Metals by EPA Method 6000/7000 series. Additional grab samples were collected from the interval just above the water table (typically 38 to 40 or 39 to 40 feet bgs) and at any interval(s) exhibiting elevated PID readings. These additional sample intervals were analyzed for CVOCs. Additionally, select deep soil samples were also analyzed for pH by EPA Method 9045D, total organic carbon (TOC) by Method 5310B Modified (Lloyd Kahn), and grain size and clay content by American Society of Testing and Methods (ASTM) Method D422.

The RI results are included in a comprehensive summary of environmental conditions included below in Section 3.0.

3.0 SUMMARY OF ENVIRONMENTAL CONDITIONS

This section includes a comprehensive summary of the data compiled during both the Phase II ESA completed by IEC, and the RI completed by AKRF. The soil analytical results were compared to the NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs), Restricted Residential Soil Cleanup Objectives (RRSCOs), and Protection of Groundwater Soil Cleanup Objectives (PGWSCOs). PGWSCOs were used for comparison for CVOCs only. Analytical results for the groundwater samples were compared to NYSDEC's Ambient Water Quality Guidance Values (AWQSGVs). No standards currently exist for soil vapor. A Site plan showing the sampling locations for the Phase II ESA and the RI is included as Figure 2.

Summary of Geological and Hydrogeological Findings

The Site was underlain by an unconsolidated fill comprised of a mixture of sand, gravel, silt, clay, brick, concrete, metal, and plastic from grade down to approximately 10.5 feet bg. The fill was underlain by a dense sand and silt with varying amounts of gravel and cobbles down to the maximum boring terminus of 75 feet bg. Bedrock was not encountered during the RI.

Groundwater beneath the Site was measured from surveyed monitoring wells to be at elevations ranging from 8.26 to elevation 8.96 feet above sea level [North American Vertical Datum 1988 (NAVD88)], or approximately 40 to 42 feet bg during the RI. Groundwater was calculated to flow in a south-southeasterly direction toward the Jamaica Bay, approximately 2.5 miles southeast of the Site. A groundwater contour map is depicted on Figure 3.

Soil Quality

Soil contamination was documented between 0 to 4 feet bg site-wide, with isolated zones of CVOC contamination extending to 21 feet bg, and an isolated area of metals contamination within the observed fill zone extending to nine feet bg.

- Chlorinated VOCs were detected at concentrations above the UUSCOs, RRSCOs, and/or PGWSCOs, including PCE (max. 98 ppm), TCE (max. 25 ppm), cis-1,2-dichloroethene (max. 0.95 ppm), and methylene chloride (max. 0.11 ppm). The highest concentrations of VOCs were detected in soil samples along the central and northern portions of the Site.
- SVOCs were detected in shallow samples above the UUSCOs and/or RRSCOs including benzo(a)anthrancene (max. 15 ppm), benzo(a)pyrene (max. 14 ppm), benzo(b)fluoranthene (max. 17 ppm), benzo(k)fluoranthene (max. 5.6 ppm), chrysene (max. 14 ppm), dibenz(a,h)anthracene (max. 2.0 ppm), indeno(1,2,3-cd)pyrene (max. 9.2 ppm), and naphthalene (max. 13 ppm). SVOC exceedances were detected in isolated areas of the Site between 0 to 4 feet bg.
- Total PCBs (max. 0.48 ppm) were detected in one sample (RI-SB-01_0-2) and its associated blind duplicate at concentrations above the UUSCO but below the RRSCO.
- Up to four pesticides were detected in shallow samples at concentrations above the UUSCOs but below RRSCOs including 4,4'-DDD (max. 0.17 ppm), 4,4'-DDE (max. 0.04 ppm), 4,4'-DDT (max. 0.28 ppm), and dieldrin (max. 0.033 ppm). Pesticide exceedances were located in isolated areas between 0 to 4 feet bg.
- Between one and 13 metals compounds were detected above their respective UUSCOs and/or RRSCOs, including arsenic (max. 18.0 ppm), barium (max. 814 ppm), cadmium (max. 11.1

ppm), trivalent chromium (max. 214 ppm), hexavalent chromium (max. 3.72 ppm), copper (max. 936 ppm), cyanide (max. 36.9 ppm), lead (max. 1,360 ppm), manganese (2,570 ppm), mercury (max. 3.71 ppm), nickel (max. 318 ppm), silver (max. 4.55 ppm), and zinc (max. 1,130 ppm). The highest concentrations of metals were detected on the central portion of the Site. The metals exceedances were located between 0 to 4 feet bg, with one location extending to 14 feet bg.

- PFOS [max. 10.8 parts per billion (ppb)] was detected above its NYSDEC Guidance Value for Unrestricted Use of 0.88 ppb in 13 samples. All PFOS detections remained below the NYSDEC Guidance Value for Restricted Residential Use. PFOA (max. 3.08 ppb) was detected above its NYSDEC Guidance Value for Unrestricted Use of 0.66 ppb in three soil samples. PFOA was not detected above its NYSDEC Guidance Value for Restricted Residential use.

Exceedances of UUSCOs, RRSCOs and/or PGWSCOs in soil samples are shown on Figures 4A through 4C.

Groundwater Quality

- Three chlorinated VOCs (PCE, TCE, and chloroform) were detected in groundwater samples at concentrations above the AWQSGVs. PCE was detected at concentrations ranging from 5.1 ppb (PDI-MW-02D) to 19,000 ppb (RI-MW-DUP), above its AWQSGV of 5 ppb. TCE was detected at concentrations ranging from 3.8 ppb (RI-MW-04) to 30 ppb (RI-MW-03), with all but one concentration above its AWQSGV of 5 ppb. Chloroform was detected in groundwater samples at concentrations ranging from a concentration of 7.2 ppb (PDI-MW-17) to 25 ppb (PDI-MW-16), exceeding its AWQSGV of 7 ppb. One additional VOC, acetone, was detected in one groundwater sample at a concentration of 74 ppb, above its AWQSGV of 50 ppb. All remaining VOCs remained below their respective AWQSGVs.

- Up to eight metals compounds, including antimony (max. 0.005 ppb), arsenic (max. 0.03 ppb), chromium (max. 0.167 ppb), iron (max. 1,700 ppb), lead (max. 0.077 ppb), manganese (max. 2,000 ppb), nickel (max. 0.275 ppb), and sodium (max. 88,900 ppb), were detected in the total metals (unfiltered) groundwater samples at concentrations above their respective AWQSGVs. Three metals including iron (max. 1,600 ppb), manganese (max. 1,940 ppb), and sodium (max. 81,500 ppb) were detected in the multiple dissolved (filtered) groundwater samples at concentrations above their respective AWQSGVs.

- PFOA was detected in groundwater throughout the Site at concentrations ranging from 16.8 nanograms per liter (ng/L) to 89.5 ng/L, above the NYSDEC screening level of 10 ng/L. PFOS was detected in groundwater throughout the Site at concentrations ranging from 1.30 ng/L to 105 ng/L, with three of the four samples detecting PFOS above the NYSDEC screening level of 10 ng/L.

Figure 5 includes a review of compounds detected in groundwater samples that exceed either the NYSDEC AWQSGVs and/or the NYSDEC Screening Levels.

Soil Vapor Quality

Six sub-slab soil vapor samples and two soil vapor samples were collected during the May 2022 Phase II Investigation, 12 sub-slab soil vapor samples were collected during the October 2022 RI, and 94 soil vapor samples were collected during the 2023 RI. All soil vapor samples were analyzed for VOCs using EPA Method TO-15.

Petroleum-related VOCs, including, among others, 1,2,4-trimethylbenzene, 2,2,-trimethylpentane, benzene, butane, cyclohexane, ethanol, ethylbenzene, hexane, isopropanol, xylenes, and toluene were detected in the sub-slab soil vapor samples.

Solvent-related VOCs in sub-slab soil vapor samples, including PCE, TCE, 1,1-dichloroethene (DCE), cis-1,2-DCE, 1,1,1-trichloroethane (TCA), 1,1,2-TCA, acetone, bromodichloromethane, chloroform, methylene chloride, and methyl ethyl ketone (MEK) were detected across the Site, with PCE and TCE being detected at concentrations up to 10,000,000 micrograms per cubic meter ($\mu g/m^3$) and 250,000 $\mu g/m^3$, respectively. The highest concentrations were detected on the central and eastern portions of the Site.

Soil vapor sample results are shown on Figures 6A through 6E.

4.0 INTERIM REMEDIAL MEASURE OBJECTIVES

Previous investigations at the Site have identified CVOCs, SVOCs, pesticides, metals, and PFAS contamination in shallow soil. The CVOC contamination was documented in the top four feet of soil across the Site, with several areas extending to 6 to 12 feet bg, and one deeper area extending to 21 feet bg. Notably, the CVOC concentrations in shallow soil, along with the contamination documented in groundwater and soil vapor, are indicative of gross contamination. The objective of the IRM is to complete an action that is protective of public health and the environment by removing an ongoing source of contamination (i.e. CVOC-contaminated soil) affecting groundwater and soil vapor beneath the Site. The actions proposed during the IRM include: indoor air mitigation at the north-adjacent off-site residence, removal of the AST and suspect USTs and any additional petroleum bulk storage tanks encountered, and excavation and removal of all CVOC contamination source areas in soil. These objectives are consistent with guidance for Brownfield Cleanup Program sites in NYSDEC DER-10. For excavation of soil, endpoint sampling will confirm attainment of PGWSCOs for CVOCs to determine the effectiveness of the IRM and RRSCOs for all other compounds listed in 6 NYCRR Part 375-6.8. Endpoint sample analysis for PFOA/PFOS will be compared to Restricted Residential Guidance Values (RRGVs) and Protection of Groundwater Guidance Values (PGWGVs) included in NYSDEC's April 2023 Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances Guidance Document. Any remaining exceedances in soil and groundwater will be addressed under the RAWP.

5.0 INTERIM REMEDIAL MEASURE – INDOOR AIR MITIGATION

It is acknowledged that the Volunteer is responsible to prevent the off-site migration of soil vapor based on the elevated concentrations of VOCs in soil vapor collected to date on-site (up to 10,000,000 µg/m^3 of PCE). Based on the elevated soil vapor concentrations, it is assumed that the potential for soil vapor intrusion exists at the north-adjacent residence (106 Snediker Avenue). As installation of a perimeter soil vapor extraction (SVE) system at the Site to prevent the off-site migration of soil vapor is not feasible, as it would not allow source removal of soil through excavation to occur, the Volunteer has agreed to (although it is not obligated to) include an IRM consisting of the installation of indoor air filtration equipment in the north-adjacent residence as a mitigation measure to reduce potentially elevated levels of VOCs. It is noted that this IRMWP also includes VOC source material soil excavation and off-site disposal noted in Section 7.0, which should also reduce concentrations of VOCs in soil vapor over time.

5.1 Indoor Air Mitigation

An IRM for indoor air mitigation will be implemented at the north-adjacent residence. The IRM will consist of an evaluation of the volume of air within the indoor spaces requiring mitigation, the type of indoor air contamination (if available), and the order of magnitude of contamination in indoor air (if available) to determine the appropriate air mitigation equipment. Indoor air mitigation units will consist of an electric air purifier with activated carbon filtration designed to remove VOCs from indoor air (i.e. AllerAir® AirMedic Pro 6 HD Vocarb, AirMedic Pro 6 Ultra Vocarb, or similar). Copies of the proposed air mitigation equipment specifications and user manual are included as Appendix D. Air filter inserts [activated carbon, high efficiency particulate air (HEPA), etc.] will be replaced according to recommended replacement schedules per manufacturer specifications. The IRM indoor air mitigation will be continuously operated (24 hours per day, 7 days per week) until NYSDEC/NYSDOH complete the SVI evaluation and determine indoor air mitigation is not necessary or complete installation and activation of a sub-slab depressurization system (SSDS) in the residence.

6.0 INTERIM REMEDIAL MEASURE – STORAGE TANK REMOVAL(S)

Although the Site was not listed in the NYSDEC's Petroleum Bulk Storage (PBS) database, petroleum bulk storage tanks are present at the Site. As such, the IRM includes procedures for the removal and closure of storage tanks and any associated piping in accordance with accepted industry standards and applicable federal, state, and local regulatory agency requirements.

6.1 1,000-Gallon AST Removal

One vaulted 1,000-gallon No. 2 fuel-oil AST is located in the sub-grade cellar of the 221 Glenmore Avenue building (Lot 1). The 1,000-gallon No. 2 fuel oil AST was previously used to fuel two fuel oil fired boilers in the sub-grade cellar. The 1,000-gallon AST will be cleaned and removed during building demolition activities by a New York City Fire Department (FDNY)-licensed tank removal contractor in accordance with federal, state, and local regulations and any petroleum-contaminated soil associated with the tank will be excavated and disposed of at a properly permitted off-site disposal facility.

AST closure, endpoint sampling, and any soil removal from the vicinity of the 1,000-gallon No. 2 fuel oil AST will be conducted in accordance with the NYSDEC DER-10, NYSDEC Divisions of Spills and Response Memorandum on Permanent Closure of Petroleum Storage Tanks, dated July 1998 and updated in December 2003, and NYSDEC Commissioner's Policy (CP)-51. Chemical analytical work will be for TCL VOCs, SVOCs, TCL pesticides, PCBs, and TAL metals. These analyses will not be limited to the CP-51 parameters where tanks are identified without prior approval by NYSDEC.

Spill reporting to the NYSDEC Spill Hotline (800-457-7362) will be conducted, if deemed necessary in consultation with the NYSDEC BCP project manager.

6.2 Suspect UST Removals

As mentioned in Section 2.1 and shown on Figure 2, historic USTs were identified on the southwestern portion of Lot 1 and southeastern portion of Lot 33 in the 1928 Sanborn Fire Insurance Map. Neither tank appeared on the 1950 Sanborn Map or more recent Sanborn images. No documentation regarding the UST removal was identified and it is not known whether the tanks were removed or abandoned in place properly.

If these USTs or any other tanks are encountered during IRM activities, the tanks and appurtenances will be cleaned and closed in accordance with accepted industry standards and applicable federal, state, and local regulatory agency requirements. Any tanks that cannot be removed would be closed in place, in accordance with accepted industry standards and applicable federal, state, and local regulatory agency requirements.

Tank closure, tank endpoint sampling, and any soil removal from the vicinity of any discovered USTs will be conducted in accordance with the NYSDEC DER-10, NYSDEC Divisions of Spills and Response Memorandum on Permanent Closure of Petroleum Storage Tanks, dated July 1998 and updated in December 2003, and NYSDEC Commissioner's Policy (CP)-51. Chemical analytical work will be for TCL VOCs, SVOCs, TCL pesticides, PCBs, and TAL metals. These analyses will not be limited to the CP-51 parameters where tanks are identified without prior approval by NYSDEC.

Spill reporting to the NYSDEC Spill Hotline (800-457-7362) will be conducted, if deemed necessary in consultation with the NYSDEC BCP project manager.

Any unregistered tanks encountered at the Site will be registered, if required, with NYSDEC in accordance with Petroleum Bulk Storage (PBS) registration requirements. Tank closure activities and any associated petroleum-contaminated soil removal will be documented in the IRM Report (see Section 8.0).

7.0 INTERIM REMEDIAL MEASURE - EXCAVATION

The IRM will include excavation and removal of the soil contamination, which is acting as a source of contamination for other environmental media (groundwater and soil vapor) that was documented during the Phase II and RI. IRM excavation will not start until NYSDEC and NYSDOH deem the RI is complete.

7.1 Site Preparation

Prior to conducting any intrusive IRM activities, the work zone(s), designated entry points, soil stockpile staging areas, decontamination zones, and truck routes will be established on a site plan, as applicable. The site plan will be updated as necessary to reflect any changes in operations during the intrusive work. Dust and odor control measures will be implemented as outlined in Section 7.7. Additional details of site preparation activities are provided in the following sections.

7.1.1 Mobilization

Site mobilization involving site security setup, installation of fencing and barriers, erosion control measures, construction of decontamination and materials staging areas, equipment mobilization, utility mark outs and marking and staking excavation areas will be performed prior to undertaking any IRM excavation work. In addition, asbestos abatement and demolition of the buildings will be completed prior to the start of IRM activities.

7.1.2 Erosion and Sedimentation Controls

Erosion and sediment control measures will be installed at the Site prior to conducting any ground-intrusive work in accordance with the protocols presented in NYS Guidelines for Urban and Erosion Sediment Controls. The control measures will include procedures for perimeter Site/stockpile controls, stabilized construction entrance pads, equipment decontamination, drainage inlet protection, and dust suppression, as applicable.

7.1.3 Stabilized Construction Entrance(s)

A crushed stone path will be constructed at all truck entrances and exits. All trucks will drive over the path prior to leaving so that they do not get re-contaminated prior to departure from the Site. A laborer will check the trucks as they leave, and will use a hose, shovel, and/or broom to clean the truck tires and body as it leaves the Site, as necessary.

7.1.4 Utility Marker and Easements Layout

The Volunteer and its contractors are solely responsible for the identification of utilities that might be affected by work under the IRM and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this IRM. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this IRM. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals pertinent to such work that may be required to perform work under this IRM. Approval of this IRMWP by NYSDEC does not constitute satisfaction of these requirements.

7.1.5 Support of Excavation

Appropriate management of structural stability of all excavations and on-site or off-site structures during on-site excavation activities is the sole responsibility of the Volunteer and its contractors. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals that may be required to perform work under this Plan and/or where permit equivalency cannot be granted. Further, the Volunteer and its contractors are solely responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved Plan.

7.1.6 Equipment and Material Staging

Staging and storage of equipment and materials will be contained within the secured site. By the nature of the work involved in this project, equipment and materials will be moved to different areas within the secured site as work progresses.

7.1.7 Decontamination Area

A decontamination area will be established in accordance with the HASP. All equipment in direct contact with known or potentially contaminated material will be either dedicated or decontaminated prior to handling less contaminated material or removal from the Site. All liquids used in the decontamination procedure will be collected, stored and disposed of in accordance with federal, state and local regulations. Personnel performing this task will wear the proper personal protective equipment as prescribed in the HASP.

7.1.8 Demobilization

After completing the scope of the IRM, it is anticipated that Site redevelopment and general construction work will continue. Equipment will be decontaminated prior to removal. Upon completion of the remedial excavation work, any waste materials (i.e., plastic sheet, absorbent pads, refuse) and the decontamination pad will be removed from the Site and properly disposed of. Areas that have been disturbed to accommodate support and temporary access areas will be restored or prepared for general construction work.

7.2 IRM Excavation

The proposed IRM includes excavation of contaminated soil to 2 to 4 feet below grade across the entire Site, plus removal of additional source material extending to depths ranging from 6 to 21 feet below grade in hotspot areas identified during the Phase II and RI. Figure 7 depicts the anticipated depth of soil excavation across the Site based on data available to date. All excavations will be considered open excavations and will be managed according to applicable local, State, and Federal regulations. The Owner and its contractors will be responsible for safe execution of all invasive and other work performed under this Plan. The presence of utilities and easements on the Site will be investigated by the Volunteer and the Remedial Engineer. It will be determined whether a risk or impediment to the planned work under this IRMWP is posed by utilities or easements on the Site.

The 2-foot deep excavation sidewalls will extend to the perimeter boundary of the Site. The 2-foot deep excavation will extend up to 4 feet bg or deeper, based on post-excavation endpoint sampling results, if necessary. The excavation depth will be extended in the hot spot areas and in the area of the suspect USTs (if encountered) as indicated on Figure 7 and will be expanded based on field screening of the sidewalls and bottom of the excavation until visual/olfactory observations demonstrate that the contaminated soil has been removed, to the extent possible.

Endpoint samples will be collected from the bottom and sidewalls of the sitewide excavation and from all hotspot removal areas in accordance with DER-10 sampling frequency requirements. The samples will be submitted for laboratory analysis to confirm that CVOCs meet the lower of the PGWSCOs and RRSCOs and that the PAHs and metals hotspots have been removed. All intrusive excavation work will be conducted in accordance with the procedures defined in the HASP (Appendix A) and CAMP (Appendix B).

7.3 Soil Screening Methods

Visual, olfactory, and instrument-based soil screening will be performed by a qualified environmental professional during all soil excavation work. Monitoring will include inspecting soil for heavy staining, sheen, odors, or other evidence of gross contamination, and field screening for the presence of VOCs with a PID. All soil exhibiting evidence of contamination will be separated and stockpiled in accordance with Section 7.4.

In addition to screening excavated material for the presence of contamination, work zone air monitoring for VOCs will be performed according to the HASP (Appendix A), and perimeter monitoring will be conducted in accordance with the CAMP (Appendix B).

Visual, olfactory, and PID soil screening and assessment will be performed under the direction of a qualified environmental professional during all IRM excavations into known or potentially contaminated material.

Visual, olfactory and instrument-based soil screening will be performed during the excavation to confirm the depth of excavation, and to confirm that there is no evidence of contamination remaining in soil at the limits of the excavation. Field screening will include inspecting soil for heavy staining, sheen, odors, or other evidence of gross contamination, and field screening for the presence of VOCs with a PID. The final excavation limits and amount of excavated soil will be measured and documented by field personnel.

7.4 Stockpile Methods

It is expected that the majority of the soil excavated from the Site will be live loaded as described in Section 7.3 based on pre-characterization sampling, which will be conducted prior to excavation activities, and soil disposal facility approvals. Small volumes of excavated soil may be placed in separate designated stockpiles based on the results of field screening, or as needed based on availability of trucks, disposal facility capacity, sequencing of work, etc. Each soil stockpile will be located based on security, or ease of loading onto haul trucks and will be placed on sheeting and kept fully covered whenever excavation and/or loading operations are not occurring with an appropriately anchored tarp or min 6-mil poly sheeting. Each stockpile cover will be routinely inspected to ensure adequate cover. If a damaged tarp/poly sheeting cover is observed, it will be promptly replaced. Soil stockpiles will be continuously encircled with a berm and/or silt fence as necessary to prevent runoff off-Site or to uncontaminated locations on-Site. Hay bales and/or other erosion and sediment controls will be used as needed near any catch basins or other discharge points. Soil excavated during the IRM will not be reused on-site.

The location and classification of each stockpile location will be tracked on Site drawings and updated, if necessary, at the end of each workday. Copies of Site drawings will be kept in the field log book.

7.5 Fluids Management

Due to the depth to water at the Site (approximately 40 feet below grade), dewatering is not anticipated during the IRM. All liquids removed from the excavation (e.g. accumulated stormwater) will be handled, transported and disposed of at Clean Water of New York or other appropriate disposal facilities in accordance with applicable local, State, and Federal regulations. NYSDEC and NYSDOH will be notified if an alternative disposal facility is proposed.

7.6 Air Monitoring

Work zone and community air monitoring will be conducted during all work identified in this IRM. The work zone air monitoring will be completed in accordance with the site-specific HASP and CAMP, which are provided in Appendix A and Appendix B, respectively.

7.7 Site Control Measures

The potential off-site transport of sediment, dust, and organic vapors potentially generated during soil excavation activities will be controlled by: placing stockpiles on and covering soil stockpiles and/or open excavations with 6-mil polyethylene sheeting; decontaminating equipment used for soil excavation/sampling; providing erosion and sedimentation controls in accordance with Section 7.1.3; and the use of odor-controlling spray foam, as warranted. In addition to the Site control measures listed above, a CAMP will be implemented during all intrusive activities. The CAMP is located in Appendix B and includes perimeter monitoring of dust and organic vapors. The CAMP includes screening levels, and a response plan that is consistent with the NYSDOH CAMP requirements. These measures will be employed according to the requirements of all applicable or relevant and appropriate Federal, State and local laws.

7.8 Remedial Performance Evaluation

Post-excavation endpoint soil samples will be collected to evaluate the effectiveness of excavation as the chosen soil remedial method. This Section includes the methods to be implemented for soil sample collection.

7.8.1 End-Point Sampling Frequency

Per NYSDEC DER-10 Section 5.4, side-wall samples will be collected a minimum one sample for every 30 linear feet and bottom samples will be collected at a frequency of one every 900 SF.

7.8.2 Methodology

Each endpoint sample collected from the excavation will be analyzed for Target Compound List (TCL) VOCs by EPA Method 8260D, TCL SVOCs by EPA Method 8270E, PCBs by EPA Method 8082A, TCL pesticides by EPA Method 8081B, herbicides by EPA Method 8151A, TAL metals by EPA Method 6000/7000 series, PFAS/PFOA by EPA Method 1633 and 1,4-dioxane by EPA method 8270 SIM isotope dilution. Samples will be shipped to the laboratory with appropriate chain of custody documentation. The samples will be analyzed in a laboratory following NYSDOH ASP Category B deliverables.

7.8.3 Quality Assurance/Quality Control (QA/QC)

Measures will be taken to provide for QA and maintain QC of environmental sampling and remedial activities conducted under the IRMWP. A QAPP that describes the QA/QC protocols and procedures that will be followed during implementation of the IRM is included in Appendix C. Adherence to the QAPP will ensure that defensible data will be obtained during the implementation of the IRM. The QAPP will be submitted to NYSDEC as a separate standalone report for approval.

7.8.4 Data Usability Summary Reports

A DUSR will be prepared for all laboratory analytical results, which will be prepared by a third-party validator.

7.9 Decontamination

Sampling equipment (hand auger, shovels, etc.) will be either dedicated or decontaminated between sampling locations. The decontamination procedure will be as follows:

1. Scrub using tap water/Simple Green® mixture and bristle brush.
2. Rinse with tap water.
3. Scrub again with tap water/ Simple Green® and bristle brush.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air-dry the equipment, if possible.

Excavation equipment including the excavator bucket will be decontaminated prior to being mobilized off-Site by steam cleaning using a tap water/Simple Green® solution. Decontamination of all equipment will be conducted on plastic sheeting (or equivalent) that is bermed to prevent discharge to the ground.

7.10 Materials Load Out

A qualified environmental professional or person under his/her supervision will oversee all load-out of all contaminated excavated material for off-site disposal. The owner of the property and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan. Loaded vehicles leaving the Site will be appropriately lined, hard-tarped, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements). The qualified environmental professional will be responsible for ensuring that all egress points for vehicle and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities.

7.11 Materials Transport Off-Site

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded. Material transported by trucks exiting the Site will be covered with a tight-fitting tarp. Loose-fitting canvas-type truck covers will be prohibited. Proposed in-bound and out-bound trucks will travel the most appropriate route and take into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) limiting total distance to major highways; (d) promoting safety in access to highways; and (e) overall safety in transport. Trucks will be prohibited from stopping and idling in the residential neighborhoods outside of the Site. To the extent possible, queuing of trucks will be performed on-Site to minimize off-Site disturbance.

7.12 Materials Disposal Off-Site

Disposal locations will be established at a later date and will be reported to the NYSDEC Project Manager prior to removal of material from the Site. Each stockpile or in-situ soil will be sampled for waste characterization purposes in accordance with the disposal facility requirements.

1. All excavated soil and fill material that is removed from the Site will be treated as regulated material and will be disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility). Non-hazardous historic fill and contaminated soil taken off-Site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2.
2. Non-hazardous and hazardous soil/fill determination will be decided upon completion of sampling performed during the waste characterization activities and in discussion with NYSDEC.

The following documentation will be obtained by the QEP (under supervision of the Remedial Engineer) for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws: (1) a letter from the QEP or BCP Volunteer to the receiving facility describing the material to be disposed of and requesting formal written acceptance of the material. This letter will state that material to be disposed of is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the QEP. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from the receiving facility stating it is in receipt of the correspondence (above) and is approved to accept the material.

7.13 Materials Reuse On-Site

It is anticipated that all soil excavated as part of the IRM will be disposed of off-site. In the event that non-hazardous material is proposed for potential on-site reuse, it will be managed in accordance with protocols in this section.

Contaminated soil, or any material in direct contact with the contaminated soil, may not be separated for reuse on-site and will be disposed of as described in Section 7.12. Organic matter (wood, roots, stumps, etc.) or other solid is prohibited for reuse on-site. Any demolished material from the existing vacant buildings, including the concrete slabs, and the existing asphalt, will be disposed of in accordance with all prevailing Federal, State, and local regulations. Soil that does not exhibit evidence of contamination during field screening, as described in Section 7.3 and is free of debris will be stockpiled and tested at a frequency of one sample per 500 cubic yards and characterized for reuse below the Site cap. Each sample will be tested for TCL VOCs by EPA Method 8260, TCL SVOCs by EPA Method 8270, PCBs by EPA Method 8082, pesticides by EPA Method 8081, TAL metals by EPA Method 6000/7000 series, and PFAS by EPA Method

1633. Samples will be shipped to the laboratory with appropriate chain of custody documentation. The samples will be analyzed in a laboratory following NYSDOH ASP Category B deliverables. Soil from representative samples that meet the lower or RRSCOs and PGWSCOs (CVOCs only) can be reused on-site and below the Site cap as backfill. Soil designated for reuse as part of the Site cap will be tested in accordance with the sampling protocol described in Section 7.14. All sampling of materials for potential reuse will be conducted in accordance with the QAPP included in Appendix C (to be submitted as a separate standalone report).

7.14 Backfill from Off-Site Sources

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated properties will not be imported to the Site. All imported soil will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d). Approval will also be based on an evaluation of the land use, protection of groundwater, and protection of ecological resources criteria. Soil will be considered appropriate for use as on-Site imported backfill if contaminant concentrations are below the lesser of the 6 NYCRR Part 375 Restricted Residential and Protection of Groundwater SCOs. Soil that meet ‘exempt’ fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Native material from a New York State Department of Transportation (NYSDOT) designated virgin quarry source will not be sampled prior to use as backfill on the Site. Non-DOT designated virgin quarry sources, or non-virgin imported material that does not have an approved NYSDEC Beneficial Use Determination will be tested at the originating facility in accordance with Section 5.4(e) 10 of NYSDEC DER 10, and at a frequency indicated by the following table:

<table>
<tr><th colspan="4">NYSDEC DER-10 Table 5.4(e) 10
Recommended Number of Soil Samples for Soil Imported To or Exported From a Site</th></tr>
<tr><td></td><td>VOCs (EPA Method 8260)</td><td colspan="2">SVOCs (EPA Method 8270), Inorganics (EPA Method 600/7000 Series & PCBs/Pesticides (EPA Methods 8082/8081)</td></tr>
<tr><td>Soil Quantity (cubic yards)</td><td>Discrete Samples</td><td>Composite Samples</td><td>Composite Sample Protocol</td></tr>
<tr><td>0-50</td><td>1</td><td>1</td><td rowspan="8">3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis</td></tr>
<tr><td>50-100</td><td>2</td><td>1</td></tr>
<tr><td>100-200</td><td>3</td><td>1</td></tr>
<tr><td>200-300</td><td>4</td><td>1</td></tr>
<tr><td>300-400</td><td>4</td><td>2</td></tr>
<tr><td>400-500</td><td>5</td><td>2</td></tr>
<tr><td>500-800</td><td>6</td><td>2</td></tr>
<tr><td>800-1,000</td><td>7</td><td>2</td></tr>
<tr><td>>1,000</td><td colspan="3">Add an additional 2 VOC and 1 composite for each additional 1,000 cubic yards or consult with NYSDEC</td></tr>
</table>

After compliance with the above import criteria is established for a specific source, adjustment of the sampling frequency may be requested by the NYSDEC.

Samples will be analyzed for VOCs using EPA Method 8260, SVOCs using EPA Method 8270, TAL metals using EPA Method 6000/7000 series, PCBs using EPA Method 8082, pesticides using EPA Method 8081, and PFAS using EPA Method 1633. All sampling of imported backfill will be conducted in accordance with the QAPP included in Appendix C (to be submitted as a separate standalone report).

All sampling data and source information will be submitted to NYSDEC for review and approval prior to importing backfill to the site.

7.15 Odor, Particulate, and Nuisance Controls

Odor Controls

Specific odor control methods to be used during implementation of the IRM will include the use of a PID to screen for VOCs and olfactory observations by a field technician. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. The NYSDEC and NYSDOH project managers will be notified of all odor events and of any other complaints about the project.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps or covers; and (c) using foams to cover exposed odorous soil. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

Particulate Controls

Particulate management during invasive on-site work will include, at a minimum, the items listed below and is further detailed in the Site-specific CAMP, included in Appendix B:

- Site fencing will be adequately constructed of plywood and/or chain-link fencing with a mesh fabric fence screen as an engineering control to help contain dust and debris during remedial activities.
- Particulate suppression will be achieved through the use of a dedicated hose connected to a fire hydrant. The hose will be equipped with a nozzle capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of the Sites will be done in stages to limit the area of exposed, non-vegetated soils vulnerable to airborne particulate production.
- Crushed stone will be used on on-site roadways to provide a clean and dust-free road surface.

- On-site roads will be limited in total area to minimize the area required for water spraying.

Other Nuisances

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing, and during all remedial work.

7.16 Site Restoration

The IRM is being conducted as the initial phase of Site remediation. After the IRM has been completed, excavation may continue for construction of foundation elements and surrounding Site cap. Any additional excavation, backfilling and site restoration work will be conducted in accordance with the NYSDEC-approved BCP Remedial Action Work Plan (RAWP). Complete details for Site restoration and final construction layout will be included in the RAWP.

8.0 REPORTING REQUIREMENTS

8.1 Interim Remedial Measures Construction Completion Report (CCR)

Upon completion of all field work and receipt of laboratory analytical results, a CCR will be prepared that will: document field activities, present field and laboratory data, and discuss conclusions and recommendations drawn from the results of the IRM in accordance with DER-10. Endpoint sampling analytical reports and DUSRs will be included in the final report. Electronic Data Deliverables (EDDs) will be submitted to NYSDEC.

8.1.1 IRM Field Activities

This section of the CCR will describe the field methods used to monitor/document the soil removal activities during the IRM excavation. The methods will include, but not be limited to oversight and sampling techniques; field screening equipment and screening methods.

8.1.2 IRM Excavation Activities

This section of the CCR will describe the field methods used to oversee and direct the IRM excavation. The methods will include, but not be limited to oversight, field screening, equipment and screening methods; excavation equipment; all soil handling activities, soil import and export, and soil endpoint sampling.

8.1.3 IRM Excavation Soil Endpoint Assessment

This section will include a description of field and laboratory data for soil screening and laboratory analysis results, which will be supported by tabulated data in the form of attached tables, and Site figures that will illustrate endpoint sample locations and laboratory results (spider maps). Field and laboratory analytical results will be compared to regulatory standards and/or guidance values. Laboratory analytical reports will be provided as attachments. The endpoint sample tables and figures included in the CCR also will be presented in the Final Engineer Report for the project to demonstrate achievement of the SCOs established in the RAWP.

8.1.4 IRM Off-Site Indoor Air Mitigation Activities

This section of the CCR will describe the field methods used to oversee and implement the indoor air mitigation IRM at the north-adjacent residence. The methods will include, but not be limited to oversight of air filter installation, field screening of indoor air, equipment and screening methods; and documentation of air filter replacements.

8.1.5 Results and Conclusions

The CCR will include an analysis of the data compiled during the IRM excavation and IRM off-site air mitigation. Conclusions regarding the effectiveness of the IRM will be presented along with recommendations for additional work (if any).

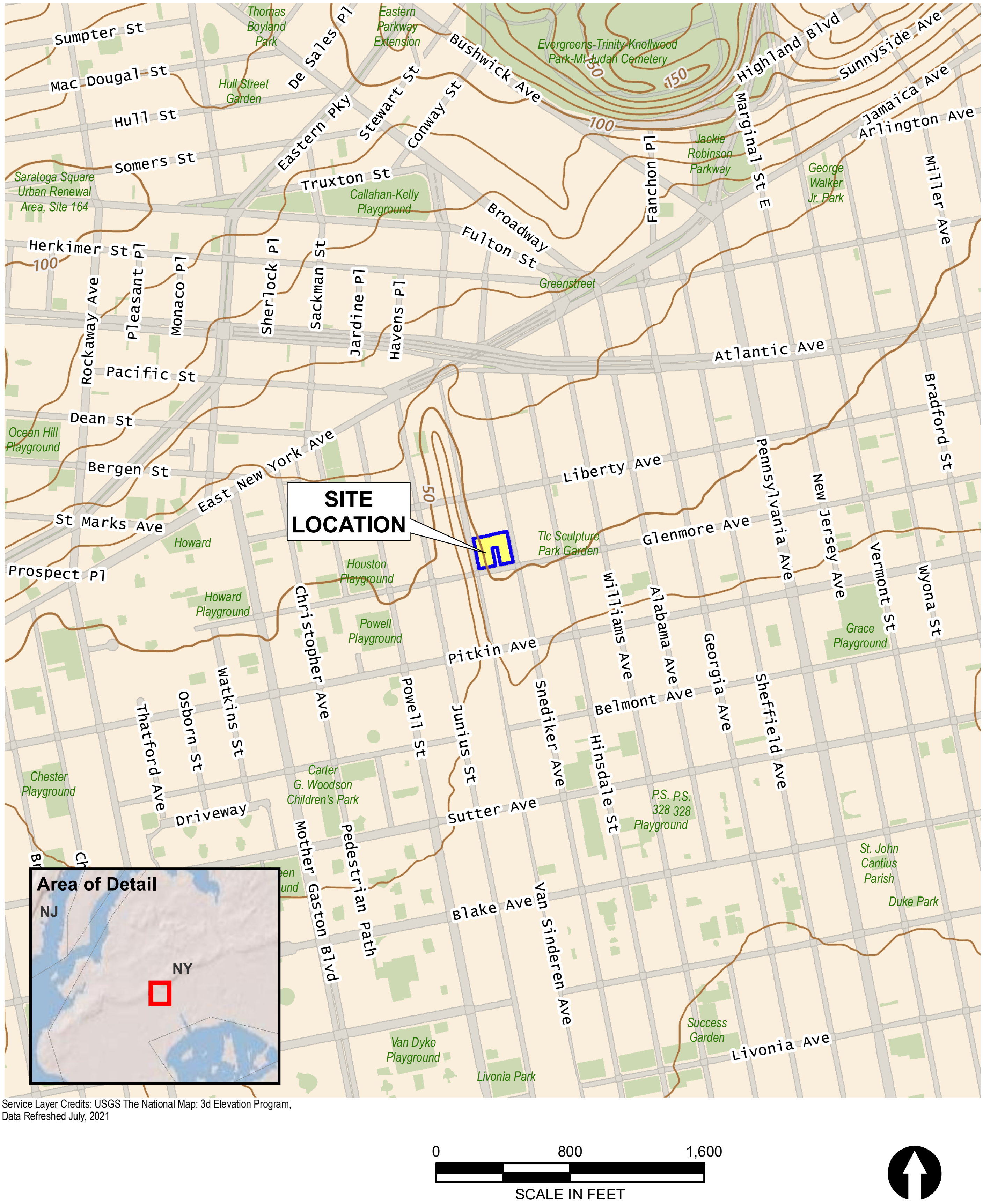
9.0 SCHEDULE OF WORK

The following tentative schedule has been developed for the project:

Table 1
Proposed IRM Schedule

Task	Date
Execution of the Brownfield Cleanup Agreement	May 2023
Approval of Citizen Participation Plan	May 2023
Asbestos Abatement of Site Buildings	May 2023
NYSDEC Approval of IRM Work Plan	June 2023
Demolition of Site Buildings	June-September 2023
Initiate IRM – Indoor Air Mitigation	June 2023
Initiate IRM – Excavation	September/October 2023
RAWP Approval and Issuance of Decision Document	September 2023
Submit IRM Construction Completion Report	March 2024
Submit Environmental Easement	By June 1, 2024
Submit Draft Site Management Plan	August 1, 2024
Submit Draft Final Engineering Report	October 1, 2024
Issue Certificate of Completion	By December 31, 2024

FIGURES



Service Layer Credits: USGS The National Map: 3d Elevation Program, Data Refreshed July, 2021

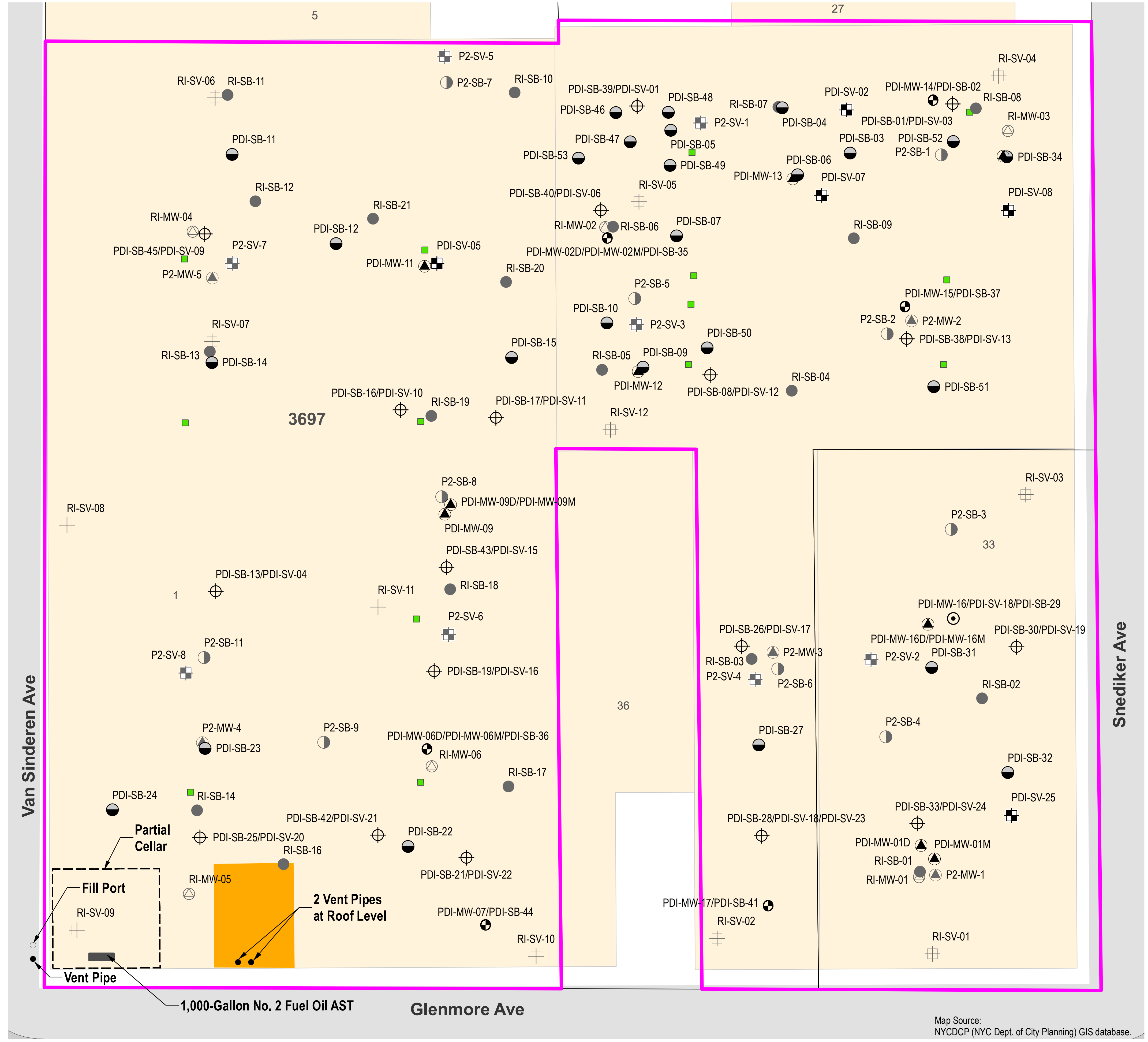
AKRF
440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site
221-241 Glenmore Avenue
Brooklyn, New York

SITE LOCATION

DATE	**12/28/2022**
PROJECT NO.	**220249**
FIGURE	**1**

©2022 AKRF Q:\Projects\220249 - 221 GLENMORE AVENUE\Technical\GIS and Graphics\SAR\RMWP\220249 Fig 1 Site Location.mxd12/28/2022 6:42:08 PM mveilleux



Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.

LEGEND

▲ PDI GROUNDWATER MONITORING WELL LOCATION (FEBRUARY TO APRIL 2023)

● PDI GROUNDWATER MONITORING WELL/SOIL BORING LOCATION (FEBRUARY TO APRIL 2023)

⊙ PDI GROUNDWATER MONITORING WELL/SOIL VAPOR POINT/SOIL BORING LOCATION (FEBRUARY TO APRIL 2023)

◒ PDI SOIL BORING LOCATION (FEBRUARY TO APRIL 2023)

⊕ PDI SOIL BORING/SOIL VAPOR POINT LOCATION (FEBRUARY TO APRIL 2023)

▣ PDI SOIL VAPOR POINT LOCATION (FEBRUARY TO APRIL 2023)

▲ PHASE II GROUNDWATER MONITORING WELL LOCATION (MAY 2022)

◐ PHASE II SOIL BORING LOCATION (MAY 2022)

▣ PHASE II SOIL VAPOR POINT LOCATION (MAY 2022)

△ REMEDIAL INVESTIGATION GROUNDWATER MONITORING WELL LOCATION (OCTOBER 2022)

● REMEDIAL INVESTIGATION SOIL BORING LOCATION (OCTOBER 2022)

⊕ REMEDIAL INVESTIGATION SOIL VAPOR POINT LOCATION (OCTOBER 2022)

🟧 GEOPHYSICAL RADAR ANOMALY (POTENTIAL UST AREA)

☐ PROJECT SITE BOUNDARY

1 LOT BOUNDARY AND TAX LOT NUMBER

3697 BLOCK NUMBER

☐ BUILDING

🟩 FLOOR DRAIN

0 20 40

SCALE IN FEET

AKRF

440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site

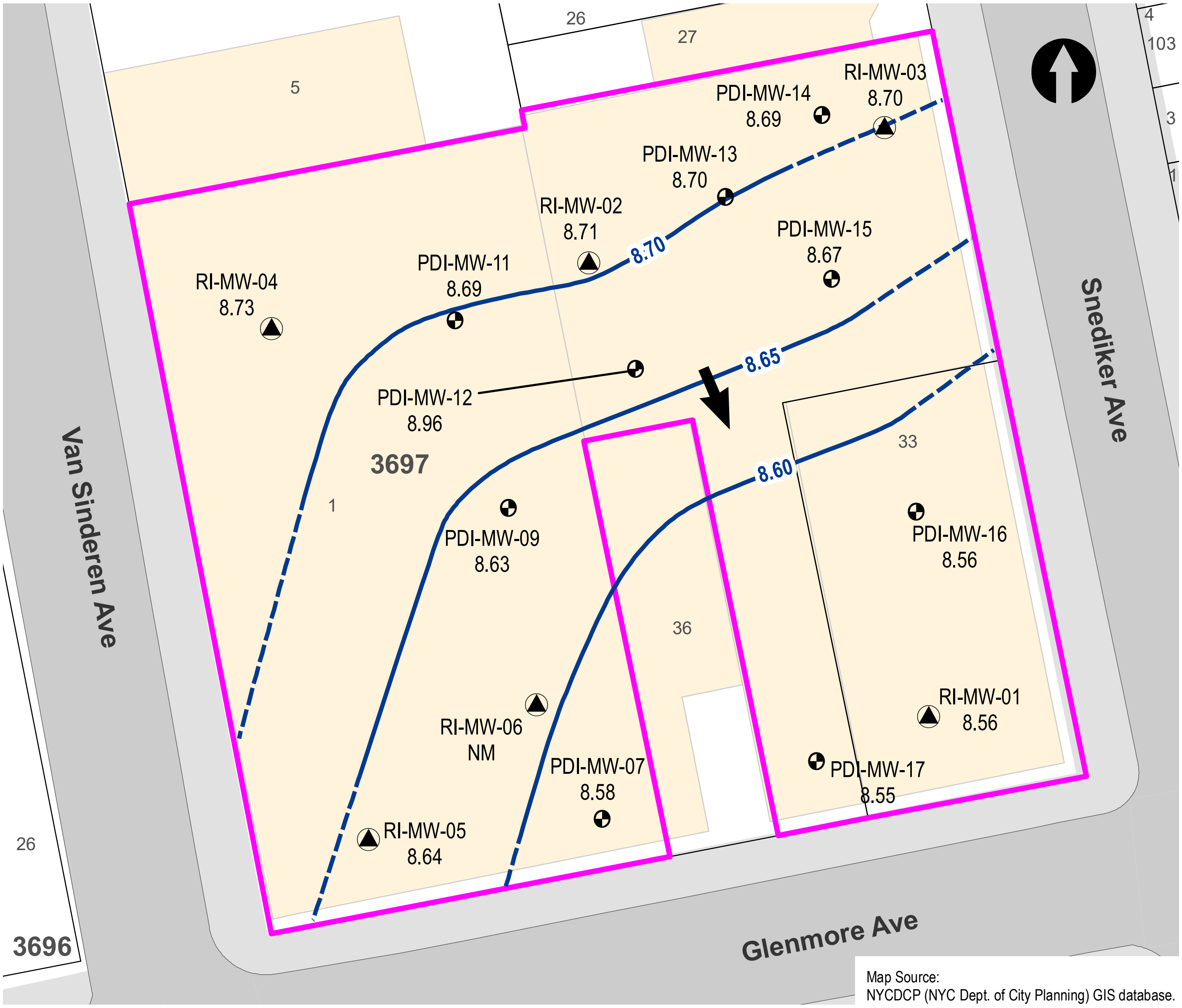
221-241 Glenmore Avenue
Brooklyn, New York

SITE PLAN AND SAMPLE LOCATIONS

DATE
5/10/2023

PROJECT NO.
220249

FIGURE
2



Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.

LEGEND

▭	PROJECT SITE BOUNDARY
1	LOT BOUNDARY AND TAX LOT NUMBER
3697	BLOCK NUMBER
▨	BUILDING
◍	PDI GROUNDWATER MONITORING WELL LOCATION (FEBRUARY TO APRIL 2023)
▲	REMEDIAL INVESTIGATION GROUNDWATER MONITORING WELL LOCATION (OCTOBER 2022)
—	GROUNDWATER ELEVATION CONTOUR LINE (DASHED WHERE INFERRED)
↓	GROUNDWATER FLOW DIRECTION

0 40 80
SCALE IN FEET

Monitor Well ID	Top of Casing (TOC) (feet elevation)	Water Table (feet below TOC) 4/6/2023	Groundwater Elevation (feet elevation) 4/6/2023
RI-MW-01	49.68	41.12	8.56
RI-MW-02	51.35	42.64	8.71
RI-MW-03	51.33	42.63	8.70
RI-MW-04	51.67	42.94	8.73
RI-MW-05	51.14	42.50	8.64
RI-MW-06	50.83	NM	NM
PDI-MW-07	50.86	42.28	8.58
PDI-MW-09	51.26	42.63	8.63
PDI-MW-11	50.85	42.16	8.69
PDI-MW-12	51.12	42.16	8.96
PDI-MW-13	51.24	42.54	8.70
PDI-MW-14	51.23	42.54	8.69
PDI-MW-15	51.40	42.73	8.67
PDI-MW-16	50.47	41.91	8.56
PDI-MW-17	49.90	41.35	8.55

Notes:
Surveyed elevations refer to NAVD 1988.
TOC - Top of Casing
NM - Not Measured

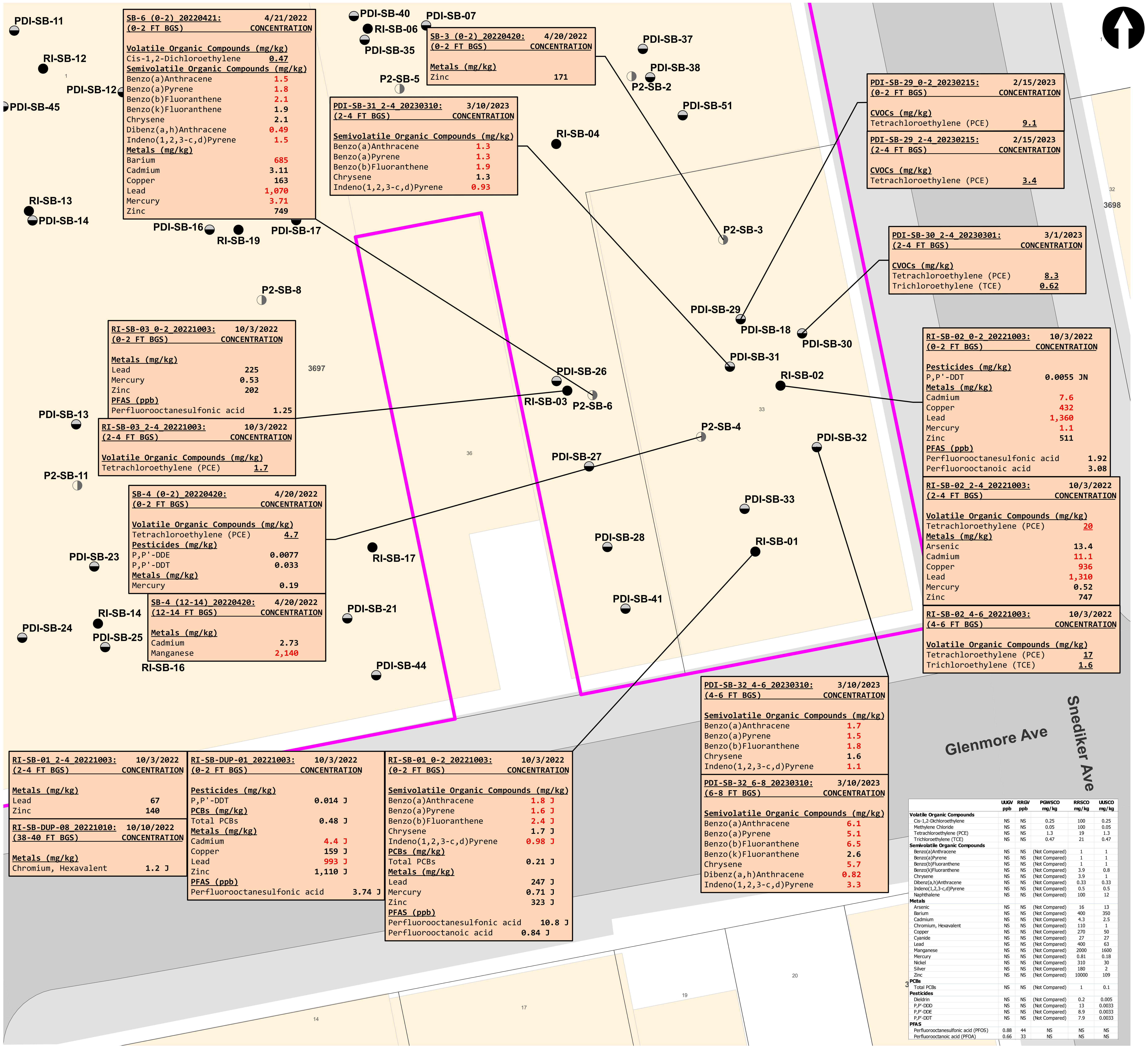
Notes:
1. Phase II monitoring well elevations were not utilized in the groundwater contour due to varying well construction details and well diameters.
2. PDI-MW-12 not used to generate this groundwater elevation contour map.

AKRF
440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site
221-241 Glenmore Avenue
Brooklyn, New York

SHALLOW GROUNDWATER ELEVATION CONTOUR MAP
APRIL 6, 2023

DATE
5/30/2023
PROJECT NO.
220249
FIGURE
3



SB-6 (0-2)_20220421: (0-2 FT BGS)	4/21/2022 CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Cis-1,2-Dichloroethylene	0.47
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	1.5
Benzo(a)Pyrene	1.8
Benzo(b)Fluoranthene	2.1
Benzo(k)Fluoranthene	1.9
Chrysene	2.1
Dibenz(a,h)Anthracene	0.49
Indeno(1,2,3-c,d)Pyrene	1.5
Metals (mg/kg)	
Barium	685
Cadmium	3.11
Copper	163
Lead	1,070
Mercury	3.71
Zinc	749

SB-3 (0-2)_20220420: (0-2 FT BGS)	4/20/2022 CONCENTRATION
Metals (mg/kg)	
Zinc	171

PDI-SB-31_2-4_20230310: (2-4 FT BGS)	3/10/2023 CONCENTRATION
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	1.3
Benzo(a)Pyrene	1.3
Benzo(b)Fluoranthene	1.9
Chrysene	1.3
Indeno(1,2,3-c,d)Pyrene	0.93

PDI-SB-29_0-2_20230215: (0-2 FT BGS)	2/15/2023 CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	9.1

PDI-SB-29_2-4_20230215: (2-4 FT BGS)	2/15/2023 CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	3.4

PDI-SB-30_2-4_20230301: (2-4 FT BGS)	3/1/2023 CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	8.3
Trichloroethylene (TCE)	0.62

RI-SB-03_0-2_20221003: (0-2 FT BGS)	10/3/2022 CONCENTRATION
Metals (mg/kg)	
Lead	225
Mercury	0.53
Zinc	202
PFAS (ppb)	
Perfluorooctanesulfonic acid	1.25

RI-SB-03_2-4_20221003: (2-4 FT BGS)	10/3/2022 CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	1.7

SB-4 (0-2)_20220420: (0-2 FT BGS)	4/20/2022 CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	4.7
Pesticides (mg/kg)	
P,P'-DDE	0.0077
P,P'-DDT	0.033
Metals (mg/kg)	
Mercury	0.19

SB-4 (12-14)_20220420: (12-14 FT BGS)	4/20/2022 CONCENTRATION
Metals (mg/kg)	
Cadmium	2.73
Manganese	2,140

RI-SB-02_0-2_20221003: (0-2 FT BGS)	10/3/2022 CONCENTRATION
Pesticides (mg/kg)	
P,P'-DDT	0.0055 JN
Metals (mg/kg)	
Cadmium	7.6
Copper	432
Lead	1,360
Mercury	1.1
Zinc	511
PFAS (ppb)	
Perfluorooctanesulfonic acid	1.92
Perfluorooctanoic acid	3.08

RI-SB-02_2-4_20221003: (2-4 FT BGS)	10/3/2022 CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	20
Metals (mg/kg)	
Arsenic	13.4
Cadmium	11.1
Copper	936
Lead	1,310
Mercury	0.52
Zinc	747

RI-SB-02_4-6_20221003: (4-6 FT BGS)	10/3/2022 CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	17
Trichloroethylene (TCE)	1.6

PDI-SB-32_4-6_20230310: (4-6 FT BGS)	3/10/2023 CONCENTRATION
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	1.7
Benzo(a)Pyrene	1.5
Benzo(b)Fluoranthene	1.8
Chrysene	1.6
Indeno(1,2,3-c,d)Pyrene	1.1

PDI-SB-32_6-8_20230310: (6-8 FT BGS)	3/10/2023 CONCENTRATION
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	6.1
Benzo(a)Pyrene	5.1
Benzo(b)Fluoranthene	6.5
Benzo(k)Fluoranthene	2.6
Chrysene	5.7
Dibenz(a,h)Anthracene	0.82
Indeno(1,2,3-c,d)Pyrene	3.3

RI-SB-01_2-4_20221003: (2-4 FT BGS)	10/3/2022 CONCENTRATION
Metals (mg/kg)	
Lead	67
Zinc	140

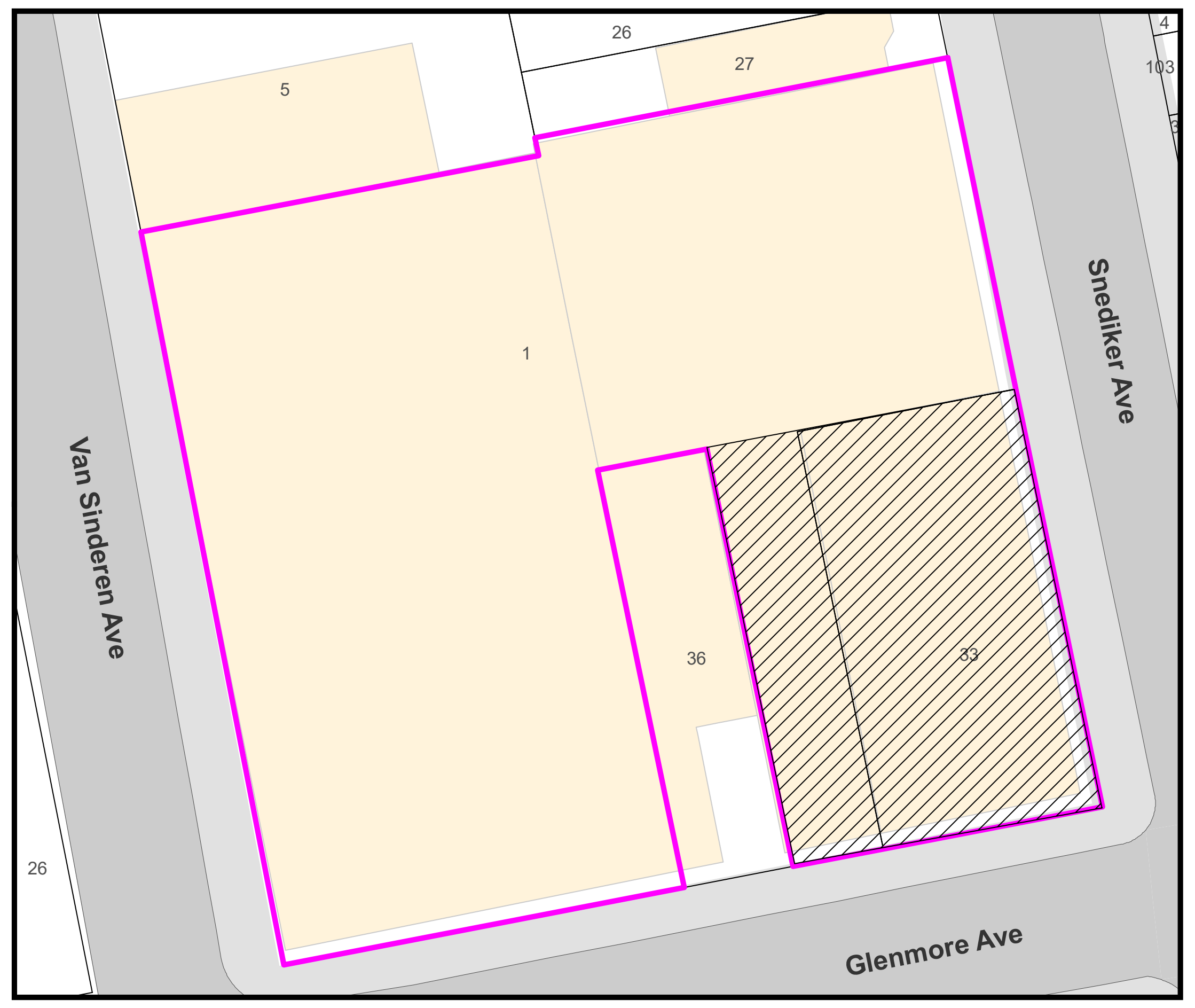
RI-SB-DUP-08_20221010: (38-40 FT BGS)	10/10/2022 CONCENTRATION
Metals (mg/kg)	
Chromium, Hexavalent	1.2 J

RI-SB-DUP-01_20221003: (0-2 FT BGS)	10/3/2022 CONCENTRATION
Pesticides (mg/kg)	
P,P'-DDT	0.014 J
PCBs (mg/kg)	
Total PCBs	0.48 J
Metals (mg/kg)	
Cadmium	4.4 J
Copper	159 J
Lead	993 J
Zinc	1,110 J
PFAS (ppb)	
Perfluorooctanesulfonic acid	3.74 J

RI-SB-01_0-2_20221003: (0-2 FT BGS)	10/3/2022 CONCENTRATION
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	1.8 J
Benzo(a)Pyrene	1.6 J
Benzo(b)Fluoranthene	2.4 J
Chrysene	1.7 J
Indeno(1,2,3-c,d)Pyrene	0.98 J
PCBs (mg/kg)	
Total PCBs	0.21 J
Metals (mg/kg)	
Lead	247 J
Mercury	0.71 J
Zinc	323 J
PFAS (ppb)	
Perfluorooctanesulfonic acid	10.8 J
Perfluorooctanoic acid	0.84 J

	UUGV ppb	RRGV ppb	PGWSCO mg/kg	RRSCO mg/kg	UUSCO mg/kg
Volatile Organic Compounds					
Cis-1,2-Dichloroethylene	NS	NS	0.25	100	0.25
Methylene Chloride	NS	NS	0.05	100	0.05
Tetrachloroethylene (PCE)	NS	NS	1.3	19	1.3
Trichloroethylene (TCE)	NS	NS	0.47	21	0.47
Semivolatile Organic Compounds					
Benzo(a)Anthracene	NS	NS	(Not Compared)	1	1
Benzo(a)Pyrene	NS	NS	(Not Compared)	1	1
Benzo(b)Fluoranthene	NS	NS	(Not Compared)	1	1
Benzo(k)Fluoranthene	NS	NS	(Not Compared)	3.9	0.8
Chrysene	NS	NS	(Not Compared)	3.9	1
Dibenz(a,h)Anthracene	NS	NS	(Not Compared)	0.33	0.33
Indeno(1,2,3-c,d)Pyrene	NS	NS	(Not Compared)	0.5	0.5
Naphthalene	NS	NS	(Not Compared)	100	12
Metals					
Arsenic	NS	NS	(Not Compared)	16	13
Barium	NS	NS	(Not Compared)	400	350
Cadmium	NS	NS	(Not Compared)	4.3	2.5
Chromium, Hexavalent	NS	NS	(Not Compared)	110	1
Copper	NS	NS	(Not Compared)	270	50
Cyanide	NS	NS	(Not Compared)	27	27
Lead	NS	NS	(Not Compared)	400	63
Manganese	NS	NS	(Not Compared)	2000	1600
Mercury	NS	NS	(Not Compared)	0.81	0.18
Nickel	NS	NS	(Not Compared)	310	30
Silver	NS	NS	(Not Compared)	180	2
Zinc	NS	NS	(Not Compared)	10000	109
PCBs					
Total PCBs	NS	NS	(Not Compared)	1	0.1
Pesticides					
Dieldrin	NS	NS	(Not Compared)	0.2	0.005
P,P'-DDD	NS	NS	(Not Compared)	13	0.0033
P,P'-DDE	NS	NS	(Not Compared)	8.9	0.0033
P,P'-DDT	NS	NS	(Not Compared)	7.9	0.0033
PFAS					
Perfluorooctanesulfonic acid (PFOS)	0.88	44	NS	NS	NS
Perfluorooctanoic acid (PFOA)	0.66	33	NS	NS	NS

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.



KEY MAP

Scale: 1" = 40'

LEGEND

▭	PROJECT SITE BOUNDARY
1	LOT BOUNDARY AND TAX LOT NUMBER
3697	BLOCK NUMBER
▭	BUILDING
◒	PDI SOIL BORING LOCATION (FEBRUARY TO APRIL 2023)
●	REMEDIAL INVESTIGATION SOIL BORING LOCATION (OCTOBER 2022)
◑	PHASE II SOIL BORING LOCATION (MAY 2022)

Part 375 Soil Cleanup Objectives (SCOs): SCOs listed in the New York State Department of Environmental Conservation (NYSDEC) "Part 375" Regulations (6 NYCRR Part 375).

Exceedances of NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs) are presented in bold font.

Exceedances of NYSDEC Restricted Residential Soil Cleanup Objectives (RRSCOs) are presented in red.

Exceedances of NYSDEC Protected Groundwater Soil Cleanup Objectives (PGWSCOs) are presented in underline.
*Note: PGWSCO comparison was performed for chlorinated VOCs only

mg/kg:milligrams per kilogram = parts per million (ppm)
µg/kg: micrograms per kilogram = parts per billion (ppb)
J: The concentration given is an estimated value.
N: Indicates presumptive evidence of a compound
D: Indicates an identified compound in an analysis that has been diluted
NS: No Standard

Sample ID — Sample Date

SB-2 (0-2)_20220509: (0-2 FT BGS)	5/9/2022 CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	16
Trichloroethylene (TCE)	0.75

Analyte/Compound — Concentration

0 10 20
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site
221-241 Glenmore Avenue
Brooklyn, New York

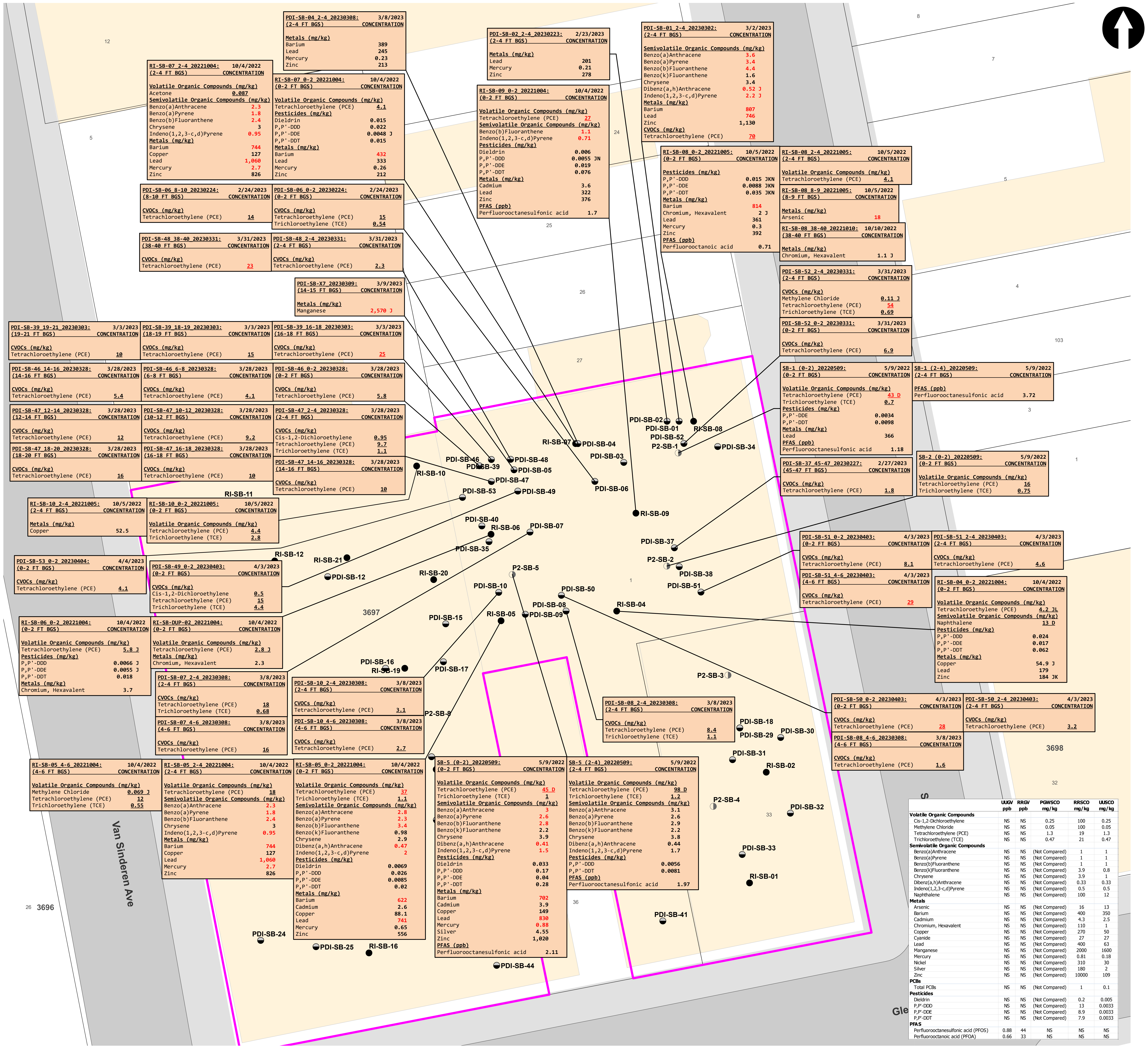
PHASE II, REMEDIAL INVESTIGATION, AND PSRI SOIL CONCENTRATIONS ABOVE NYSDEC UUSCOS, RRSCOS, AND PGWSCOS

DATE
05/11/2023

PROJECT NO.
220249

FIGURE
4A

©2023 AKRF Q:\Projects\220249 - 221 GLENMORE AVENUE\Technical\GIS and Graphics\SAR\RIR Update\220249 Fig 5A Ph 2, RI, PDI Soil Concentrations Above NYSDEC UUSCOs, RRSCOs, and PGWSCOs.mxd5/10/2023 3:22:40 PM mrwilleux



PDI-SB-04_2-4_20230308:	3/8/2023
(2-4 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Barium	389
Lead	245
Mercury	0.23
Zinc	213

RI-SB-07_2-4_20221004:	10/4/2022
(2-4 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Acetone	0.087
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	2.3
Benzo(a)Pyrene	1.8
Benzo(b)Fluoranthene	2.4
Chrysene	3
Indeno(1,2,3-c,d)Pyrene	0.95
Metals (mg/kg)	
Barium	744
Copper	127
Lead	1,060
Mercury	2.7
Zinc	826

RI-SB-07_0-2_20221004:	10/4/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	4.1
Pesticides (mg/kg)	
Dieldrin	0.015
P,P'-DDD	0.022
P,P'-DDE	0.0048 J
P,P'-DDT	0.015
Metals (mg/kg)	
Barium	432
Lead	333
Mercury	0.26
Zinc	212

PDI-SB-02_2-4_20230223:	2/23/2023
(2-4 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Lead	201
Mercury	0.21
Zinc	278

RI-SB-09_0-2_20221004:	10/4/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	27
Semivolatile Organic Compounds (mg/kg)	
Benzo(b)Fluoranthene	1.1
Indeno(1,2,3-c,d)Pyrene	0.71
Pesticides (mg/kg)	
Dieldrin	0.006
P,P'-DDD	0.0055 JN
P,P'-DDE	0.019
P,P'-DDT	0.076
Metals (mg/kg)	
Cadmium	3.6
Lead	322
Zinc	376
PFAS (ppb)	
Perfluorooctanesulfonic acid	1.7

PDI-SB-01_2-4_20230302:	3/2/2023
(2-4 FT BGS)	CONCENTRATION
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	3.6
Benzo(a)Pyrene	3.4
Benzo(b)Fluoranthene	4.4
Benzo(k)Fluoranthene	1.6
Chrysene	3.4
Dibenz(a,h)Anthracene	0.52 J
Indeno(1,2,3-c,d)Pyrene	2.2 J
Metals (mg/kg)	
Barium	807
Lead	746
Zinc	1,130
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	70

RI-SB-08_0-2_20221005:	10/5/2022
(0-2 FT BGS)	CONCENTRATION
Pesticides (mg/kg)	
P,P'-DDD	0.015 JKN
P,P'-DDE	0.0088 JKN
P,P'-DDT	0.035 JKN
Metals (mg/kg)	
Barium	814
Chromium, Hexavalent	2 J
Lead	361
Mercury	0.3
Zinc	392
PFAS (ppb)	
Perfluorooctanoic acid	0.71

RI-SB-08_2-4_20221005:	10/5/2022
(2-4 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	4.1

RI-SB-08_8-9_20221005:	10/5/2022
(8-9 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Arsenic	18

RI-SB-08_38-40_20221010:	10/10/2022
(38-40 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Chromium, Hexavalent	1.1 J

PDI-SB-06_8-10_20230224:	2/24/2023
(8-10 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	14

PDI-SB-06_0-2_20230224:	2/24/2023
(0-2 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	15
Trichloroethylene (TCE)	0.54

PDI-SB-48_38-40_20230331:	3/31/2023
(38-40 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	23

PDI-SB-48_2-4_20230331:	3/31/2023
(2-4 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	2.3

PDI-SB-52_2-4_20230331:	3/31/2023
(2-4 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Methylene Chloride	0.11 J
Tetrachloroethylene (PCE)	54
Trichloroethylene (TCE)	0.69

PDI-SB-X7_20230309:	3/9/2023
(14-15 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Manganese	2,570 J

PDI-SB-52_0-2_20230331:	3/31/2023
(0-2 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	6.9

PDI-SB-39_19-21_20230303:	3/3/2023
(19-21 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	10

PDI-SB-39_18-19_20230303:	3/3/2023
(18-19 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	15

PDI-SB-39_16-18_20230303:	3/3/2023
(16-18 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	25

SB-1 (0-2)_20220509:	5/9/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	43 D
Trichloroethylene (TCE)	0.7
Pesticides (mg/kg)	
P,P'-DDE	0.0034
P,P'-DDT	0.0098
Metals (mg/kg)	
Lead	366
PFAS (ppb)	
Perfluorooctanesulfonic acid	1.18

SB-1 (2-4)_20220509:	5/9/2022
(2-4 FT BGS)	CONCENTRATION
PFAS (ppb)	
Perfluorooctanesulfonic acid	3.72

PDI-SB-46_14-16_20230328:	3/28/2023
(14-16 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	5.4

PDI-SB-46_6-8_20230328:	3/28/2023
(6-8 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	4.1

PDI-SB-46_0-2_20230328:	3/28/2023
(0-2 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	5.8

PDI-SB-47_12-14_20230328:	3/28/2023
(12-14 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	12

PDI-SB-47_10-12_20230328:	3/28/2023
(10-12 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	9.2

PDI-SB-47_2-4_20230328:	3/28/2023
(2-4 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Cis-1,2-Dichloroethylene	0.95
Tetrachloroethylene (PCE)	9.7
Trichloroethylene (TCE)	1.1

PDI-SB-47_18-20_20230328:	3/28/2023
(18-20 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	16

PDI-SB-47_16-18_20230328:	3/28/2023
(16-18 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	10

PDI-SB-47_14-16_20230328:	3/28/2023
(14-16 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	10

PDI-SB-37_45-47_20230227:	2/27/2023
(45-47 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	1.8

SB-2 (0-2)_20220509:	5/9/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	16
Trichloroethylene (TCE)	0.75

RI-SB-10_2-4_20221005:	10/5/2022
(2-4 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Copper	52.5

RI-SB-10_0-2_20221005:	10/5/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	4.4
Trichloroethylene (TCE)	2.8

PDI-SB-51_0-2_20230403:	4/3/2023
(0-2 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	8.1

PDI-SB-51_2-4_20230403:	4/3/2023
(2-4 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	4.6

PDI-SB-53_0-2_20230404:	4/4/2023
(0-2 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	4.1

PDI-SB-49_0-2_20230403:	4/3/2023
(0-2 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Cis-1,2-Dichloroethylene	0.5
Tetrachloroethylene (PCE)	15
Trichloroethylene (TCE)	4.4

PDI-SB-51_4-6_20230403:	4/3/2023
(4-6 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	29

RI-SB-04_0-2_20221004:	10/4/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	4.2 JL
Semivolatile Organic Compounds (mg/kg)	
Naphthalene	13 D
Pesticides (mg/kg)	
P,P'-DDD	0.024
P,P'-DDE	0.017
P,P'-DDT	0.062
Metals (mg/kg)	
Copper	54.9 J
Lead	179
Zinc	184 JK

RI-SB-06_0-2_20221004:	10/4/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	5.8 J
Pesticides (mg/kg)	
P,P'-DDD	0.0066 J
P,P'-DDE	0.0055 J
P,P'-DDT	0.018
Metals (mg/kg)	
Chromium, Hexavalent	3.7

RI-SB-DUP-02_20221004:	10/4/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	2.8 J
Metals (mg/kg)	
Chromium, Hexavalent	2.3

PDI-SB-07_2-4_20230308:	3/8/2023
(2-4 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	18
Trichloroethylene (TCE)	0.68

PDI-SB-10_2-4_20230308:	3/8/2023
(2-4 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	3.1

PDI-SB-08_2-4_20230308:	3/8/2023
(2-4 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	8.4
Trichloroethylene (TCE)	1.1

PDI-SB-50_0-2_20230403:	4/3/2023
(0-2 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	28

PDI-SB-50_2-4_20230403:	4/3/2023
(2-4 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	3.2

PDI-SB-07_4-6_20230308:	3/8/2023
(4-6 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	16

PDI-SB-10_4-6_20230308:	3/8/2023
(4-6 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	2.7

PDI-SB-08_4-6_20230308:	3/8/2023
(4-6 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	1.6

RI-SB-05_4-6_20221004:	10/4/2022
(4-6 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Methylene Chloride	0.069 J
Tetrachloroethylene (PCE)	12
Trichloroethylene (TCE)	0.55

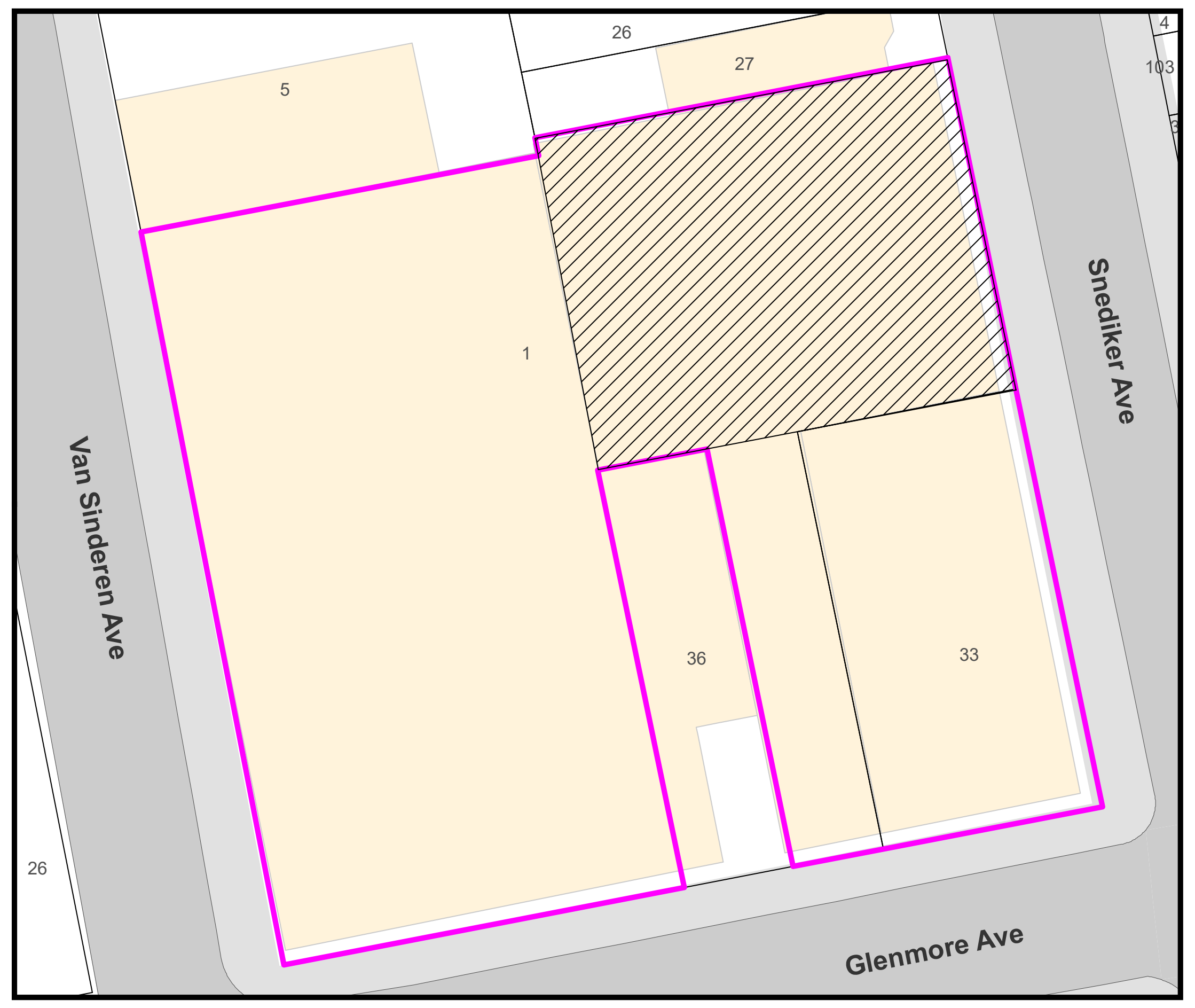
RI-SB-05_2-4_20221004:	10/4/2022
(2-4 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	18
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	2.3
Benzo(a)Pyrene	1.8
Benzo(b)Fluoranthene	2.4
Chrysene	3
Indeno(1,2,3-c,d)Pyrene	0.95
Metals (mg/kg)	
Barium	744
Copper	127
Lead	1,060
Mercury	2.7
Zinc	826

RI-SB-05_0-2_20221004:	10/4/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	37
Trichloroethylene (TCE)	1.1
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	2.8
Benzo(a)Pyrene	2.3
Benzo(b)Fluoranthene	3.4
Benzo(k)Fluoranthene	0.98
Chrysene	2.9
Dibenz(a,h)Anthracene	0.47
Indeno(1,2,3-c,d)Pyrene	2
Pesticides (mg/kg)	
Dieldrin	0.0069
P,P'-DDD	0.026
P,P'-DDE	0.0085
P,P'-DDT	0.02
Metals (mg/kg)	
Barium	622
Cadmium	2.6
Copper	88.1
Lead	741
Mercury	0.65
Zinc	556

SB-5 (0-2)_20220509:	5/9/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	45 D
Trichloroethylene (TCE)	1
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	3
Benzo(a)Pyrene	2.6
Benzo(b)Fluoranthene	2.8
Benzo(k)Fluoranthene	2.2
Chrysene	3.9
Dibenz(a,h)Anthracene	0.41
Indeno(1,2,3-c,d)Pyrene	1.5
Pesticides (mg/kg)	
Dieldrin	0.033
P,P'-DDD	0.17
P,P'-DDE	0.04
P,P'-DDT	0.28
Metals (mg/kg)	
Barium	702
Cadmium	3.9
Copper	149
Lead	830
Mercury	0.88
Silver	4.55
Zinc	1,020
PFAS (ppb)	
Perfluorooctanesulfonic acid	2.11

SB-5 (2-4)_20220509:	5/9/2022
(2-4 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	98 D
Trichloroethylene (TCE)	1.2
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	3.1
Benzo(a)Pyrene	2.6
Benzo(b)Fluoranthene	2.9
Benzo(k)Fluoranthene	2.2
Chrysene	3.8
Dibenz(a,h)Anthracene	0.44
Indeno(1,2,3-c,d)Pyrene	1.7
Pesticides (mg/kg)	
P,P'-DDD	0.0056
P,P'-DDT	0.0081
PFAS (ppb)	
Perfluorooctanesulfonic acid	1.97

	UUGV ppb	RRGV ppb	PGWSCO mg/kg	RRSCO mg/kg	UUSCO mg/kg
Volatile Organic Compounds					
Cis-1,2-Dichloroethylene	NS	NS	0.25	100	0.25
Methylene Chloride	NS	NS	0.05	100	0.05
Tetrachloroethylene (PCE)	NS	NS	1.3	19	1.3
Trichloroethylene (TCE)	NS	NS	0.47	21	0.47
Semivolatile Organic Compounds					
Benzo(a)Anthracene	NS	NS	(Not Compared)	1	1
Benzo(a)Pyrene	NS	NS	(Not Compared)	1	1
Benzo(b)Fluoranthene	NS	NS	(Not Compared)	1	1
Benzo(k)Fluoranthene	NS	NS	(Not Compared)	3.9	0.8
Chrysene	NS	NS	(Not Compared)	3.9	1
Dibenz(a,h)Anthracene	NS	NS	(Not Compared)	0.33	0.33
Indeno(1,2,3-c,d)Pyrene	NS	NS	(Not Compared)	0.5	0.5
Naphthalene	NS	NS	(Not Compared)	100	12
Metals					
Arsenic	NS	NS	(Not Compared)	16	13
Barium	NS	NS	(Not Compared)	400	350
Cadmium	NS	NS	(Not Compared)	4.3	2.5
Chromium, Hexavalent	NS	NS	(Not Compared)	110	1
Copper	NS	NS	(Not Compared)	270	50
Cyanide	NS	NS	(Not Compared)	27	27
Lead	NS	NS	(Not Compared)	400	63
Manganese	NS	NS	(Not Compared)	2000	1600
Mercury	NS	NS	(Not Compared)	0.81	0.18
Nickel	NS	NS	(Not Compared)	310	30
Silver	NS	NS	(Not Compared)	180	2
Zinc	NS	NS	(Not Compared)	10000	109
PCBs					
Total PCBs	NS	NS	(Not Compared)	1	0.1
Pesticides					
Dieldrin	NS	NS	(Not Compared)	0.2	0.005
P,P'-DDD	NS	NS	(Not Compared)	13	0.0033
P,P'-DDE	NS	NS	(Not Compared)	8.9	0.0033
P,P'-DDT	NS	NS	(Not Compared)	7.9	0.0033
PFAS					
Perfluorooctanesulfonic acid (PFOS)	0.88	44	NS	NS	NS
Perfluorooctanoic acid (PFOA)	0.66	33	NS	NS	NS



KEY MAP

Scale: 1" = 40'

LEGEND

- ▭ PROJECT SITE BOUNDARY
- ▭ 1 LOT BOUNDARY AND TAX LOT NUMBER
- 3697 BLOCK NUMBER
- ▭ BUILDING
- ◒ PDI SOIL BORING LOCATION (FEBRUARY TO APRIL 2023)
- ● REMEDIAL INVESTIGATION SOIL BORING LOCATION (OCTOBER 2022)
- ◑ PHASE II SOIL BORING LOCATION (MAY 2022)

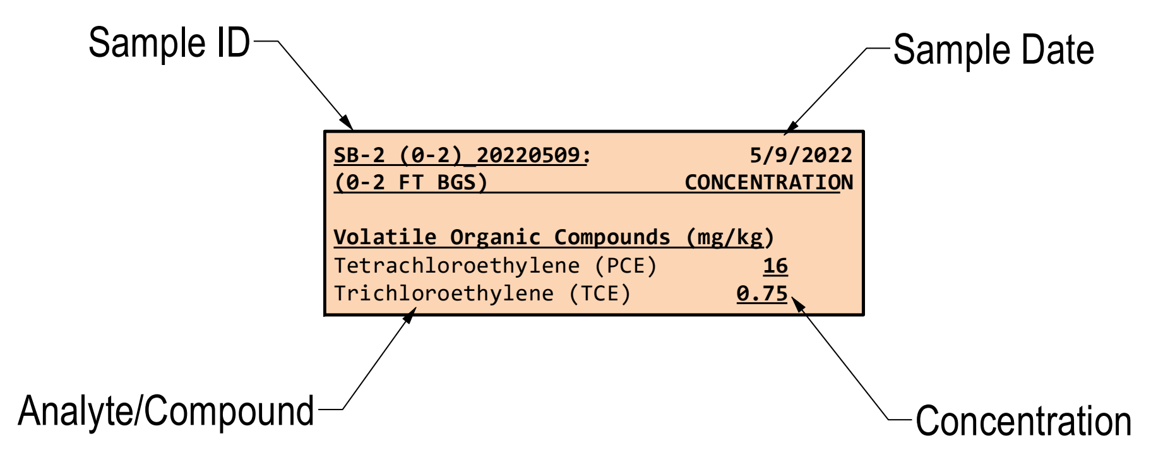
Part 375 Soil Cleanup Objectives (SCOs): SCOs listed in the New York State Department of Environmental Conservation (NYSDEC) "Part 375" Regulations (6 NYCRR Part 375).

Exceedances of NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs) are presented in bold font.

Exceedances of NYSDEC Restricted Residential Soil Cleanup Objectives (RRSCOs) are presented in red.

Exceedances of NYSDEC Protected Groundwater Soil Cleanup Objectives (PGWSCOs) are presented in underline.
*Note: PGWSCO comparison was performed for chlorinated VOCs only

mg/kg:milligrams per kilogram = parts per million (ppm)
µg/kg: micrograms per kilogram = parts per billion (ppb)
J: The concentration given is an estimated value.
K: Reported concentration value is proportional to dilution factor and may be exaggerated.
L: Sample result is estimated and biased low.
N: Indicates presumptive evidence of a compound.
D: Indicates an identified compound in an analysis that has been diluted.
NS: No Standard



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SCALE IN FEET

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.

©2023 AKRF Q:\Projects\220249 - 221 GLENMORE AVENUE\Technical\GIS and Graphics\SAR\RIR Update\220249 Fig 5B Ph 2, RI, PDI Soil Concentrations Above NYSDEC UUSCOs, RRSCOs, and PGWSCOs.mxd5/11/2023 4:16:22 PM mveilleux

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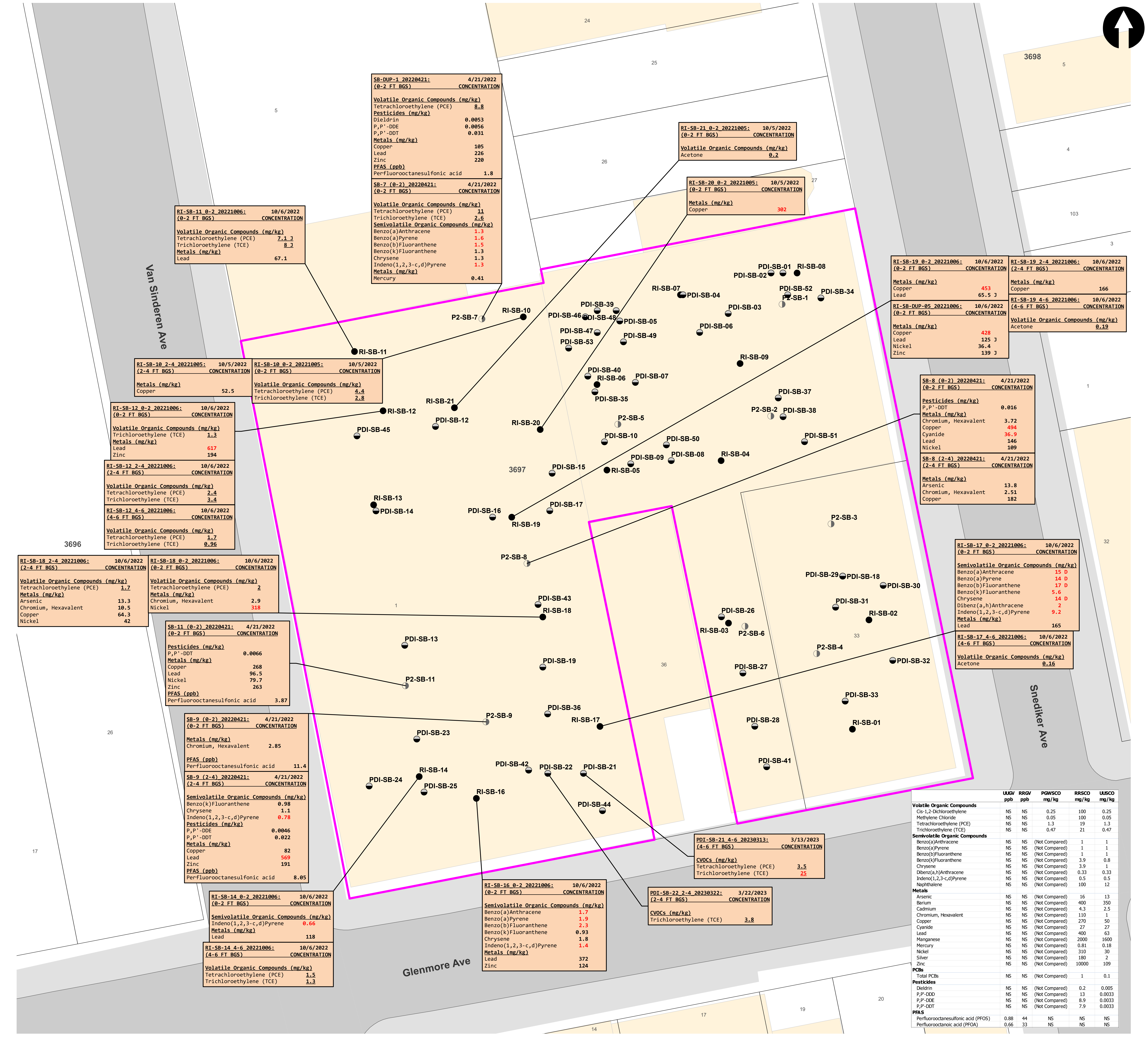
PHASE II, REMEDIAL INVESTIGATION, AND SRI SOIL CONCENTRATIONS ABOVE NYSDEC UUSCOS, RRSCOS, AND PGWSCOS

DATE
05/11/2023

PROJECT NO.
220249

FIGURE
4B



SB-DUP-1_20220421:	4/21/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	8.8
Pesticides (mg/kg)	
Dieldrin	0.0053
P,P'-DDE	0.0056
P,P'-DDT	0.031
Metals (mg/kg)	
Copper	105
Lead	226
Zinc	220
PFAS (ppb)	
Perfluorooctanesulfonic acid	1.8

SB-7 (0-2)_20220421:	4/21/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	11
Trichloroethylene (TCE)	2.6
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	1.3
Benzo(a)Pyrene	1.6
Benzo(b)Fluoranthene	1.5
Benzo(k)Fluoranthene	1.3
Chrysene	1.3
Indeno(1,2,3-c,d)Pyrene	1.3
Metals (mg/kg)	
Mercury	0.41

RI-SB-11_0-2_20221006:	10/6/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	7.1 J
Trichloroethylene (TCE)	8 J
Metals (mg/kg)	
Lead	67.1

RI-SB-21_0-2_20221005:	10/5/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Acetone	0.2

RI-SB-20_0-2_20221005:	10/5/2022
(0-2 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Copper	302

RI-SB-19_0-2_20221006:	10/6/2022
(0-2 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Copper	453
Lead	65.5 J

RI-SB-19_2-4_20221006:	10/6/2022
(2-4 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Copper	166

RI-SB-19_4-6_20221006:	10/6/2022
(4-6 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Acetone	0.19

RI-SB-DUP-05_20221006:	10/6/2022
(0-2 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Copper	428
Lead	125 J
Nickel	36.4
Zinc	139 J

RI-SB-10_2-4_20221005:	10/5/2022
(2-4 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Copper	52.5

RI-SB-10_0-2_20221005:	10/5/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	4.4
Trichloroethylene (TCE)	2.8

RI-SB-12_0-2_20221006:	10/6/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Trichloroethylene (TCE)	1.3
Metals (mg/kg)	
Lead	617
Zinc	194

RI-SB-12_2-4_20221006:	10/6/2022
(2-4 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	2.4
Trichloroethylene (TCE)	3.4

RI-SB-12_4-6_20221006:	10/6/2022
(4-6 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	1.7
Trichloroethylene (TCE)	0.96

RI-SB-18_2-4_20221006:	10/6/2022
(2-4 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	1.7
Metals (mg/kg)	
Arsenic	13.3
Chromium, Hexavalent	10.5
Copper	64.3
Nickel	42

RI-SB-18_0-2_20221006:	10/6/2022
(0-2 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	2
Metals (mg/kg)	
Chromium, Hexavalent	2.9
Nickel	318

SB-11 (0-2)_20220421:	4/21/2022
(0-2 FT BGS)	CONCENTRATION
Pesticides (mg/kg)	
P,P'-DDT	0.0066
Metals (mg/kg)	
Copper	268
Lead	96.5
Nickel	79.7
Zinc	263
PFAS (ppb)	
Perfluorooctanesulfonic acid	3.87

SB-9 (0-2)_20220421:	4/21/2022
(0-2 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Chromium, Hexavalent	2.85
PFAS (ppb)	
Perfluorooctanesulfonic acid	11.4

SB-9 (2-4)_20220421:	4/21/2022
(2-4 FT BGS)	CONCENTRATION
Semivolatile Organic Compounds (mg/kg)	
Benzo(k)Fluoranthene	0.98
Chrysene	1.1
Indeno(1,2,3-c,d)Pyrene	0.78
Pesticides (mg/kg)	
P,P'-DDE	0.0046
P,P'-DDT	0.022
Metals (mg/kg)	
Copper	82
Lead	569
Zinc	191
PFAS (ppb)	
Perfluorooctanesulfonic acid	8.05

RI-SB-14_0-2_20221006:	10/6/2022
(0-2 FT BGS)	CONCENTRATION
Semivolatile Organic Compounds (mg/kg)	
Indeno(1,2,3-c,d)Pyrene	0.66
Metals (mg/kg)	
Lead	118

RI-SB-14_4-6_20221006:	10/6/2022
(4-6 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Tetrachloroethylene (PCE)	1.5
Trichloroethylene (TCE)	1.3

RI-SB-16_0-2_20221006:	10/6/2022
(0-2 FT BGS)	CONCENTRATION
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	1.7
Benzo(a)Pyrene	1.9
Benzo(b)Fluoranthene	2.3
Benzo(k)Fluoranthene	0.93
Chrysene	1.8
Indeno(1,2,3-c,d)Pyrene	1.4
Metals (mg/kg)	
Lead	372
Zinc	124

PDI-SB-22_2-4_20230322:	3/22/2023
(2-4 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Trichloroethylene (TCE)	3.8

PDI-SB-21_4-6_20230313:	3/13/2023
(4-6 FT BGS)	CONCENTRATION
CVOCs (mg/kg)	
Tetrachloroethylene (PCE)	3.5
Trichloroethylene (TCE)	25

SB-8 (0-2)_20220421:	4/21/2022
(0-2 FT BGS)	CONCENTRATION
Pesticides (mg/kg)	
P,P'-DDT	0.016
Metals (mg/kg)	
Chromium, Hexavalent	3.72
Copper	494
Cyanide	36.9
Lead	146
Nickel	109

SB-8 (2-4)_20220421:	4/21/2022
(2-4 FT BGS)	CONCENTRATION
Metals (mg/kg)	
Arsenic	13.8
Chromium, Hexavalent	2.51
Copper	182

RI-SB-17_0-2_20221006:	10/6/2022
(0-2 FT BGS)	CONCENTRATION
Semivolatile Organic Compounds (mg/kg)	
Benzo(a)Anthracene	15 D
Benzo(a)Pyrene	14 D
Benzo(b)Fluoranthene	17 D
Benzo(k)Fluoranthene	5.6
Chrysene	14 D
Dibenz(a,h)Anthracene	2
Indeno(1,2,3-c,d)Pyrene	9.2
Metals (mg/kg)	
Lead	165

RI-SB-17_4-6_20221006:	10/6/2022
(4-6 FT BGS)	CONCENTRATION
Volatile Organic Compounds (mg/kg)	
Acetone	0.16

	UUGV ppb	RRGV ppb	PGWSCO mg/kg	RRSCO mg/kg	UUSCO mg/kg
Volatile Organic Compounds					
Cis-1,2-Dichloroethylene	NS	NS	0.25	100	0.25
Methylene Chloride	NS	NS	0.05	100	0.05
Tetrachloroethylene (PCE)	NS	NS	1.3	19	1.3
Trichloroethylene (TCE)	NS	NS	0.47	21	0.47
Semivolatile Organic Compounds					
Benzo(a)Anthracene	NS	NS	(Not Compared)	1	1
Benzo(a)Pyrene	NS	NS	(Not Compared)	1	1
Benzo(b)Fluoranthene	NS	NS	(Not Compared)	1	1
Benzo(k)Fluoranthene	NS	NS	(Not Compared)	3.9	0.8
Chrysene	NS	NS	(Not Compared)	3.9	1
Dibenz(a,h)Anthracene	NS	NS	(Not Compared)	0.33	0.33
Indeno(1,2,3-c,d)Pyrene	NS	NS	(Not Compared)	0.5	0.5
Naphthalene	NS	NS	(Not Compared)	100	12
Metals					
Arsenic	NS	NS	(Not Compared)	16	13
Barium	NS	NS	(Not Compared)	400	350
Cadmium	NS	NS	(Not Compared)	4.3	2.5
Chromium, Hexavalent	NS	NS	(Not Compared)	110	1
Copper	NS	NS	(Not Compared)	270	50
Cyanide	NS	NS	(Not Compared)	27	27
Lead	NS	NS	(Not Compared)	400	63
Manganese	NS	NS	(Not Compared)	2000	1600
Mercury	NS	NS	(Not Compared)	0.81	0.18
Nickel	NS	NS	(Not Compared)	310	30
Silver	NS	NS	(Not Compared)	180	2
Zinc	NS	NS	(Not Compared)	10000	109
PCBs					
Total PCBs	NS	NS	(Not Compared)	1	0.1
Pesticides					
Dieldrin	NS	NS	(Not Compared)	0.2	0.005
P,P'-DDD	NS	NS	(Not Compared)	13	0.0033
P,P'-DDE	NS	NS	(Not Compared)	8.9	0.0033
P,P'-DDT	NS	NS	(Not Compared)	7.9	0.0033
PFAS					
Perfluorooctanesulfonic acid (PFOS)	0.88	44	NS	NS	NS
Perfluorooctanoic acid (PFOA)	0.66	33	NS	NS	NS

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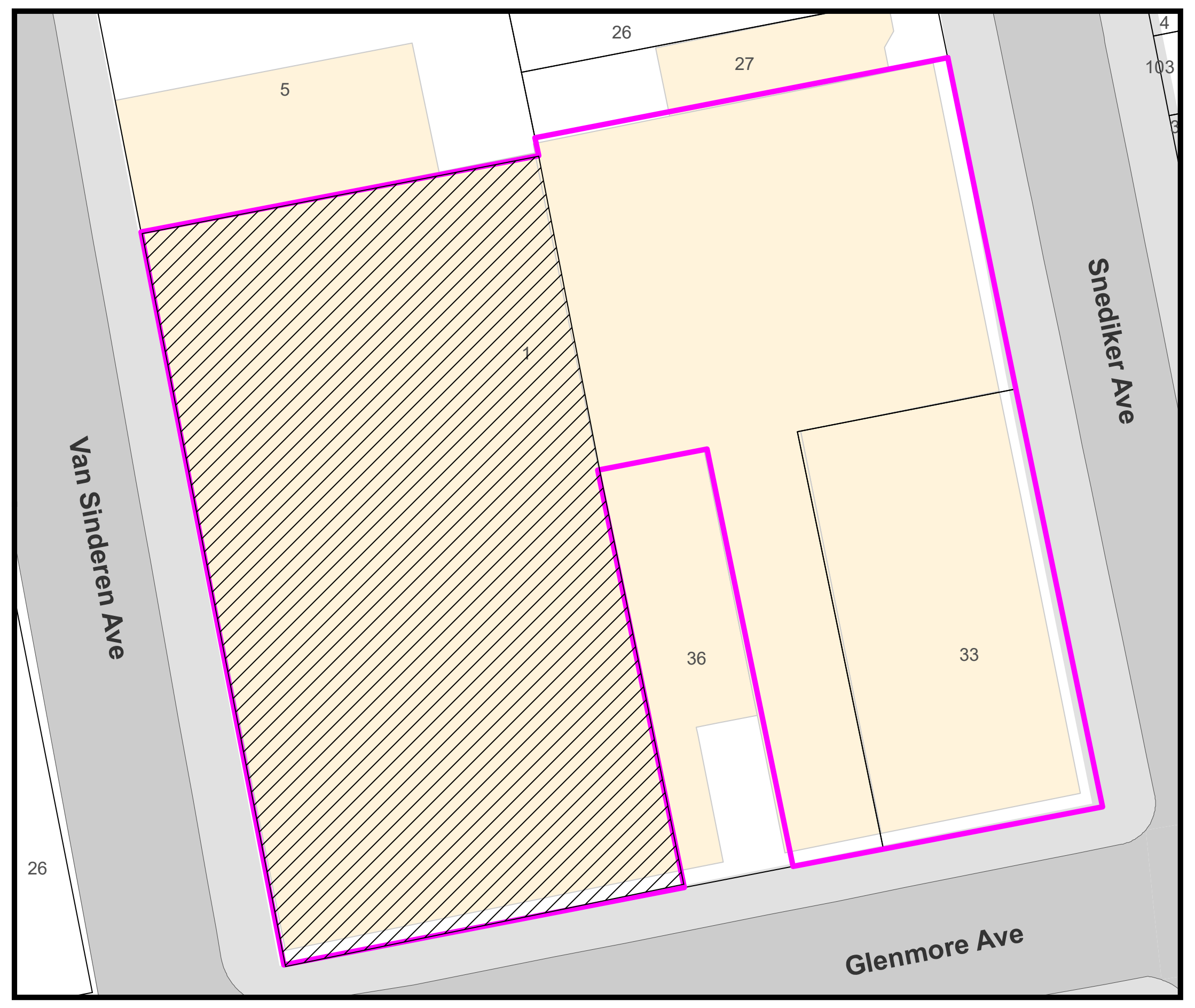
SCALE IN FEET

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.



KEY MAP

Scale: 1" = 40'

LEGEND

- ☐ PROJECT SITE BOUNDARY
- 1 LOT BOUNDARY AND TAX LOT NUMBER
- 3697 BLOCK NUMBER
- ▨ BUILDING
- ◒ PDI SOIL BORING LOCATION (FEBRUARY TO APRIL 2023)
- ● REMEDIAL INVESTIGATION SOIL BORING LOCATION (OCTOBER 2022)
- ◐ PHASE II SOIL BORING LOCATION (MAY 2022)

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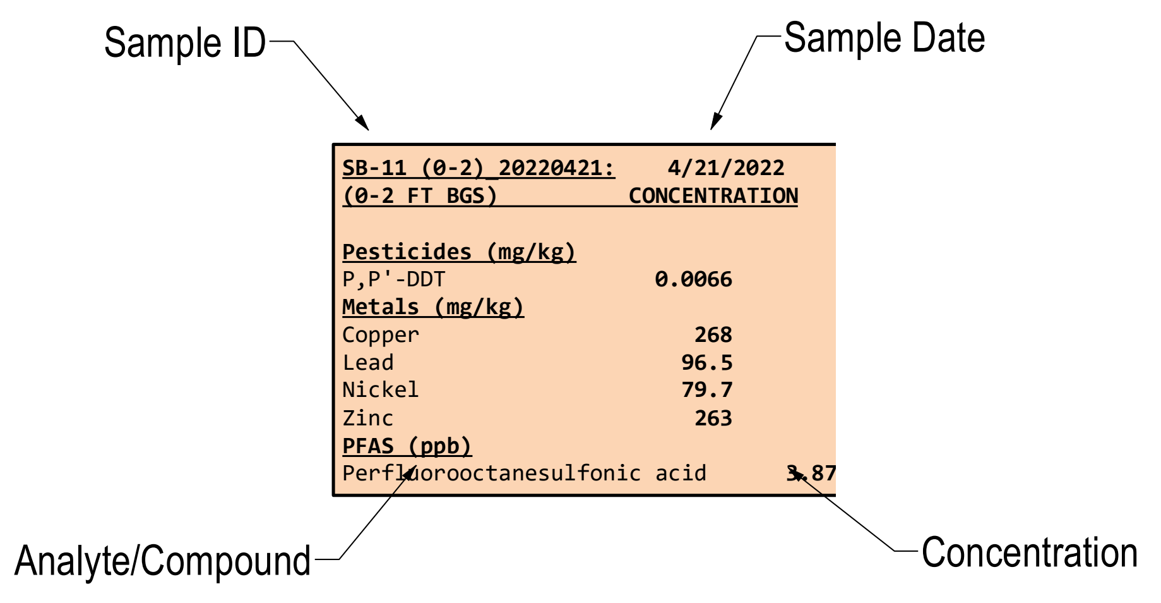
Exceedances of NYSDEC Protected Groundwater Soil Cleanup Objectives (PGWSCOs) are presented in underline.

*Note: PGWSCO comparison was performed for chlorinated VOCs only

mg/kg:milligrams per kilogram = parts per million (ppm)
µg/kg: micrograms per kilogram = parts per billion (ppb)
J: The concentration given is an estimated value.
D: Indicates an identified compound in an analysis that has been diluted.
NS: No Standard



SB-11 (0-2)_20220421:	4/21/2022
(0-2 FT BGS)	CONCENTRATION
Pesticides (mg/kg)	
P,P'-DDT	0.0066
Metals (mg/kg)	
Copper	268
Lead	96.5
Nickel	79.7
Zinc	263
PFAS (ppb)	
Perfluorooctanesulfonic acid	3.87

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Brooklyn, New York

PHASE II. REMEDIAL INVESTIGATION, AND SRI SOIL CONCENTRATIONS ABOVE NYSDEC UUSCOS, RRSCOS, AND PGWSCOS

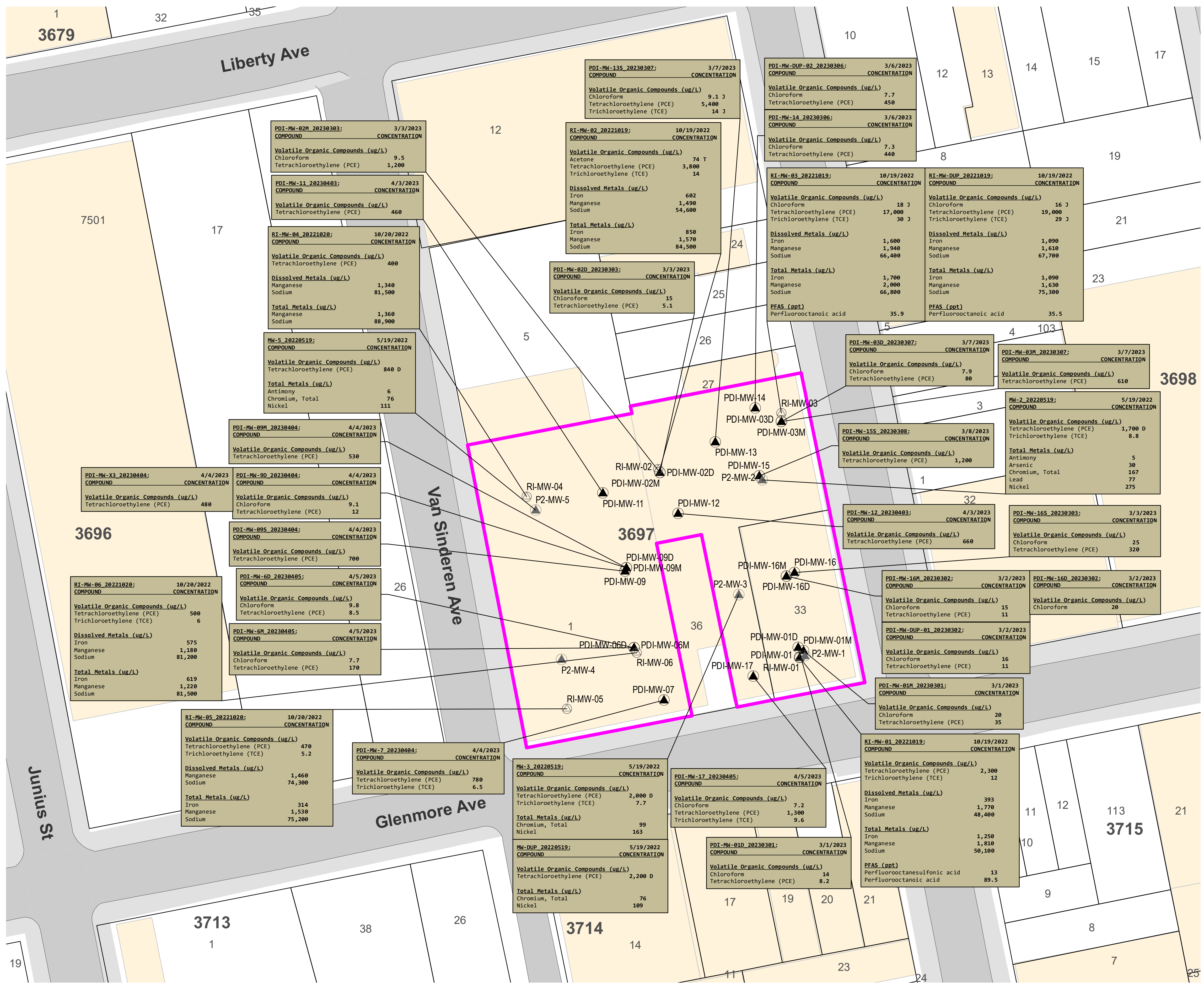
DATE
05/11/2023

PROJECT NO.
220249

FIGURE
4C

©2023 AKRF Q:\Projects\220249 - 221 GLENMORE AVENUE\Technical\GIS and Graphics\SAR\RIR Update\220249 Fig 5C Ph 2, RI, PDI Soil Concentrations Above NYSDEC UUSCOs, RRSCOs, and PGWSCOs.mxd5/11/2023 4:28:51 PM mveilleux

©2023 AKRF Q:\Projects\220249 - 221 GLENMORE AVENUE\Technical\GIS and Graphics\SAR\RIR Update\220249 Fig 8 Groundwater Concentrations above NYSDEC Ambient Water Quality Standards and Guidance Values and PFAS Guidance Values.mxd5/11/2023 2:07:08 PM mveilleux



PDI-MW-13S_20230307:	3/7/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	9.1 J
Tetrachloroethylene (PCE)	**5,400**
Trichloroethylene (TCE)	**14 J**

PDI-MW-02M_20230303:	3/3/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**9.5**
Tetrachloroethylene (PCE)	**1,200**

PDI-MW-11_20230403:	4/3/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**460**

RI-MW-02_20221019:	10/19/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Acetone	**74 T**
Tetrachloroethylene (PCE)	**3,800**
Trichloroethylene (TCE)	**14**
Dissolved Metals (ug/L)	
Iron	**602**
Manganese	**1,490**
Sodium	**54,600**
Total Metals (ug/L)	
Iron	**850**
Manganese	**1,570**
Sodium	**84,500**

RI-MW-04_20221020:	10/20/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**400**
Dissolved Metals (ug/L)	
Manganese	**1,340**
Sodium	**81,500**
Total Metals (ug/L)	
Manganese	**1,360**
Sodium	**88,900**

PDI-MW-02D_20230303:	3/3/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**15**
Tetrachloroethylene (PCE)	**5.1**

PDI-MW-DUP-02_20230306:	3/6/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**7.7**
Tetrachloroethylene (PCE)	**450**

PDI-MW-14_20230306:	3/6/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**7.3**
Tetrachloroethylene (PCE)	**440**

RI-MW-03_20221019:	10/19/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**18 J**
Tetrachloroethylene (PCE)	**17,000**
Trichloroethylene (TCE)	**30 J**
Dissolved Metals (ug/L)	
Iron	**1,600**
Manganese	**1,940**
Sodium	**66,400**
Total Metals (ug/L)	
Iron	**1,700**
Manganese	**2,000**
Sodium	**66,800**
PFAS (ppt)	
Perfluorooctanoic acid	**35.9**

RI-MW-DUP_20221019:	10/19/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**16 J**
Tetrachloroethylene (PCE)	**19,000**
Trichloroethylene (TCE)	**29 J**
Dissolved Metals (ug/L)	
Iron	**1,090**
Manganese	**1,610**
Sodium	**67,700**
Total Metals (ug/L)	
Iron	**1,090**
Manganese	**1,630**
Sodium	**75,300**
PFAS (ppt)	
Perfluorooctanoic acid	**35.5**

MW-5_20220519:	5/19/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**840 D**
Total Metals (ug/L)	
Antimony	**6**
Chromium, Total	**76**
Nickel	**111**

PDI-MW-03D_20230307:	3/7/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**7.9**
Tetrachloroethylene (PCE)	**80**

PDI-MW-03M_20230307:	3/7/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**610**

MW-2_20220519:	5/19/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**1,700 D**
Trichloroethylene (TCE)	**8.8**
Total Metals (ug/L)	
Antimony	**5**
Arsenic	**30**
Chromium, Total	**167**
Lead	**77**
Nickel	**275**

PDI-MW-15S_20230308:	3/8/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**1,200**

PDI-MW-09M_20230404:	4/4/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**530**

PDI-MW-X3_20230404:	4/4/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**480**

PDI-MW-9D_20230404:	4/4/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**9.1**
Tetrachloroethylene (PCE)	**12**

PDI-MW-12_20230403:	4/3/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**660**

PDI-MW-16S_20230303:	3/3/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**25**
Tetrachloroethylene (PCE)	**320**

PDI-MW-09S_20230404:	4/4/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**700**

PDI-MW-6D_20230405:	4/5/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**9.8**
Tetrachloroethylene (PCE)	**8.5**

RI-MW-06_20221020:	10/20/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**500**
Trichloroethylene (TCE)	**6**
Dissolved Metals (ug/L)	
Iron	**575**
Manganese	**1,180**
Sodium	**81,200**
Total Metals (ug/L)	
Iron	**619**
Manganese	**1,220**
Sodium	**81,500**

PDI-MW-16M_20230302:	3/2/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**15**
Tetrachloroethylene (PCE)	**11**

PDI-MW-16D_20230302:	3/2/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**20**

PDI-MW-6M_20230405:	4/5/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**7.7**
Tetrachloroethylene (PCE)	**170**

PDI-MW-DUP-01_20230302:	3/2/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**16**
Tetrachloroethylene (PCE)	**11**

PDI-MW-01M_20230301:	3/1/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**20**
Tetrachloroethylene (PCE)	**35**

RI-MW-05_20221020:	10/20/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**470**
Trichloroethylene (TCE)	**5.2**
Dissolved Metals (ug/L)	
Manganese	**1,460**
Sodium	**74,300**
Total Metals (ug/L)	
Iron	**314**
Manganese	**1,530**
Sodium	**75,200**

RI-MW-01_20221019:	10/19/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**2,300**
Trichloroethylene (TCE)	**12**
Dissolved Metals (ug/L)	
Iron	**393**
Manganese	**1,770**
Sodium	**48,400**
Total Metals (ug/L)	
Iron	**1,250**
Manganese	**1,810**
Sodium	**50,100**
PFAS (ppt)	
Perfluorooctanesulfonic acid	**13**
Perfluorooctanoic acid	**89.5**

PDI-MW-7_20230404:	4/4/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**780**
Trichloroethylene (TCE)	**6.5**

MW-3_20220519:	5/19/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**2,000 D**
Trichloroethylene (TCE)	**7.7**
Total Metals (ug/L)	
Chromium, Total	**99**
Nickel	**163**

PDI-MW-17_20230405:	4/5/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**7.2**
Tetrachloroethylene (PCE)	**1,300**
Trichloroethylene (TCE)	**9.6**

MW-DUP_20220519:	5/19/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**2,200 D**
Total Metals (ug/L)	
Chromium, Total	**76**
Nickel	**109**

PDI-MW-01D_20230301:	3/1/2023
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Chloroform	**14**
Tetrachloroethylene (PCE)	**8.2**

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.

LEGEND

- ▭ PROJECT SITE BOUNDARY
- 1 LOT BOUNDARY AND TAX LOT NUMBER
- **3697** BLOCK NUMBER
- ▭ BUILDING
- ▲ PDI GROUNDWATER MONITORING WELL LOCATION (FEBRUARY TO APRIL 2023)
- ▲ PHASE II GROUNDWATER MONITORING WELL LOCATION (MAY 2022)
- △ REMEDIAL INVESTIGATION GROUNDWATER MONITORING WELL LOCATION (OCTOBER 2022)

NYSDEC TOGS Class GA Ambient Water Quality Standard and Guidance Values (AWQSGVs): New York State Department of Environmental Conservation (NYSDEC) Technical and Operational Guidance Series (TOGS) (1.1.1):

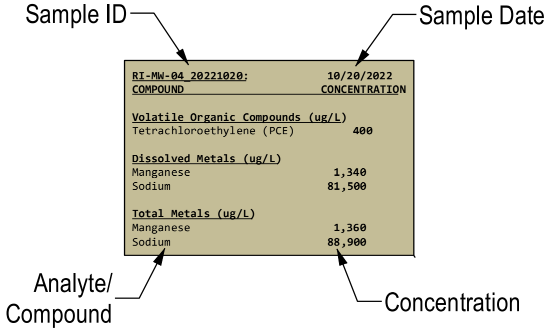
Groundwater PFAS results are compared to guidance values listed in NYSDEC's 2021 *Draft Addendum to the Technical and Operational Guidance (TOGS) No. 1.1.1.*

µg/L: micrograms per Liter = parts per billion (ppb)
ppt: parts per trillion

D: Indicates an identified compound in an analysis that has been diluted.
J: The concentration given is an estimated value.
T: Indicates that a quality control parameter has exceeded laboratory limits

Only Exceedances of NYSDEC AWQSGVs or PFAS Screening Levels are shown in bold font.

	NYSDEC AWQSGVs ug/l	Groundwater Screening Level ppt
Volatile Organic Compounds		
Acetone	50	NS
Chloroform	7	NS
Tetrachloroethylene (PCE)	5	NS
Trichloroethylene (TCE)	5	NS
Metals		
Antimony	3	NS
Arsenic	25	NS
Chromium, Total	50	NS
Iron	300	NS
Lead	25	NS
Manganese	300	NS
Nickel	100	NS
Sodium	20000	NS
PFAS		
Perfluorooctanesulfonic acid (PFOS)	NS	10
Perfluorooctanoic acid (PFOA)	NS	10



RI-MW-04_20221020:	10/20/2022
COMPOUND	CONCENTRATION
Volatile Organic Compounds (ug/L)	
Tetrachloroethylene (PCE)	**400**
Dissolved Metals (ug/L)	
Manganese	**1,340**
Sodium	**81,500**
Total Metals (ug/L)	
Manganese	**1,360**
Sodium	**88,900**

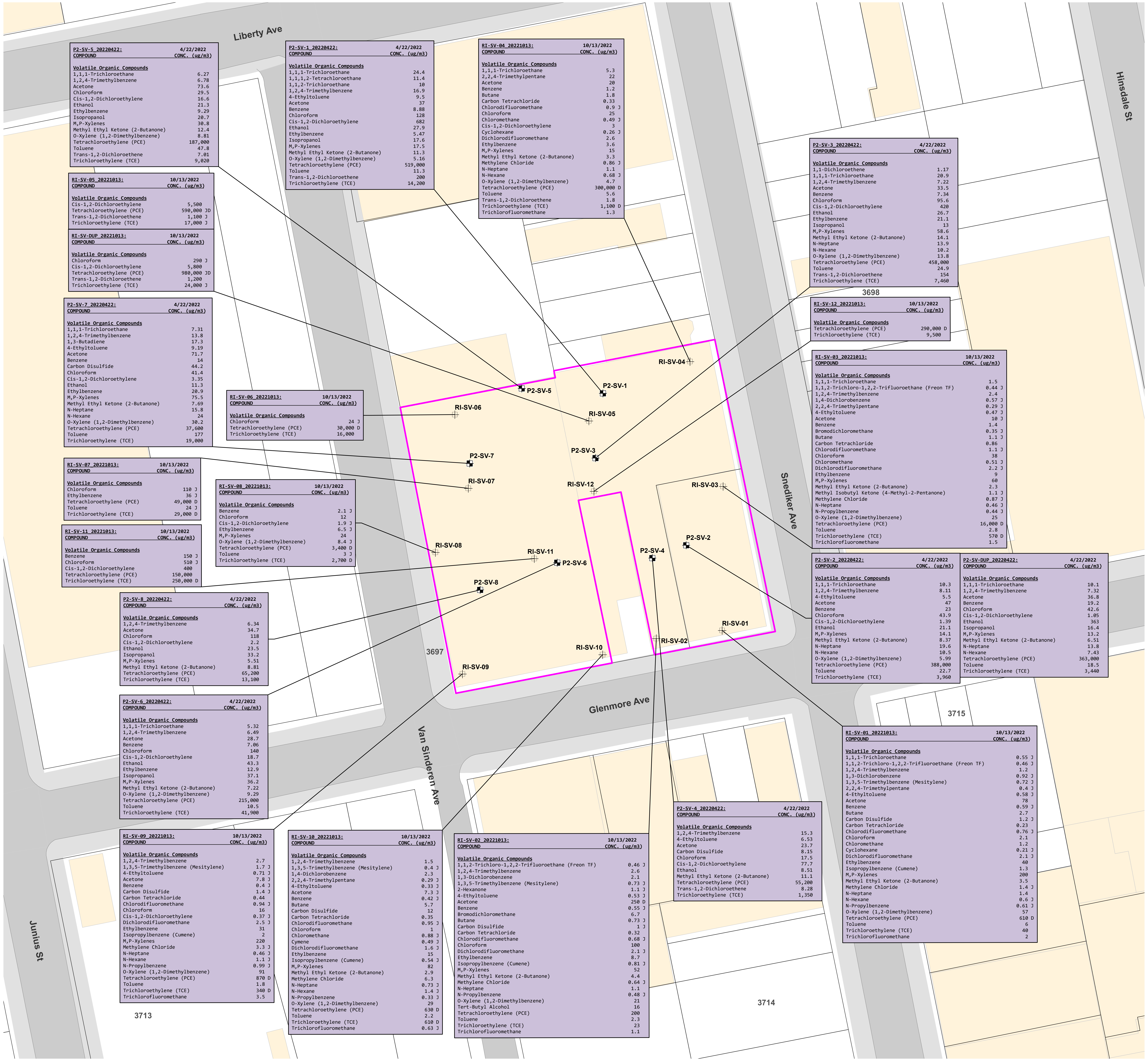
0 60 120
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site
221-241 Glenmore Avenue
Brooklyn, New York

GROUNDWATER CONCENTRATIONS ABOVE NYSDEC AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES AND PFAS GUIDANCE VALUES

DATE
5/11/2023
PROJECT NO.
220249
FIGURE
5



P2-SV-5_20220422:	4/22/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	6.27
1,2,4-Trimethylbenzene	6.78
Acetone	73.6
Chloroform	29.5
Cis-1,2-Dichloroethylene	16.6
Ethanol	21.3
Ethylbenzene	9.29
Isopropanol	20.7
M,P-Xylenes	30.8
Methyl Ethyl Ketone (2-Butanone)	12.4
O-Xylene (1,2-Dimethylbenzene)	8.81
Tetrachloroethylene (PCE)	187,000
Toluene	47.8
Trans-1,2-Dichloroethene	7.01
Trichloroethylene (TCE)	9,020

RI-SV-05_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Cis-1,2-Dichloroethylene	5,500
Tetrachloroethylene (PCE)	590,000 JD
Trans-1,2-Dichloroethene	1,100 J
Trichloroethylene (TCE)	17,000 J

RI-SV-DUP_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	290 J
Cis-1,2-Dichloroethylene	5,800
Tetrachloroethylene (PCE)	980,000 JD
Trans-1,2-Dichloroethene	1,200
Trichloroethylene (TCE)	24,000 J

P2-SV-7_20220422:	4/22/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	7.31
1,2,4-Trimethylbenzene	13.8
1,3-Butadiene	17.3
4-Ethyltoluene	9.19
Acetone	71.7
Benzene	14
Carbon Disulfide	44.2
Chloroform	41.4
Cis-1,2-Dichloroethylene	3.35
Ethanol	11.3
Ethylbenzene	20.9
M,P-Xylenes	75.5
Methyl Ethyl Ketone (2-Butanone)	7.69
N-Heptane	15.8
N-Hexane	24
O-Xylene (1,2-Dimethylbenzene)	30.2
Tetrachloroethylene (PCE)	37,600
Toluene	177
Trichloroethylene (TCE)	19,000

RI-SV-06_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	24 J
Tetrachloroethylene (PCE)	30,000 D
Trichloroethylene (TCE)	16,000

RI-SV-07_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	110 J
Ethylbenzene	36 J
Tetrachloroethylene (PCE)	49,000 D
Toluene	24 J
Trichloroethylene (TCE)	29,000 D

RI-SV-08_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Benzene	2.1 J
Chloroform	12
Cis-1,2-Dichloroethylene	1.9 J
Ethylbenzene	6.5 J
M,P-Xylenes	24
O-Xylene (1,2-Dimethylbenzene)	8.4 J
Tetrachloroethylene (PCE)	3,400 D
Toluene	3 J
Trichloroethylene (TCE)	2,700 D

RI-SV-11_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Benzene	150 J
Chloroform	510 J
Cis-1,2-Dichloroethylene	400
Tetrachloroethylene (PCE)	150,000
Trichloroethylene (TCE)	250,000 D

P2-SV-8_20220422:	4/22/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	6.34
Acetone	34.7
Chloroform	118
Cis-1,2-Dichloroethylene	2.2
Ethanol	23.5
Isopropanol	33.2
M,P-Xylenes	5.51
Methyl Ethyl Ketone (2-Butanone)	8.81
Tetrachloroethylene (PCE)	65,200
Trichloroethylene (TCE)	13,100

P2-SV-6_20220422:	4/22/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	5.32
1,2,4-Trimethylbenzene	6.49
Acetone	28.7
Benzene	7.06
Chloroform	140
Cis-1,2-Dichloroethylene	18.7
Ethanol	43.3
Ethylbenzene	12.9
Isopropanol	37.1
M,P-Xylenes	36.2
Methyl Ethyl Ketone (2-Butanone)	7.22
O-Xylene (1,2-Dimethylbenzene)	9.29
Tetrachloroethylene (PCE)	215,000
Toluene	10.5
Trichloroethylene (TCE)	41,900

RI-SV-09_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	2.7
1,3,5-Trimethylbenzene (Mesitylene)	1.7 J
4-Ethyltoluene	0.71 J
Acetone	7.8 J
Benzene	0.4 J
Carbon Disulfide	1.4 J
Carbon Tetrachloride	0.44
Chlorodifluoromethane	0.94 J
Chloroform	16
Cis-1,2-Dichloroethylene	0.37 J
Dichlorodifluoromethane	2.5 J
Ethylbenzene	31
Isopropylbenzene (Cumene)	2
M,P-Xylenes	220
Methylene Chloride	3.3 J
N-Heptane	0.46 J
N-Hexane	1.1 J
N-Propylbenzene	0.99 J
O-Xylene (1,2-Dimethylbenzene)	91
Tetrachloroethylene (PCE)	870 D
Toluene	1.8
Trichloroethylene (TCE)	340 D
Trichlorofluoromethane	3.5

RI-SV-10_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	1.5
1,3,5-Trimethylbenzene (Mesitylene)	0.4 J
1,4-Dichlorobenzene	2.3
2,2,4-Trimethylpentane	0.29 J
4-Ethyltoluene	0.33 J
Acetone	7.3 J
Benzene	0.42 J
Butane	5.7
Carbon Disulfide	12
Carbon Tetrachloride	0.35
Chlorodifluoromethane	0.95 J
Chloroform	1
Chloromethane	0.88 J
Cymene	0.49 J
Dichlorodifluoromethane	1.6 J
Ethylbenzene	15
Isopropylbenzene (Cumene)	0.54 J
M,P-Xylenes	82
Methyl Ethyl Ketone (2-Butanone)	2.9
Methylene Chloride	6.3
N-Heptane	0.73 J
N-Hexane	1.4 J
N-Propylbenzene	0.33 J
O-Xylene (1,2-Dimethylbenzene)	29
Tetrachloroethylene (PCE)	630 D
Toluene	2.2
Trichloroethylene (TCE)	610 D
Trichlorofluoromethane	0.63 J

RI-SV-02_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon TF)	0.46 J
1,2,4-Trimethylbenzene	2.6
1,3-Dichlorobenzene	2.1
1,3,5-Trimethylbenzene (Mesitylene)	0.73 J
2-Hexanone	1.1 J
4-Ethyltoluene	0.53 J
Acetone	250 D
Benzene	0.55 J
Bromodichloromethane	6.7
Butane	0.73 J
Carbon Disulfide	1 J
Carbon Tetrachloride	0.32
Chlorodifluoromethane	0.68 J
Chloroform	100
Dichlorodifluoromethane	2.1 J
Ethylbenzene	8.7
Isopropylbenzene (Cumene)	0.81 J
M,P-Xylenes	52
Methyl Ethyl Ketone (2-Butanone)	4.4
Methylene Chloride	0.64 J
N-Heptane	1.1
N-Propylbenzene	0.48 J
O-Xylene (1,2-Dimethylbenzene)	21
Tert-Butyl Alcohol	16
Tetrachloroethylene (PCE)	200
Toluene	2.3
Trichloroethylene (TCE)	23
Trichlorofluoromethane	1.1

P2-SV-1_20220422:	4/22/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	24.4
1,1,1,2-Tetrachloroethane	11.4
1,1,2-Trichloroethane	10
1,2,4-Trimethylbenzene	16.9
4-Ethyltoluene	9.5
Acetone	37
Benzene	8.88
Chloroform	128
Cis-1,2-Dichloroethylene	682
Ethanol	27.9
Ethylbenzene	5.47
Isopropanol	17.6
M,P-Xylenes	17.5
Methyl Ethyl Ketone (2-Butanone)	11.3
O-Xylene (1,2-Dimethylbenzene)	5.16
Tetrachloroethylene (PCE)	519,000
Toluene	11.3
Trans-1,2-Dichloroethene	200
Trichloroethylene (TCE)	14,200

RI-SV-04_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	5.3
2,2,4-Trimethylpentane	22
Acetone	20
Benzene	1.2
Butane	1.8
Carbon Tetrachloride	0.33
Chlorodifluoromethane	0.9 J
Chloroform	25
Chloromethane	0.49 J
Cis-1,2-Dichloroethylene	3
Cyclohexane	0.26 J
Dichlorodifluoromethane	2.6
Ethylbenzene	3.6
M,P-Xylenes	15
Methyl Ethyl Ketone (2-Butanone)	3.3
Methylene Chloride	0.86 J
N-Heptane	1.1
N-Hexane	0.68 J
O-Xylene (1,2-Dimethylbenzene)	4.7
Tetrachloroethylene (PCE)	300,000 D
Toluene	5.6
Trans-1,2-Dichloroethene	1.8
Trichloroethylene (TCE)	1,100 D
Trichlorofluoromethane	1.3

P2-SV-4_20220422:	4/22/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	15.3
4-Ethyltoluene	6.53
Acetone	23.7
Carbon Disulfide	8.15
Chloroform	17.5
Cis-1,2-Dichloroethylene	77.7
Ethanol	8.51
Methyl Ethyl Ketone (2-Butanone)	11.1
Tetrachloroethylene (PCE)	55,200
Trans-1,2-Dichloroethene	8.28
Trichloroethylene (TCE)	1,350

P2-SV-3_20220422:	4/22/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1-Dichloroethene	1.17
1,1,1-Trichloroethane	20.9
1,2,4-Trimethylbenzene	7.22
Acetone	33.5
Benzene	7.34
Chloroform	95.6
Cis-1,2-Dichloroethylene	420
Ethanol	26.7
Ethylbenzene	21.1
Isopropanol	13
M,P-Xylenes	58.6
Methyl Ethyl Ketone (2-Butanone)	14.1
N-Heptane	13.9
N-Hexane	10.2
O-Xylene (1,2-Dimethylbenzene)	13.8
Tetrachloroethylene (PCE)	458,000
Toluene	24.9
Trans-1,2-Dichloroethene	154
Trichloroethylene (TCE)	7,460

RI-SV-12_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Tetrachloroethylene (PCE)	290,000 D
Trichloroethylene (TCE)	9,500

RI-SV-03_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	1.5
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon TF)	0.44 J
1,2,4-Trimethylbenzene	2.4
1,4-Dichlorobenzene	0.57 J
2,2,4-Trimethylpentane	0.29 J
4-Ethyltoluene	0.47 J
Acetone	10 J
Benzene	1.4
Bromodichloromethane	0.35 J
Butane	1.1 J
Carbon Tetrachloride	0.86
Chlorodifluoromethane	1.1 J
Chloroform	38
Chloromethane	0.51 J
Dichlorodifluoromethane	2.2 J
Ethylbenzene	9
M,P-Xylenes	60
Methyl Ethyl Ketone (2-Butanone)	2.3
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	1.1 J
Methylene Chloride	0.87 J
N-Heptane	0.46 J
N-Propylbenzene	0.44 J
O-Xylene (1,2-Dimethylbenzene)	25
Tetrachloroethylene (PCE)	16,000 D
Toluene	2.8
Trichloroethylene (TCE)	570 D
Trichlorofluoromethane	1.5

P2-SV-2_20220422:	4/22/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	10.3
1,2,4-Trimethylbenzene	8.11
4-Ethyltoluene	5.5
Acetone	47
Benzene	23
Chloroform	43.9
Cis-1,2-Dichloroethylene	1.39
Ethanol	21.1
M,P-Xylenes	14.1
Methyl Ethyl Ketone (2-Butanone)	8.37
N-Heptane	19.6
N-Hexane	10.5
O-Xylene (1,2-Dimethylbenzene)	5.99
Tetrachloroethylene (PCE)	388,000
Toluene	22.7
Trichloroethylene (TCE)	3,960

P2-SV-DUP_20220422:	4/22/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	10.1
1,2,4-Trimethylbenzene	7.32
Acetone	36.8
Benzene	19.2
Chloroform	42.6
Cis-1,2-Dichloroethylene	1.05
Ethanol	363
Isopropanol	16.4
M,P-Xylenes	13.2
Methyl Ethyl Ketone (2-Butanone)	6.51
N-Heptane	13.8
N-Hexane	7.43
Tetrachloroethylene (PCE)	363,000
Toluene	18.5
Trichloroethylene (TCE)	3,440

RI-SV-01_20221013:	10/13/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	0.55 J
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon TF)	0.46 J
1,2,4-Trimethylbenzene	1.2
1,3-Dichlorobenzene	0.92 J
1,3,5-Trimethylbenzene (Mesitylene)	0.72 J
2,2,4-Trimethylpentane	0.4 J
4-Ethyltoluene	0.58 J
Acetone	78
Benzene	0.59 J
Butane	2.7
Carbon Disulfide	1.2 J
Carbon Tetrachloride	0.23
Chlorodifluoromethane	0.76 J
Chloroform	2.1
Chloromethane	1.2
Cyclohexane	0.21 J
Dichlorodifluoromethane	2.1 J
Ethylbenzene	40
Isopropylbenzene (Cumene)	1.3
M,P-Xylenes	200
Methyl Ethyl Ketone (2-Butanone)	3.5
Methylene Chloride	1.4 J
N-Heptane	1.4
N-Hexane	0.6 J
N-Propylbenzene	0.61 J
O-Xylene (1,2-Dimethylbenzene)	57
Tetrachloroethylene (PCE)	610 D
Toluene	6
Trichloroethylene (TCE)	40
Trichlorofluoromethane	2

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.

LEGEND

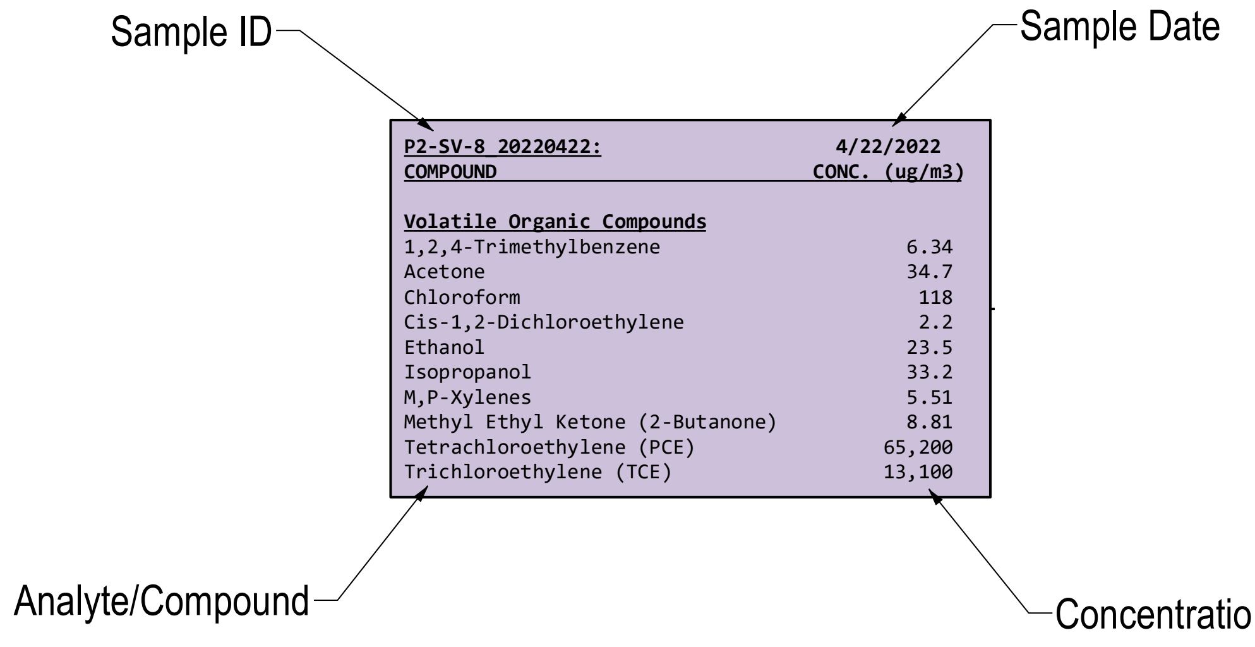
▭	PROJECT SITE BOUNDARY
▭ 1	LOT BOUNDARY AND TAX LOT NUMBER
3697	BLOCK NUMBER
▨	BUILDING
■	PHASE II SOIL VAPOR POINT LOCATION (MAY 2022)
+	REMEDAIL INVESTIGATION SOIL VAPOR POINT LOCATION (OCTOBER 2022)

SOIL VAPOR

D: Analyte concentration obtained from dilution.
J: The concentration given is an estimated value.

µg/m³ - micrograms per cubic meter

Concentrations detected above the laboratory reporting limit are shown.



P2-SV-8_20220422:	4/22/2022
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	6.34
Acetone	34.7
Chloroform	118
Cis-1,2-Dichloroethylene	2.2
Ethanol	23.5
Isopropanol	33.2
M,P-Xylenes	5.51
Methyl Ethyl Ketone (2-Butanone)	8.81
Tetrachloroethylene (PCE)	65,200
Trichloroethylene (TCE)	13,100

0 30 60
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site
221-241 Glenmore Avenue
Brooklyn, New York

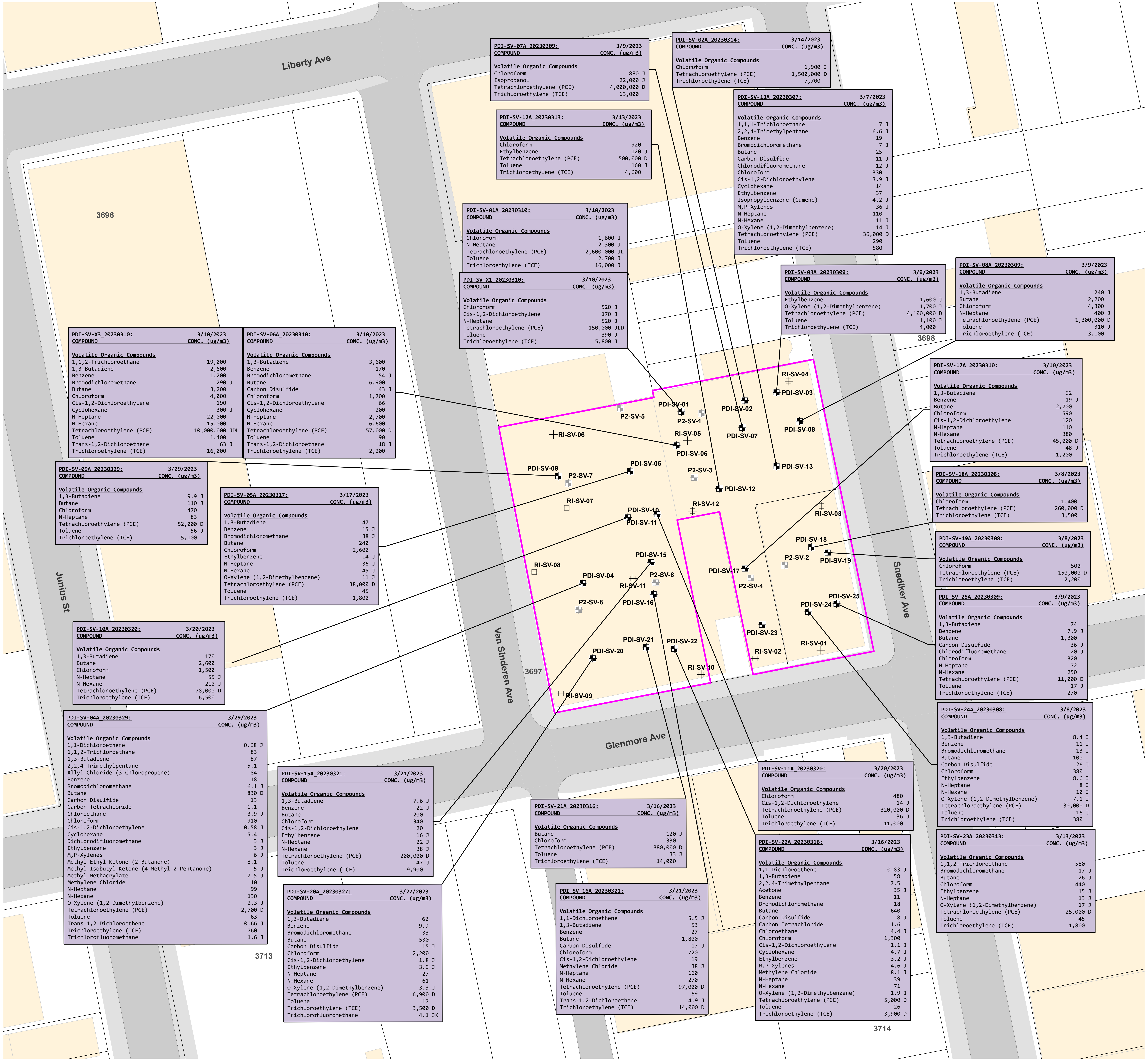
SUB-SLAB SOIL VAPOR CONCENTRATIONS

DATE
05/22/2023

PROJECT NO.
220249

FIGURE
6A

©2023 AKRF Q:\Projects\220249 - 221 GLENMORE AVENUE\Technical\GIS and Graphics\SAR\RIR Update\220249 Fig 10A - Sub-Slab Soil Vapor Concentrations.mxd5/22/2023 10:25:42 AM rmvelliex



PDI-SV-07A_20230309: COMPOUND	3/9/2023 CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	880 J
Isopropanol	22,000 J
Tetrachloroethylene (PCE)	4,000,000 D
Trichloroethylene (TCE)	13,000

PDI-SV-02A_20230314: COMPOUND	3/14/2023 CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	1,900 J
Tetrachloroethylene (PCE)	1,500,000 D
Trichloroethylene (TCE)	7,700

PDI-SV-12A_20230313: COMPOUND	3/13/2023 CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	920
Ethylbenzene	120 J
Tetrachloroethylene (PCE)	500,000 D
Toluene	160 J
Trichloroethylene (TCE)	4,600

PDI-SV-13A_20230307: COMPOUND	3/7/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	7 J
2,2,4-Trimethylpentane	6.6 J
Benzene	19
Bromodichloromethane	7 J
Butane	25
Carbon Disulfide	11 J
Chlorodifluoromethane	12 J
Chloroform	330
Cis-1,2-Dichloroethylene	3.9 J
Cyclohexane	14
Ethylbenzene	37
Isopropylbenzene (Cumene)	4.2 J
M,P-Xylenes	36 J
N-Heptane	110
N-Hexane	11 J
O-Xylene (1,2-Dimethylbenzene)	14 J
Tetrachloroethylene (PCE)	36,000 D
Toluene	290
Trichloroethylene (TCE)	580

PDI-SV-01A_20230310: COMPOUND	3/10/2023 CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	1,600 J
N-Heptane	2,300 J
Tetrachloroethylene (PCE)	2,600,000 JL
Toluene	2,700 J
Trichloroethylene (TCE)	16,000 J

PDI-SV-X1_20230310: COMPOUND	3/10/2023 CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	520 J
Cis-1,2-Dichloroethylene	170 J
N-Heptane	520 J
Tetrachloroethylene (PCE)	150,000 JLD
Toluene	390 J
Trichloroethylene (TCE)	5,800 J

PDI-SV-03A_20230309: COMPOUND	3/9/2023 CONC. (ug/m3)
Volatile Organic Compounds	
Ethylbenzene	1,600 J
O-Xylene (1,2-Dimethylbenzene)	1,700 J
Tetrachloroethylene (PCE)	4,100,000 D
Toluene	1,100 J
Trichloroethylene (TCE)	4,000

PDI-SV-08A_20230309: COMPOUND	3/9/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	240 J
Butane	2,200
Chloroform	4,300
N-Heptane	400 J
Tetrachloroethylene (PCE)	1,300,000 D
Toluene	310 J
Trichloroethylene (TCE)	3,100

PDI-SV-X3_20230310: COMPOUND	3/10/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,1,2-Trichloroethane	19,000
1,3-Butadiene	2,600
Benzene	1,200
Bromodichloromethane	290 J
Butane	3,200
Chloroform	4,000
Cis-1,2-Dichloroethylene	190
Cyclohexane	300 J
N-Heptane	22,000
N-Hexane	15,000
Tetrachloroethylene (PCE)	10,000,000 JDL
Toluene	1,400
Trans-1,2-Dichloroethene	63 J
Trichloroethylene (TCE)	16,000

PDI-SV-06A_20230310: COMPOUND	3/10/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	3,600
Benzene	170
Bromodichloromethane	54 J
Butane	6,900
Carbon Disulfide	43 J
Chloroform	1,700
Cis-1,2-Dichloroethylene	66
Cyclohexane	200
N-Heptane	2,700
N-Hexane	6,600
Tetrachloroethylene (PCE)	57,000 D
Toluene	90
Trans-1,2-Dichloroethene	18 J
Trichloroethylene (TCE)	2,200

PDI-SV-17A_20230310: COMPOUND	3/10/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	92
Benzene	19 J
Butane	2,700
Chloroform	590
Cis-1,2-Dichloroethylene	120
N-Heptane	110
N-Hexane	380
Tetrachloroethylene (PCE)	45,000 D
Toluene	48 J
Trichloroethylene (TCE)	1,200

PDI-SV-09A_20230329: COMPOUND	3/29/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	9.9 J
Butane	110 J
Chloroform	470
N-Heptane	83
Tetrachloroethylene (PCE)	52,000 D
Toluene	56 J
Trichloroethylene (TCE)	5,100

PDI-SV-05A_20230317: COMPOUND	3/17/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	47
Benzene	15 J
Bromodichloromethane	38 J
Butane	240
Chloroform	2,600
Ethylbenzene	14 J
N-Heptane	36 J
N-Hexane	45 J
O-Xylene (1,2-Dimethylbenzene)	11 J
Tetrachloroethylene (PCE)	38,000 D
Toluene	45
Trichloroethylene (TCE)	1,800

PDI-SV-18A_20230308: COMPOUND	3/8/2023 CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	1,400
Tetrachloroethylene (PCE)	260,000 D
Trichloroethylene (TCE)	3,500

PDI-SV-19A_20230308: COMPOUND	3/8/2023 CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	500
Tetrachloroethylene (PCE)	150,000 D
Trichloroethylene (TCE)	2,200

PDI-SV-25A_20230309: COMPOUND	3/9/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	74
Benzene	7.9 J
Butane	1,300
Carbon Disulfide	36 J
Chlorodifluoromethane	20 J
Chloroform	320
N-Heptane	72
N-Hexane	250
Tetrachloroethylene (PCE)	11,000 D
Toluene	17 J
Trichloroethylene (TCE)	270

PDI-SV-10A_20230320: COMPOUND	3/20/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	170
Butane	2,600
Chloroform	1,500
N-Heptane	55 J
N-Hexane	210 J
Tetrachloroethylene (PCE)	78,000 D
Trichloroethylene (TCE)	6,500

PDI-SV-04A_20230329: COMPOUND	3/29/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,1-Dichloroethene	0.68 J
1,1,2-Trichloroethane	83
1,3-Butadiene	87
2,2,4-Trimethylpentane	5.1
Allyl Chloride (3-Chloropropene)	84
Benzene	18
Bromodichloromethane	6.1 J
Butane	830 D
Carbon Disulfide	13
Carbon Tetrachloride	1.1
Chloroethane	3.9 J
Chloroform	910
Cis-1,2-Dichloroethylene	0.58 J
Cyclohexane	5.4
Dichlorodifluoromethane	3 J
Ethylbenzene	3 J
M,P-Xylenes	6 J
Methyl Ethyl Ketone (2-Butanone)	8.1
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	5 J
Methyl Methacrylate	7.5 J
Methylene Chloride	10
N-Heptane	99
N-Hexane	130
O-Xylene (1,2-Dimethylbenzene)	2.3 J
Tetrachloroethylene (PCE)	2,700 D
Toluene	63
Trans-1,2-Dichloroethene	0.66 J
Trichloroethylene (TCE)	760
Trichlorofluoromethane	1.6 J

PDI-SV-24A_20230308: COMPOUND	3/8/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	8.4 J
Benzene	11 J
Bromodichloromethane	13 J
Butane	100
Carbon Disulfide	26 J
Chloroform	380
Ethylbenzene	8.6 J
N-Heptane	8 J
N-Hexane	10 J
O-Xylene (1,2-Dimethylbenzene)	7.1 J
Tetrachloroethylene (PCE)	30,000 D
Toluene	16 J
Trichloroethylene (TCE)	380

PDI-SV-15A_20230321: COMPOUND	3/21/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	7.6 J
Benzene	22 J
Butane	200
Chloroform	340
Cis-1,2-Dichloroethylene	20
Ethylbenzene	16 J
N-Heptane	22 J
N-Hexane	38 J
Tetrachloroethylene (PCE)	200,000 D
Toluene	47 J
Trichloroethylene (TCE)	9,900

PDI-SV-11A_20230320: COMPOUND	3/20/2023 CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	480
Cis-1,2-Dichloroethylene	14 J
Tetrachloroethylene (PCE)	320,000 D
Toluene	36 J
Trichloroethylene (TCE)	11,000

PDI-SV-21A_20230316: COMPOUND	3/16/2023 CONC. (ug/m3)
Volatile Organic Compounds	
Butane	120 J
Chloroform	330
Tetrachloroethylene (PCE)	380,000 D
Toluene	33 J
Trichloroethylene (TCE)	14,000

PDI-SV-22A_20230316: COMPOUND	3/16/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,1-Dichloroethene	0.83 J
1,3-Butadiene	58
2,2,4-Trimethylpentane	7.5
Acetone	35 J
Benzene	11
Bromodichloromethane	18
Butane	640
Carbon Disulfide	8 J
Carbon Tetrachloride	1.6
Chloroethane	4.4 J
Chloroform	1,300
Cis-1,2-Dichloroethylene	1.1 J
Cyclohexane	4.7 J
Ethylbenzene	3.2 J
M,P-Xylenes	4.6 J
Methylene Chloride	8.1 J
N-Heptane	39
N-Hexane	71
O-Xylene (1,2-Dimethylbenzene)	1.9 J
Tetrachloroethylene (PCE)	5,000 D
Toluene	26
Trichloroethylene (TCE)	3,900 D

PDI-SV-23A_20230313: COMPOUND	3/13/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,1,2-Trichloroethane	580
Bromodichloromethane	17 J
Butane	26 J
Chloroform	440
Ethylbenzene	15 J
N-Heptane	13 J
O-Xylene (1,2-Dimethylbenzene)	17 J
Tetrachloroethylene (PCE)	25,000 D
Toluene	45
Trichloroethylene (TCE)	1,800

PDI-SV-16A_20230321: COMPOUND	3/21/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,1-Dichloroethene	5.5 J
1,3-Butadiene	53
Benzene	27
Butane	1,800
Carbon Disulfide	17 J
Chloroform	720
Cis-1,2-Dichloroethylene	19
Methylene Chloride	38 J
N-Heptane	160
N-Hexane	270
Tetrachloroethylene (PCE)	97,000 D
Toluene	69
Trans-1,2-Dichloroethene	4.9 J
Trichloroethylene (TCE)	14,000 D

PDI-SV-20A_20230327: COMPOUND	3/27/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	62
Benzene	9.9
Bromodichloromethane	33
Butane	530
Carbon Disulfide	15 J
Chloroform	2,200
Cis-1,2-Dichloroethylene	1.8 J
Ethylbenzene	3.9 J
N-Heptane	27
N-Hexane	61
O-Xylene (1,2-Dimethylbenzene)	3.3 J
Tetrachloroethylene (PCE)	6,900 D
Toluene	17
Trichloroethylene (TCE)	3,500 D
Trichlorofluoromethane	4.1 JK

LEGEND

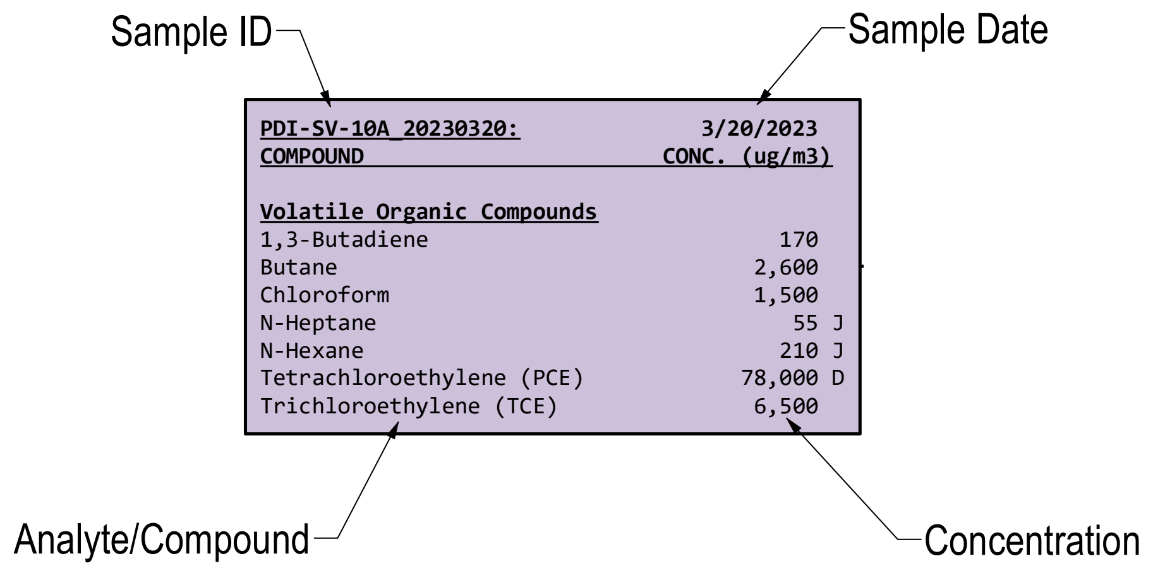
▭	PROJECT SITE BOUNDARY
1	LOT BOUNDARY AND TAX LOT NUMBER
3697	BLOCK NUMBER
▭	BUILDING
	SRI SOIL VAPOR POINT LOCATION (FEBRUARY TO APRIL 2023)
	PHASE II SOIL VAPOR POINT LOCATION (MAY 2022)
⌖	REMEDAIL INVESTIGATION SOIL VAPOR POINT LOCATION (OCTOBER 2022)

SOIL VAPOR

D: Analyte concentration obtained from dilution.
J: The concentration given is an estimated value.
L: Sample result is estimated and biased low.

µg/m³ - micrograms per cubic meter

Concentrations detected above the laboratory reporting limit are shown.



PDI-SV-10A_20230320: COMPOUND	3/20/2023 CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	170
Butane	2,600
Chloroform	1,500
N-Heptane	55 J
N-Hexane	210 J
Tetrachloroethylene (PCE)	78,000 D
Trichloroethylene (TCE)	6,500

0 30 60
SCALE IN FEET

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.

AKRF
440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site

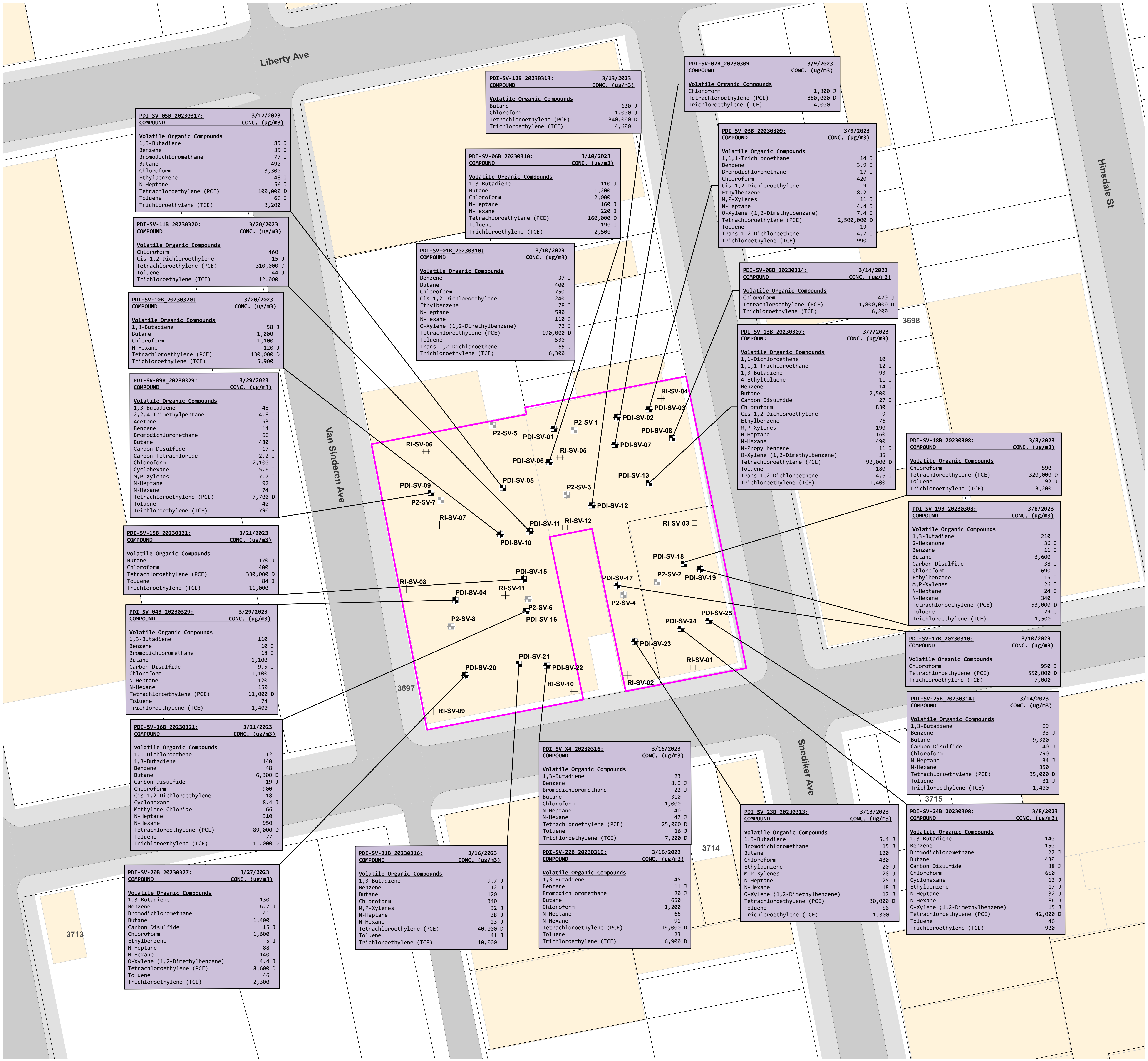
221-241 Glenmore Avenue
Brooklyn, New York

SOIL VAPOR CONCENTRATIONS (APPROXIMATELY 10 FEET BELOW GRADE)

DATE
05/22/2023

PROJECT NO.
220249

FIGURE
6B



PDI-SV-05B_20230317:	3/17/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	85 J
Benzene	35 J
Bromodichloromethane	77 J
Butane	490
Chloroform	3,300
Ethylbenzene	48 J
N-Heptane	56 J
Tetrachloroethylene (PCE)	100,000 D
Toluene	69 J
Trichloroethylene (TCE)	3,200

PDI-SV-11B_20230320:	3/20/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	460
Cis-1,2-Dichloroethylene	15 J
Tetrachloroethylene (PCE)	310,000 D
Toluene	44 J
Trichloroethylene (TCE)	12,000

PDI-SV-10B_20230320:	3/20/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	58 J
Butane	1,000
Chloroform	1,100
N-Hexane	120 J
Tetrachloroethylene (PCE)	130,000 D
Trichloroethylene (TCE)	5,900

PDI-SV-09B_20230329:	3/29/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	48
2,2,4-Trimethylpentane	4.8 J
Acetone	53 J
Benzene	14
Bromodichloromethane	66
Butane	480
Carbon Disulfide	17 J
Carbon Tetrachloride	2.2 J
Chloroform	2,100
Cyclohexane	5.6 J
M,P-Xylenes	7.7 J
N-Heptane	92
N-Hexane	74
Tetrachloroethylene (PCE)	7,700 D
Toluene	40
Trichloroethylene (TCE)	790

PDI-SV-15B_20230321:	3/21/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Butane	170 J
Chloroform	400
Tetrachloroethylene (PCE)	330,000 D
Toluene	84 J
Trichloroethylene (TCE)	11,000

PDI-SV-04B_20230329:	3/29/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	110
Benzene	10 J
Bromodichloromethane	18 J
Butane	1,100
Carbon Disulfide	9.5 J
Chloroform	1,100
N-Heptane	120
N-Hexane	150
Tetrachloroethylene (PCE)	11,000 D
Toluene	74
Trichloroethylene (TCE)	1,400

PDI-SV-16B_20230321:	3/21/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1-Dichloroethene	12
1,3-Butadiene	140
Benzene	48
Butane	6,300 D
Carbon Disulfide	19 J
Chloroform	900
Cis-1,2-Dichloroethylene	18
Cyclohexane	8.4 J
Methylene Chloride	66
N-Heptane	310
N-Hexane	950
Tetrachloroethylene (PCE)	89,000 D
Toluene	77
Trichloroethylene (TCE)	11,000 D

PDI-SV-20B_20230327:	3/27/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	130
Benzene	6.7 J
Bromodichloromethane	41
Butane	1,400
Carbon Disulfide	15 J
Chloroform	1,600
Ethylbenzene	5 J
N-Heptane	88
N-Hexane	140
O-Xylene (1,2-Dimethylbenzene)	4.4 J
Tetrachloroethylene (PCE)	8,600 D
Toluene	46
Trichloroethylene (TCE)	2,300

PDI-SV-12B_20230313:	3/13/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Butane	630 J
Chloroform	1,000 J
Tetrachloroethylene (PCE)	340,000 D
Trichloroethylene (TCE)	4,600

PDI-SV-06B_20230310:	3/10/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	110 J
Butane	1,200
Chloroform	2,000
N-Heptane	160 J
N-Hexane	220 J
Tetrachloroethylene (PCE)	160,000 D
Toluene	190 J
Trichloroethylene (TCE)	2,500

PDI-SV-01B_20230310:	3/10/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Benzene	37 J
Butane	400
Chloroform	750
Cis-1,2-Dichloroethylene	240
Ethylbenzene	78 J
N-Heptane	580
N-Hexane	110 J
O-Xylene (1,2-Dimethylbenzene)	72 J
Tetrachloroethylene (PCE)	190,000 D
Toluene	530
Trans-1,2-Dichloroethene	65 J
Trichloroethylene (TCE)	6,300

PDI-SV-07B_20230309:	3/9/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	1,300 J
Tetrachloroethylene (PCE)	880,000 D
Trichloroethylene (TCE)	4,000

PDI-SV-03B_20230309:	3/9/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1,1-Trichloroethane	14 J
Benzene	3.9 J
Bromodichloromethane	17 J
Chloroform	420
Cis-1,2-Dichloroethylene	9
Ethylbenzene	8.2 J
M,P-Xylenes	11 J
N-Heptane	4.4 J
O-Xylene (1,2-Dimethylbenzene)	7.4 J
Tetrachloroethylene (PCE)	2,500,000 D
Toluene	19
Trans-1,2-Dichloroethene	4.7 J
Trichloroethylene (TCE)	990

PDI-SV-08B_20230314:	3/14/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	470 J
Tetrachloroethylene (PCE)	1,800,000 D
Trichloroethylene (TCE)	6,200

PDI-SV-13B_20230307:	3/7/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1-Dichloroethene	10
1,1,1-Trichloroethane	12 J
1,3-Butadiene	93
4-Ethyltoluene	11 J
Benzene	14 J
Butane	2,500
Carbon Disulfide	27 J
Chloroform	830
Cis-1,2-Dichloroethylene	9
Ethylbenzene	76
M,P-Xylenes	190
N-Heptane	160
N-Hexane	490
N-Propylbenzene	11 J
O-Xylene (1,2-Dimethylbenzene)	35
Tetrachloroethylene (PCE)	92,000 D
Toluene	180
Trans-1,2-Dichloroethene	4.6 J
Trichloroethylene (TCE)	1,400

PDI-SV-18B_20230308:	3/8/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	590
Tetrachloroethylene (PCE)	320,000 D
Toluene	92 J
Trichloroethylene (TCE)	3,200

PDI-SV-19B_20230308:	3/8/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	210
2-Hexanone	36 J
Benzene	11 J
Butane	3,600
Carbon Disulfide	38 J
Chloroform	690
Ethylbenzene	15 J
M,P-Xylenes	26 J
N-Heptane	24 J
N-Hexane	340
Tetrachloroethylene (PCE)	53,000 D
Toluene	29 J
Trichloroethylene (TCE)	1,500

PDI-SV-17B_20230310:	3/10/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	950 J
Tetrachloroethylene (PCE)	550,000 D
Trichloroethylene (TCE)	7,000

PDI-SV-25B_20230314:	3/14/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	99
Benzene	33 J
Butane	9,300
Carbon Disulfide	40 J
Chloroform	790
N-Heptane	34 J
N-Hexane	350
Tetrachloroethylene (PCE)	35,000 D
Toluene	31 J
Trichloroethylene (TCE)	1,400

PDI-SV-24B_20230308:	3/8/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	140
Benzene	150
Bromodichloromethane	27 J
Butane	430
Carbon Disulfide	38 J
Chloroform	650
Cyclohexane	13 J
Ethylbenzene	17 J
N-Heptane	32 J
N-Hexane	86 J
O-Xylene (1,2-Dimethylbenzene)	15 J
Tetrachloroethylene (PCE)	42,000 D
Toluene	46
Trichloroethylene (TCE)	930

PDI-SV-23B_20230313:	3/13/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	5.4 J
Bromodichloromethane	15 J
Butane	120
Chloroform	430
Ethylbenzene	20 J
M,P-Xylenes	28 J
N-Heptane	25 J
N-Hexane	18 J
O-Xylene (1,2-Dimethylbenzene)	17 J
Tetrachloroethylene (PCE)	30,000 D
Toluene	56
Trichloroethylene (TCE)	1,300

PDI-SV-X4_20230316:	3/16/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	23
Benzene	8.9 J
Bromodichloromethane	22 J
Butane	310
Chloroform	1,000
N-Heptane	40
N-Hexane	47 J
Tetrachloroethylene (PCE)	25,000 D
Toluene	16 J
Trichloroethylene (TCE)	7,200 D

PDI-SV-22B_20230316:	3/16/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	45
Benzene	11 J
Bromodichloromethane	20 J
Butane	650
Chloroform	1,200
N-Heptane	66
N-Hexane	91
Tetrachloroethylene (PCE)	19,000 D
Toluene	23
Trichloroethylene (TCE)	6,900 D

PDI-SV-21B_20230316:	3/16/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	9.7 J
Benzene	12 J
Butane	120
Chloroform	340
M,P-Xylenes	32 J
N-Heptane	38 J
N-Hexane	23 J
Tetrachloroethylene (PCE)	40,000 D
Toluene	41 J
Trichloroethylene (TCE)	10,000

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.

LEGEND

🟪	PROJECT SITE BOUNDARY
1	LOT BOUNDARY AND TAX LOT NUMBER
3697	BLOCK NUMBER
▭	BUILDING
	SRI SOIL VAPOR POINT LOCATION (FEBRUARY TO APRIL 2023)
	PHASE II SOIL VAPOR POINT LOCATION (MAY 2022)
⌖	REMEDAIL INVESTIGATION SOIL VAPOR POINT LOCATION (OCTOBER 2022)

SOIL VAPOR

D: Analyte concentration obtained from dilution.
J: The concentration given is an estimated value.
L: Sample result is estimated and biased low.

µg/m³ - micrograms per cubic meter

Concentrations detected above the laboratory reporting limit are shown.

Sample ID
Sample Date

PDI-SV-20B_20230327:	3/27/2023
COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	130
Benzene	6.7 J
Bromodichloromethane	41
Butane	1,400
Carbon Disulfide	15 J
Chloroform	1,600
Ethylbenzene	5 J
N-Heptane	88
N-Hexane	140
O-Xylene (1,2-Dimethylbenzene)	4.4 J
Tetrachloroethylene (PCE)	8,600 D
Toluene	46
Trichloroethylene (TCE)	2,300

Analyte/Compound
Concentration

0 30 60
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site
221-241 Glenmore Avenue
Brooklyn, New York

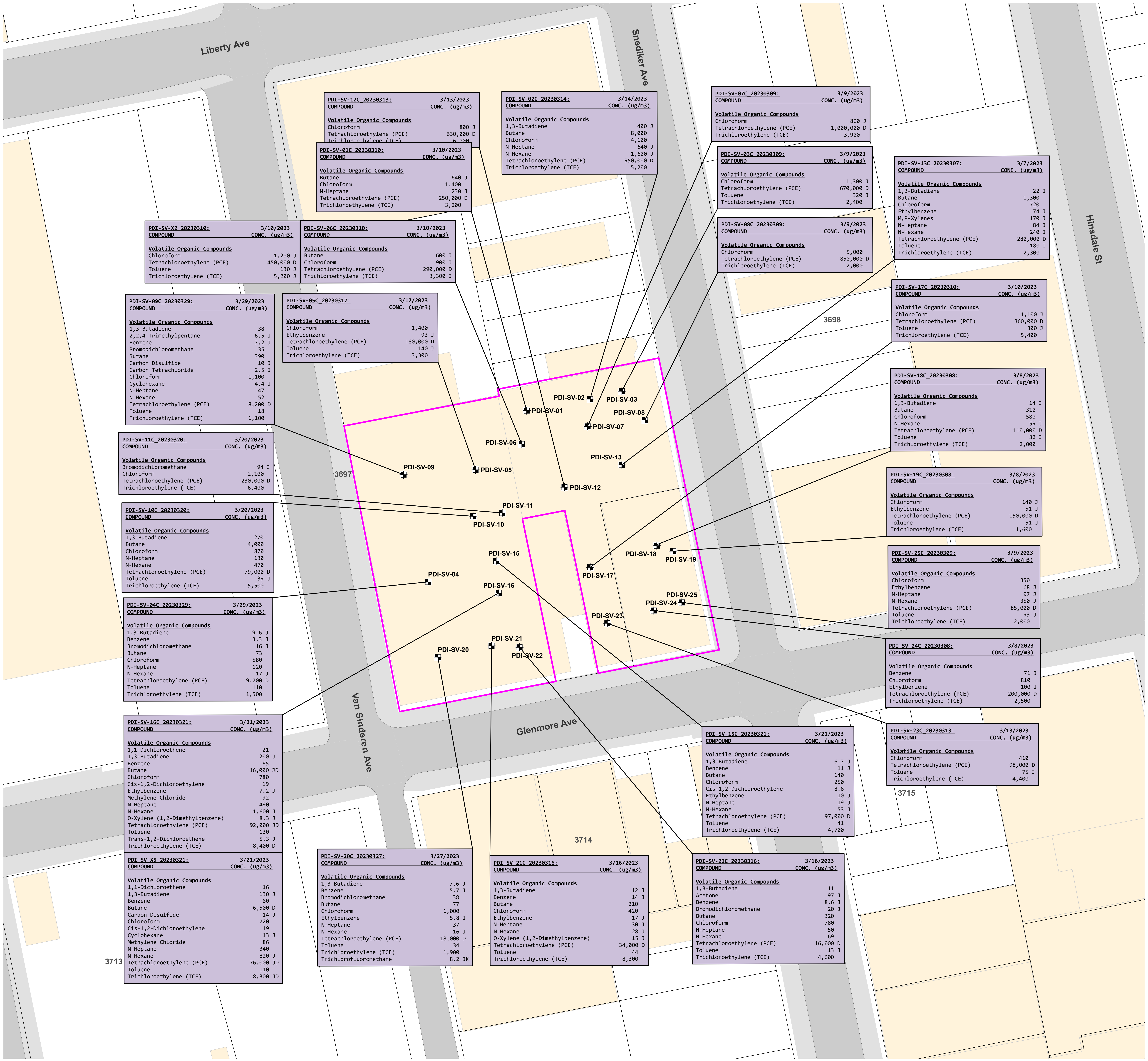
SOIL VAPOR CONCENTRATIONS (APPROXIMATELY 20 FEET BELOW GRADE)

DATE
05/22/2023

PROJECT NO.
220249

FIGURE
6C

©2023 AKRF Q:\Projects\220249 - 221 GLENMORE AVENUE\Technical\GIS and Graphics\SAR\RIR Update\220249 Fig 10C - Soil Vapor Concentrations - 20 FT BG.mxd5/22/2023 2:43:56 PM mvelleux



PDI-SV-12C_20230313: 3/13/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	800 J
Tetrachloroethylene (PCE)	630,000 D
Trichloroethylene (TCE)	6,000

PDI-SV-01C_20230310: 3/10/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Butane	640 J
Chloroform	1,400
N-Heptane	230 J
Tetrachloroethylene (PCE)	250,000 D
Trichloroethylene (TCE)	3,200

PDI-SV-02C_20230314: 3/14/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	400 J
Butane	8,000
Chloroform	4,100
N-Heptane	640 J
N-Hexane	1,600 J
Tetrachloroethylene (PCE)	950,000 D
Trichloroethylene (TCE)	5,200

PDI-SV-07C_20230309: 3/9/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	890 J
Tetrachloroethylene (PCE)	1,000,000 D
Trichloroethylene (TCE)	3,900

PDI-SV-03C_20230309: 3/9/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	1,300 J
Tetrachloroethylene (PCE)	670,000 D
Toluene	320 J
Trichloroethylene (TCE)	2,400

PDI-SV-08C_20230309: 3/9/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	5,000
Tetrachloroethylene (PCE)	850,000 D
Trichloroethylene (TCE)	2,000

PDI-SV-13C_20230307: 3/7/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	22 J
Butane	1,300
Chloroform	720
Ethylbenzene	74 J
M,P-Xylenes	170 J
N-Heptane	84 J
N-Hexane	240 J
Tetrachloroethylene (PCE)	280,000 D
Toluene	180 J
Trichloroethylene (TCE)	2,300

PDI-SV-X2_20230310: 3/10/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	1,200 J
Tetrachloroethylene (PCE)	450,000 D
Toluene	130 J
Trichloroethylene (TCE)	5,200 J

PDI-SV-06C_20230310: 3/10/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Butane	600 J
Chloroform	900 J
Tetrachloroethylene (PCE)	290,000 D
Trichloroethylene (TCE)	3,300 J

PDI-SV-17C_20230310: 3/10/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	1,100 J
Tetrachloroethylene (PCE)	360,000 D
Toluene	300 J
Trichloroethylene (TCE)	5,400

PDI-SV-09C_20230329: 3/29/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	38
2,2,4-Trimethylpentane	6.5 J
Benzene	7.2 J
Bromodichloromethane	35
Butane	390
Carbon Disulfide	10 J
Carbon Tetrachloride	2.5 J
Chloroform	1,100
Cyclohexane	4.4 J
N-Heptane	47
N-Hexane	52
Tetrachloroethylene (PCE)	8,200 D
Toluene	18
Trichloroethylene (TCE)	1,100

PDI-SV-05C_20230317: 3/17/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	1,400
Ethylbenzene	93 J
Tetrachloroethylene (PCE)	180,000 D
Toluene	140 J
Trichloroethylene (TCE)	3,300

PDI-SV-18C_20230308: 3/8/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	14 J
Butane	310
Chloroform	580
N-Hexane	59 J
Tetrachloroethylene (PCE)	110,000 D
Toluene	32 J
Trichloroethylene (TCE)	2,000

PDI-SV-11C_20230320: 3/20/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Bromodichloromethane	94 J
Chloroform	2,100
Tetrachloroethylene (PCE)	230,000 D
Trichloroethylene (TCE)	6,400

PDI-SV-19C_20230308: 3/8/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	140 J
Ethylbenzene	51 J
Tetrachloroethylene (PCE)	150,000 D
Toluene	51 J
Trichloroethylene (TCE)	1,600

PDI-SV-10C_20230320: 3/20/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	270
Butane	4,000
Chloroform	870
N-Heptane	130
N-Hexane	470
Tetrachloroethylene (PCE)	79,000 D
Toluene	39 J
Trichloroethylene (TCE)	5,500

PDI-SV-25C_20230309: 3/9/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	350
Ethylbenzene	68 J
N-Heptane	97 J
N-Hexane	350 J
Tetrachloroethylene (PCE)	85,000 D
Toluene	93 J
Trichloroethylene (TCE)	2,000

PDI-SV-04C_20230329: 3/29/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	9.6 J
Benzene	3.3 J
Bromodichloromethane	16 J
Butane	73
Chloroform	580
N-Heptane	120
N-Hexane	17 J
Tetrachloroethylene (PCE)	9,700 D
Toluene	110
Trichloroethylene (TCE)	1,500

PDI-SV-24C_20230308: 3/8/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Benzene	71 J
Chloroform	810
Ethylbenzene	100 J
Tetrachloroethylene (PCE)	200,000 D
Trichloroethylene (TCE)	2,500

PDI-SV-16C_20230321: 3/21/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1-Dichloroethene	21
1,3-Butadiene	200 J
Benzene	65
Butane	16,000 JD
Chloroform	780
Cis-1,2-Dichloroethylene	19
Ethylbenzene	7.2 J
Methylene Chloride	92
N-Heptane	490
N-Hexane	1,600 J
O-Xylene (1,2-Dimethylbenzene)	8.3 J
Tetrachloroethylene (PCE)	92,000 JD
Toluene	130
Trans-1,2-Dichloroethene	5.3 J
Trichloroethylene (TCE)	8,400 D

PDI-SV-15C_20230321: 3/21/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	6.7 J
Benzene	11 J
Butane	140
Chloroform	250
Cis-1,2-Dichloroethylene	8.6
Ethylbenzene	10 J
N-Heptane	19 J
N-Hexane	53 J
Tetrachloroethylene (PCE)	97,000 D
Toluene	41
Trichloroethylene (TCE)	4,700

PDI-SV-23C_20230313: 3/13/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Chloroform	410
Tetrachloroethylene (PCE)	98,000 D
Toluene	75 J
Trichloroethylene (TCE)	4,400

PDI-SV-X5_20230321: 3/21/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,1-Dichloroethene	16
1,3-Butadiene	130 J
Benzene	60
Butane	6,500 D
Carbon Disulfide	14 J
Chloroform	720
Cis-1,2-Dichloroethylene	19
Cyclohexane	13 J
Methylene Chloride	86
N-Heptane	340
N-Hexane	820 J
Tetrachloroethylene (PCE)	76,000 JD
Toluene	110
Trichloroethylene (TCE)	8,300 JD

PDI-SV-20C_20230327: 3/27/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	7.6 J
Benzene	5.7 J
Bromodichloromethane	38
Butane	77
Chloroform	1,000
Ethylbenzene	5.8 J
N-Heptane	37
N-Hexane	16 J
Tetrachloroethylene (PCE)	18,000 D
Toluene	34
Trichloroethylene (TCE)	1,900
Trichlorofluoromethane	8.2 JK

PDI-SV-21C_20230316: 3/16/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	12 J
Benzene	14 J
Butane	210
Chloroform	420
Ethylbenzene	17 J
N-Heptane	30 J
N-Hexane	28 J
O-Xylene (1,2-Dimethylbenzene)	15 J
Tetrachloroethylene (PCE)	34,000 D
Toluene	44
Trichloroethylene (TCE)	8,300

PDI-SV-22C_20230316: 3/16/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
1,3-Butadiene	11
Acetone	97 J
Benzene	8.6 J
Bromodichloromethane	20 J
Butane	320
Chloroform	780
N-Heptane	50
N-Hexane	69
Tetrachloroethylene (PCE)	16,000 D
Toluene	13 J
Trichloroethylene (TCE)	4,600

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.

LEGEND

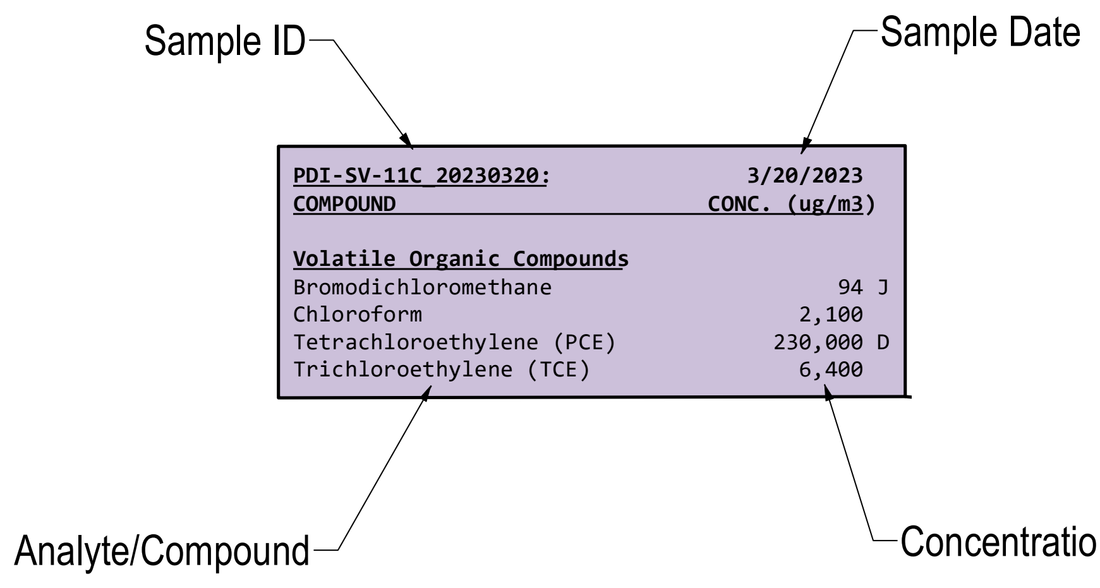
▭	PROJECT SITE BOUNDARY
1	LOT BOUNDARY AND TAX LOT NUMBER
3697	BLOCK NUMBER
▭	BUILDING
⌖	SRI SOIL VAPOR POINT LOCATION (FEBRUARY TO APRIL 2023)

SOIL VAPOR

D: Analyte concentration obtained from dilution.
J: The concentration given is an estimated value.
L: Sample result is estimated and biased low.

µg/m³ - micrograms per cubic meter

Concentrations detected above the laboratory reporting limit are shown.



PDI-SV-11C_20230320: 3/20/2023

COMPOUND	CONC. (ug/m3)
Volatile Organic Compounds	
Bromodichloromethane	94 J
Chloroform	2,100
Tetrachloroethylene (PCE)	230,000 D
Trichloroethylene (TCE)	6,400

0 30 60
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site
221-241 Glenmore Avenue
Brooklyn, New York

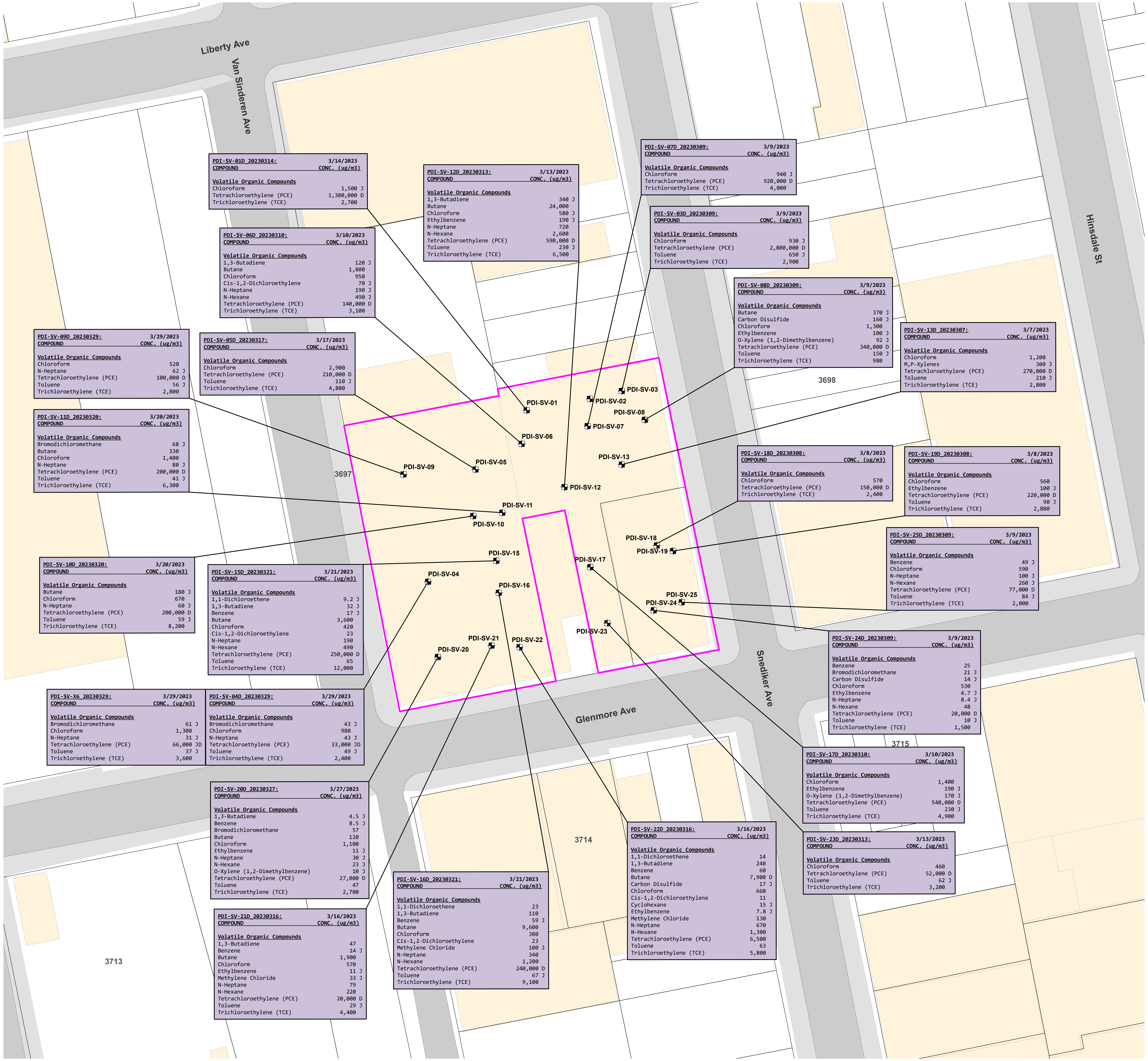
SOIL VAPOR CONCENTRATIONS (APPROXIMATELY 30 FEET BELOW GRADE)

DATE
05/22/2023

PROJECT NO.
220249

FIGURE
6D

ⓒ2023 AKRF Q:\Projects\220249 - 221 GLENMORE AVENUE\Technical\GIS and Graphics\SAR\RIR Update\220249 Fig 10D - Soil Vapor Concentrations - 30 FT BG.mxd5/22/2023 7:08:23 PM mvelleux



PDI-SV-07D_20230309:	3/9/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Chloroform	940 J
Tetrachloroethylene (PCE)	920,000 D
Trichloroethylene (TCE)	4,000

PDI-SV-01D_20230314:	3/14/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Chloroform	1,500 J
Tetrachloroethylene (PCE)	1,300,000 D
Trichloroethylene (TCE)	2,700

PDI-SV-12D_20230313:	3/13/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
1,3-Butadiene	340 J
Butane	24,000
Chloroform	580 J
Ethylbenzene	190 J
N-Heptane	720
N-Hexane	2,600
Tetrachloroethylene (PCE)	590,000 D
Toluene	230 J
Trichloroethylene (TCE)	6,500

PDI-SV-03D_20230309:	3/9/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Chloroform	930 J
Tetrachloroethylene (PCE)	2,800,000 D
Toluene	650 J
Trichloroethylene (TCE)	2,900

PDI-SV-06D_20230310:	3/10/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
1,3-Butadiene	120 J
Butane	1,800
Chloroform	950
Cis-1,2-Dichloroethylene	70 J
N-Heptane	190 J
N-Hexane	490 J
Tetrachloroethylene (PCE)	140,000 D
Trichloroethylene (TCE)	3,100

PDI-SV-08D_20230309:	3/9/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Butane	370 J
Carbon Disulfide	160 J
Chloroform	1,300
Ethylbenzene	100 J
O-Xylene (1,2-Dimethylbenzene)	92 J
Tetrachloroethylene (PCE)	340,000 D
Toluene	150 J
Trichloroethylene (TCE)	980

PDI-SV-09D_20230329:	3/29/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Chloroform	520
N-Heptane	62 J
Tetrachloroethylene (PCE)	100,000 D
Toluene	56 J
Trichloroethylene (TCE)	2,800

PDI-SV-05D_20230317:	3/17/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Chloroform	2,900
Tetrachloroethylene (PCE)	210,000 D
Toluene	110 J
Trichloroethylene (TCE)	4,800

PDI-SV-13D_20230307:	3/7/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Chloroform	1,200
M,P-Xylenes	300 J
Tetrachloroethylene (PCE)	270,000 D
Toluene	210 J
Trichloroethylene (TCE)	2,800

PDI-SV-11D_20230320:	3/20/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Bromodichloromethane	68 J
Butane	330
Chloroform	1,400
N-Heptane	80 J
Tetrachloroethylene (PCE)	200,000 D
Toluene	41 J
Trichloroethylene (TCE)	6,300

PDI-SV-18D_20230308:	3/8/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Chloroform	570
Tetrachloroethylene (PCE)	150,000 D
Trichloroethylene (TCE)	2,400

PDI-SV-19D_20230308:	3/8/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Chloroform	560
Ethylbenzene	100 J
Tetrachloroethylene (PCE)	220,000 D
Toluene	90 J
Trichloroethylene (TCE)	2,800

PDI-SV-25D_20230309:	3/9/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Benzene	49 J
Chloroform	590
N-Heptane	100 J
N-Hexane	260 J
Tetrachloroethylene (PCE)	77,000 D
Toluene	84 J
Trichloroethylene (TCE)	2,000

PDI-SV-10D_20230320:	3/20/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Butane	180 J
Chloroform	670
N-Heptane	60 J
Tetrachloroethylene (PCE)	200,000 D
Toluene	59 J
Trichloroethylene (TCE)	8,200

PDI-SV-15D_20230321:	3/21/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
1,1-Dichloroethene	9.2 J
1,3-Butadiene	32 J
Benzene	17 J
Butane	3,600
Chloroform	420
Cis-1,2-Dichloroethylene	23
N-Heptane	190
N-Hexane	490
Tetrachloroethylene (PCE)	250,000 D
Toluene	65
Trichloroethylene (TCE)	12,000

PDI-SV-24D_20230309:	3/9/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Benzene	25
Bromodichloromethane	21 J
Carbon Disulfide	14 J
Chloroform	530
Ethylbenzene	4.7 J
N-Heptane	8.4 J
N-Hexane	48
Tetrachloroethylene (PCE)	20,000 D
Toluene	10 J
Trichloroethylene (TCE)	1,500

PDI-SV-X6_20230329:	3/29/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Bromodichloromethane	61 J
Chloroform	1,300
N-Heptane	31 J
Tetrachloroethylene (PCE)	66,000 JD
Toluene	37 J
Trichloroethylene (TCE)	3,600

PDI-SV-04D_20230329:	3/29/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Bromodichloromethane	43 J
Chloroform	980
N-Heptane	43 J
Tetrachloroethylene (PCE)	33,000 JD
Toluene	49 J
Trichloroethylene (TCE)	2,400

PDI-SV-17D_20230310:	3/10/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Chloroform	1,400
Ethylbenzene	190 J
O-Xylene (1,2-Dimethylbenzene)	170 J
Tetrachloroethylene (PCE)	540,000 D
Toluene	230 J
Trichloroethylene (TCE)	4,900

PDI-SV-20D_20230327:	3/27/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
1,3-Butadiene	4.5 J
Benzene	8.5 J
Bromodichloromethane	57
Butane	120
Chloroform	1,100
Ethylbenzene	11 J
N-Heptane	30 J
N-Hexane	23 J
O-Xylene (1,2-Dimethylbenzene)	10 J
Tetrachloroethylene (PCE)	27,000 D
Toluene	47
Trichloroethylene (TCE)	2,700

PDI-SV-22D_20230316:	3/16/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
1,1-Dichloroethene	14
1,3-Butadiene	240
Benzene	60
Butane	7,900 D
Carbon Disulfide	17 J
Chloroform	660
Cis-1,2-Dichloroethylene	11
Cyclohexane	15 J
Ethylbenzene	7.8 J
Methylene Chloride	130
N-Heptane	670
N-Hexane	1,300
Tetrachloroethylene (PCE)	6,500
Toluene	63
Trichloroethylene (TCE)	5,800

PDI-SV-23D_20230313:	3/13/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Chloroform	460
Tetrachloroethylene (PCE)	52,000 D
Toluene	62 J
Trichloroethylene (TCE)	3,200

PDI-SV-16D_20230321:	3/21/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
1,1-Dichloroethene	23
1,3-Butadiene	110
Benzene	59 J
Butane	9,600
Chloroform	380
Cis-1,2-Dichloroethylene	23
Methylene Chloride	100 J
N-Heptane	340
N-Hexane	1,200
Tetrachloroethylene (PCE)	240,000 D
Toluene	67 J
Trichloroethylene (TCE)	9,100

PDI-SV-21D_20230316:	3/16/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
1,3-Butadiene	47
Benzene	14 J
Butane	1,900
Chloroform	570
Ethylbenzene	11 J
Methylene Chloride	33 J
N-Heptane	79
N-Hexane	220
Tetrachloroethylene (PCE)	20,000 D
Toluene	29 J
Trichloroethylene (TCE)	4,400

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.

LEGEND

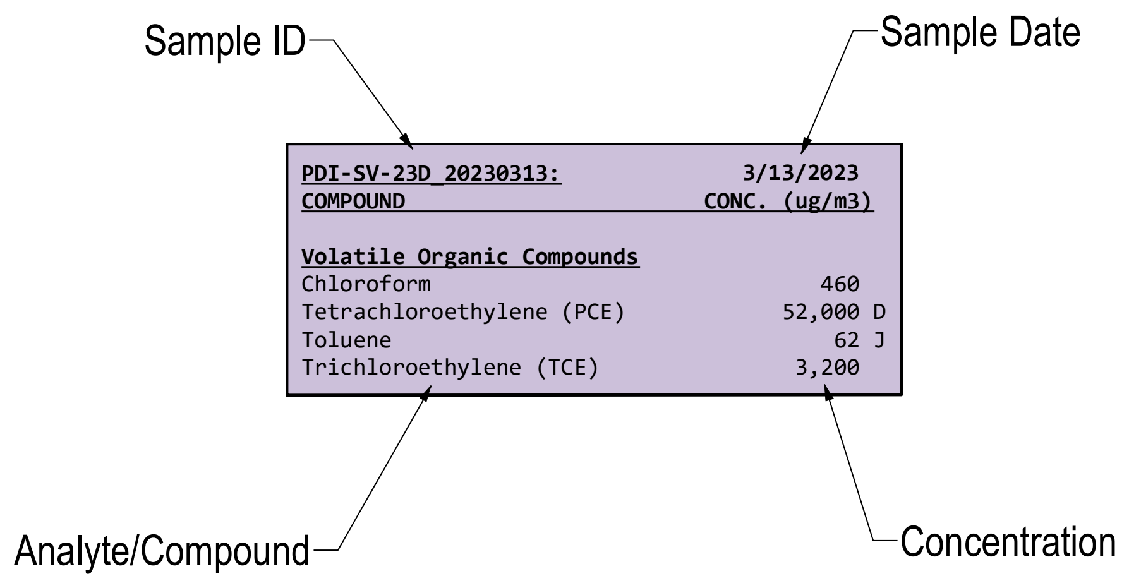
▭	PROJECT SITE BOUNDARY
1	LOT BOUNDARY AND TAX LOT NUMBER
3697	BLOCK NUMBER
▭	BUILDING
	SRI SOIL VAPOR POINT LOCATION (FEBRUARY TO APRIL 2023)

SOIL VAPOR

D: Analyte concentration obtained from dilution.
J: The concentration given is an estimated value.
L: Sample result is estimated and biased low.

µg/m³ - micrograms per cubic meter

Concentrations detected above the laboratory reporting limit are shown.



PDI-SV-23D_20230313:	3/13/2023
COMPOUND	**CONC. (ug/m3)**
Volatile Organic Compounds	
Chloroform	460
Tetrachloroethylene (PCE)	52,000 D
Toluene	62 J
Trichloroethylene (TCE)	3,200

0 30 60
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

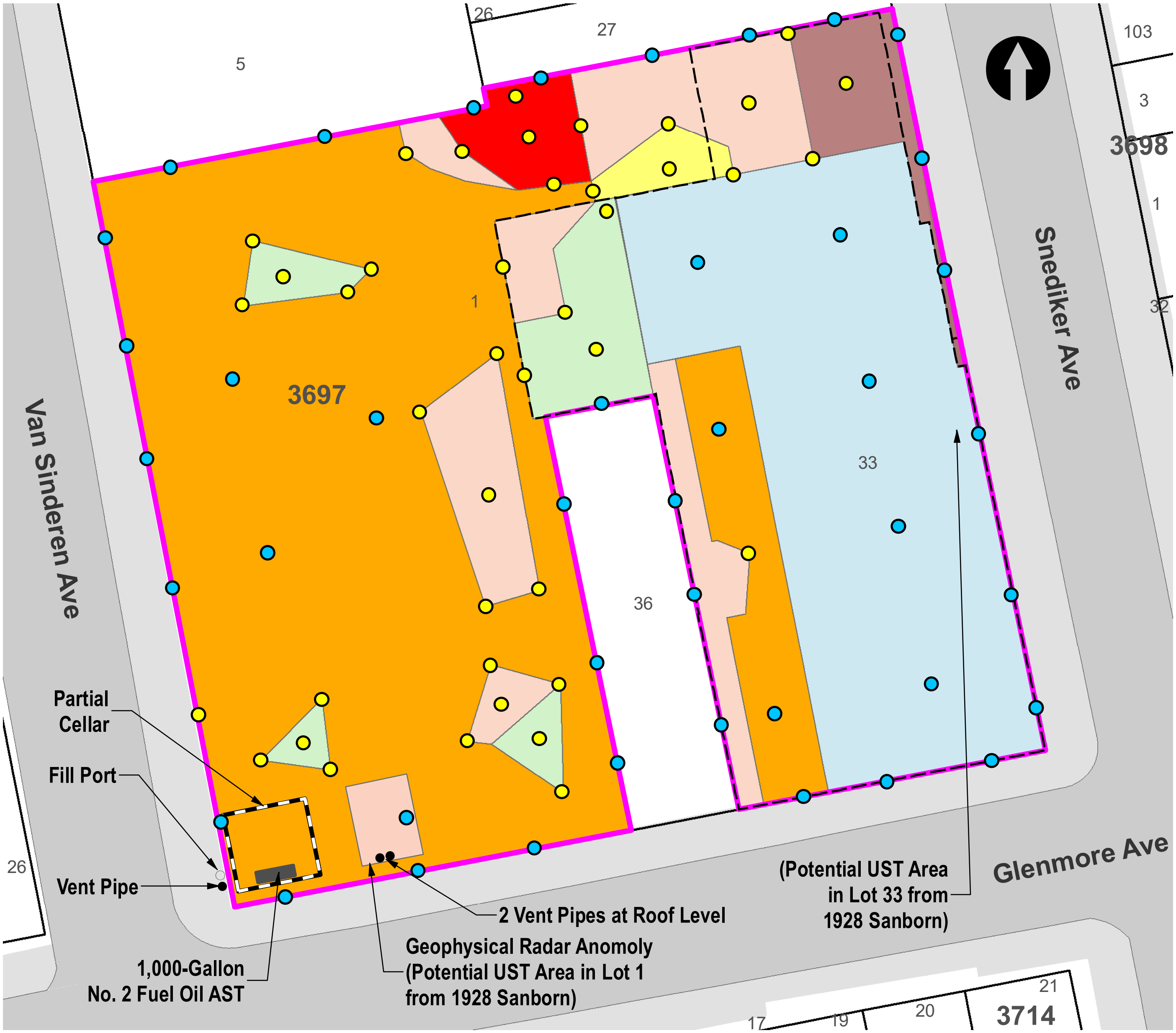
114 Snediker Avenue Site
221-241 Glenmore Avenue
Brooklyn, New York

SOIL VAPOR CONCENTRATIONS (APPROXIMATELY 40 FEET BELOW GRADE)

DATE
05/22/2023

PROJECT NO.
220249

FIGURE
6E



Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.

LEGEND

- ▭ PROJECT SITE BOUNDARY
- 1 LOT BOUNDARY AND TAX LOT NUMBER
- 3697 BLOCK NUMBER
- ⬚ APPROXIMATE PROPOSED BUILDING FOOTPRINT
- ● PROPOSED EXCAVATION ENDPOINT SAMPLE LOCATION
- ● PROPOSED HOT SPOT ENDPOINT SAMPLE LOCATION

AST: ABOVEGROUND STORAGE TANK
UST: UNDERGROUND STORAGE TANK

- 🟧 PROPOSED EXCAVATION TO APPROXIMATELY A MINIMUM OF 2 FEET BELOW GRADE (UP TO 4 FEET BELOW GRADE)
- ■ PROPOSED EXCAVATION TO APPROXIMATELY 6 FEET BELOW GRADE
- 🟩 PROPOSED EXCAVATION TO APPROXIMATELY 8 FEET BELOW GRADE
- 🟫 PROPOSED EXCAVATION TO APPROXIMATELY 10 FEET BELOW GRADE
- 🟨 PROPOSED EXCAVATION TO APPROXIMATELY 12 FEET BELOW GRADE
- 🟦 PROPOSED EXCAVATION TO APPROXIMATELY 15 FEET BELOW GRADE
- 🟥 PROPOSED EXCAVATION TO APPROXIMATELY 21 FEET BELOW GRADE

0 40 80
SCALE IN FEET

Note: Actual excavation will be expanded as needed based on field observations, endpoint sampling results, and sloping/support of excavation.

AKRF
440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site
221-241 Glenmore Avenue
Brooklyn, New York

PROPOSED IRM EXCAVATION AND ENDPOINT SAMPLING PLAN

DATE
6/2/2023

PROJECT NO.
220249

FIGURE
7

APPENDIX A

HEALTH AND SAFETY PLAN

114 SNEDIKER AVENUE SITE

221-241 GLENMORE AVENUE
BROOKLYN, NEW YORK

Health and Safety Plan

NYSDEC BCP Site No.: C224385
AKRF Project Number: 220249

Prepared for:

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

Prepared on Behalf of:

Glenmore Owner LLC
116 East 27th Street, 11th Floor
New York, New York 10016

Prepared by:

AKRF

440 Park Avenue South, 7th Floor
New York, NY 10016
212-696-0670

MAY 2023

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FIGURES

APPENDICES

1.0 INTRODUCTION

This environmental Health and Safety Plan (HASP) has been developed for implementation of the Interim Remedial Measures (IRM) Work Plan activities conducted by all personnel on-site, both AKRF employees and others, at the 114 Snediker Avenue Site located at 221-241 Glenmore Avenue in the New Lots sub-section of the East New York neighborhood of Brooklyn, New York, hereafter referred to as the "Site". The approximately 0.823-acre Site is identified by the City of New York as Borough of Brooklyn, Block 3697, Lots 1 and 33. The Requestor is applied to remediate the Site under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) in December 2022. On May 22, 2023, a Brownfield Cleanup Agreement (BCA) was executed between the Volunteer and the NYSDEC to complete remediation and investigation activities at the Site under purview of the NYSDEC BCP (BCP Site No. C224385).

The Site is developed with three adjoining buildings: a two-story building on Lot 33, formerly utilized as storage and workshop spaces on the first floor and management offices on the second floor (southeast portion of the Site, 241 Glenmore Avenue); a single-story former manufacturing building on the northeastern portion of Lot 1 (northeast portion of Site, 221 Glenmore Avenue); and, a single-story former manufacturing building on the western portion of Lot 1, which previously operated as the lighting manufacturing area (western portion of the Site, 221 Glenmore Avenue). The three adjoining buildings were occupied by Legion Lighting Co. Inc. (Legion), an industrial lighting manufacturer. Manufacturing operations ceased in May 2022 and the Site has only been used for storage since. A small sub-grade cellar located in the southwestern corner of Lot 1 (221 Glenmore Avenue) contains an encased 1,000-gallon No. 2 fuel oil aboveground storage tank (AST) and two fuel-oil fired boilers. A Site Location map is provided as Figure 1.

A Phase II Environmental Site Assessment (ESA) was conducted by Impact Environmental Closures, Inc, (IEC) in May 2022 and a Remedial Investigation (RI) and Supplemental Remedial Investigation (SRI) were conducted by AKRF in October 2022 and February through April 2023, respectively. The investigations have identified elevated levels of chlorinated volatile organic compounds (CVOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) and metals in soil, chlorinated VOCs, metals and PFOS/PFOA in groundwater and chlorinated VOCs in soil vapor.

The purpose of this HASP is to assign responsibilities, establish personnel protection standards and mandatory safety practices and procedures, and provide for contingencies that may arise during field activities at the Site. The HASP is intended to minimize health and safety risks resulting from the known or potential presence of contaminated materials.

This HASP does not discuss other routine health and safety issues common to general construction and excavation, including but not limited to slips, trips, falls, shoring, and other physical hazards. All AKRF employees are directed that all work must be performed in accordance with the Company's Generic HASP and all Occupation Safety and Health Administration (OSHA) applicable regulations for the work activities required for the project. All project personnel are furthermore directed that they are not permitted to enter Permit Required Confined Spaces (as defined by OSHA). For issues unrelated to contaminated materials, all non-AKRF employees are to be bound by all applicable OSHA regulations as well as any more stringent requirements specified by their employer in their corporate HASP or otherwise.

AKRF is not responsible for providing oversight for issues unrelated to contaminated materials for non-employees. This oversight shall be the responsibility of the employer of that worker or other official designated by that employer.

2.0 HEALTH AND SAFETY GUIDELINES AND PROCEDURES

2.1 Hazard Evaluation

2.1.1 Hazards of Concern

Check all that apply		
(**X**) Organic Chemicals	(**X**) Inorganic Chemicals	( ) Radiological
( ) Biological	( ) Explosive/Flammable	( ) Oxygen Deficient Atm
(**X**) Heat Stress	(**X**) Cold Stress	( ) Carbon Monoxide
Comments: No personnel are permitted to enter permit confined spaces.		

2.1.2 Physical Characteristics

Check all that apply		
(**X**) Liquid	(**X**) Solid	( ) Sludge
(**X**) Vapors	( ) Unknown	( ) Other
Comments:		

2.1.3 Hazardous Materials

Check all that apply

Chemicals	**Solids**	**Sludges**	**Solvents**	**Oils**	**Other**
( ) Acids	(**X**) Ash	( ) Paints	( ) Halogens	( ) Transformer	( ) Lab
( ) Caustics	( ) Asbestos	( ) Metals	(**X**) Petroleum	( ) Other DF	( ) Pharm
(**X**) Pesticides	( ) Tailings	( ) POTW	(**X**) Chlorinated solvents	( ) Motor or Hydraulic Oil	( ) Hospital
(**X**) Petroleum	(**X**) Other	( )Other:		(**X**) Gasoline	( ) Rad
( ) Inks	Fill material			(**X**) Fuel Oil	( ) MGP
(**X**) PCBs					( ) Mold
(**X**) Metals					( ) Cyanide
(**X**)Other: VOCs & SVOCs					

2.1.4 Chemicals of Concern

Chemical	REL/PEL/STEL	Health Hazards
Arsenic	REL C: 0.002 mg/m^3 PEL: 0.010 mg/m^3	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen].
Barium	REL: 0.5 mg/m^3 PEL: 0.5 mg/m^3	(ingestion) Irritation of digestive system, muscle weakness, difficulty breathing, blood pressure changes
Benzene	REL: 0.1 ppm N STEL: 1 ppm PEL: 1 ppm O STEL: 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen].
Cadmium	PEL: 0.005 mg/m^3	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen].
Carbon Disulfide	REL: 1 ppm N STEL: 10 ppm PEL: 20 ppm PEL C: 30 ppm; 30-min man peak: 100 ppm	Dizziness, headache, poor sleep, lassitude (weakness, exhaustion), anxiety, anorexia, weight loss; psychosis; polyneuropathy; Parkinson-like syndrome; ocular changes; coronary heart disease; gastritis; kidney, liver injury; eye, skin burns; dermatitis; reproductive effects.
Carbon Tetrachloride	N STEL: 2 ppm PEL: 10 ppm PEL C: 25 ppm; 5-min max peak 200 ppm	Irritation eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen].
Chromium	REL: 0.5 mg/m^3 PEL: 1 mg/m^3	Irritation eyes, skin; lung fibrosis (histologic).
Copper	REL: 1 mg/m^3 PEL: 1 mg/m^3	Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; In Animals: lung, liver, kidney damage; anemia.

DDD, DDE, & DDT	REL: 0.5 mg/m^3 PEL: 1 mg/m^3	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen].
Ethylbenzene	REL: 100 ppm N STEL: 125 ppm PEL: 100 ppm	Irritation eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects.
Fuel Oils	REL: 100 mg/m3	Irritation eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid).
Lead	REL: 0.050 mg/m^3 PEL:0.050 mg/m^3	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension.
Mercury	REL: 0.05 mg/m^3 REL C: 0.1 mg/m^3 PEL: 0.1 mg/m^3	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria.
Methylene Chloride	PEL: 25 ppm O STEL: 125 ppm	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen].

PAHs	REL: 0.1 mg/m^3 PEL: 0.2 mg/m^3	Effects reported from occupational exposure to PAHs include chronic bronchitis, chronic cough irritation, bronchogenic cancer, dermatitis, cutaneous photosensitization, and pilosebaceous reactions. Reported health effects associated with chronic exposure to coal tar and its by-products (e.g., PAHs): Skin: erythema, burns, and warts on sun-exposed areas with progression to cancer. The toxic effects of coal tar are enhanced by exposure to ultraviolet light. Eyes: irritation and photosensitivity. Respiratory system: cough, bronchitis, and bronchogenic cancer. Gastrointestinal system: leukoplakia, buccal-pharyngeal cancer, and cancer of the lip. Hematopoietic system: leukemia (inconclusive) and lymphoma. Genitourinary system: hematuria and kidney and bladder cancers.
PCBs	REL: 0.001 mg/m^3 PEL: 0.5 mg/m^3	Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen].
Tetrachloroethylene (PCE)	PEL: 100 ppm PEL C: 200 ppm; max peak: 300 ppm	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen].
Toluene	REL: 100 ppm N STEL: 150 ppm PEL: 200 ppm PEL C: 300 ppm; 10-min max peak: 500 ppm	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Trichloroethylene (TCE)	PEL: 100 ppm PEL C: 200 ppm; 5-min max peak: 300 ppm	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen].
Xylene	REL: 100 ppm N STEL: 150 ppm PEL: 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.

Zinc	REL: 5 mg/m^3 REL C: 15 mg/m^3 N STEL: 10 mg/m^3 PEL: 5 mg/m^3 (ZnO fume); 15 mg/m^3 (ZnO dust)	Chills, elevated body temperature, myalgia, cough, fatigue, chest pain, stomach cramps, nausea, anemia, changes in cholesterol levels, and vomiting.
Notes: REL: Recommended exposure limit (NIOSH) PEL: Permissible exposure limits (OSHA) STEL: Short-term exposure limit N: NIOSH O: OSHA C: Ceiling		

The potential health effects from these known and suspected on-site contaminants are provided in Appendix B.

2.2 Designated Personnel

AKRF will appoint one of its on-site personnel as the Site Safety Officer (SSO). This individual will be responsible for the implementation of the HASP. The SSO will work under the direction of a Qualified Environmental Professional (QEP) and will be experienced in the implementation of air monitoring and hazardous materials sampling programs. Health and safety training required for the SSO and all field personnel are outlined in Section 2.3 of this HASP.

2.3 Training

All personnel who enter the work area while intrusive activities are being performed will have completed a 40-hour training course that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards. In addition, all personnel will have up-to-date 8-hour refresher training. The training will allow personnel to recognize and understand the potential hazards to health and safety. All field personnel must attend a training program, whose purpose is to:

- Make them aware of the potential hazards they may encounter;
- Provide the knowledge and skills necessary for them to perform the work with minimal risk to health and safety
- Make them aware of the purpose and limitations of safety equipment; and
- Ensure that they can safely avoid or escape from emergencies.

Each member of the field crew will be instructed in these objectives before he/she goes onto the Site. A Site safety meeting will be conducted at the start of the project. Additional meetings shall be conducted, as necessary, for new personnel working at the Site.

2.4 Medical Surveillance Program

All AKRF and subcontractor personnel performing field work involving subsurface disturbance at the Site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120 (f). A physician’s medical release for work will be confirmed by the SSO before an employee can begin Site activities. The medical release shall consider the type of work to be performed and the required personal protective equipment (PPE). The medical examination will, at a minimum, be provided annually and upon termination of hazardous waste Site work.

2.5 Site Work Zones

During any activities involving subsurface disturbance, the work area must be divided into various zones to prevent the spread of contamination, ensure that proper protective equipment is donned, and provide an area for decontamination.

The Exclusion Zone is defined as the area where exposure to impacted media could be encountered. The Contamination Reduction Zone (CRZ) is the area where decontamination procedures take place and is located next to the Exclusion Zone. The Support is the zone area where support facilities such as vehicles, fire extinguisher, and first aid supplies are located. The emergency staging area (part of the Support Zone) is the area where all workers on-site would assemble in the event of an emergency. A summary of these areas is provided below. These zones may be changed by the SSO, depending on that day's activities. All field personnel will be informed of the location of these zones before work begins.

Task	Exclusion Zone	CRZ	Support Zone
Soil Excavation	15 feet from excavation border and excavation equipment or vehicles	15 feet from excavation border and excavation equipment or vehicles	As Needed
Comments: Control measures such as "caution tape" and/or traffic cones will be placed around the perimeter of the work area when work is being done in a public area.			

2.6 Personal Protection Equipment

The personal protection equipment required for various kinds of site investigation tasks are based on 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, Appendix B, "General Description and Discussion of the Levels of Protection and Protective Gear."

AKRF field personnel and other site personnel shall wear, at a minimum, Level D personal protective equipment. The protection will be based on the air monitoring described in the Community Air Monitoring Plan (CAMP) as part of the IRM.

LEVEL OF PROTECTION & PPE		Excavation/ Sampling
Level D (**X**) Steel Toe Shoes (**X**) Hard Hat (within 25 ft of drill rig) (**X**) Work Gloves (**X**) Face Covering (Covid-19)	(**X**) Safety Glasses ( ) Face Shield (**X**) Ear Plugs (within 25 ft of drill rig) (**X**) Nitrile Gloves (**X**) Tyvek for drill rig operator if NAPL present	Yes
Level C ***(in addition to Level D)*** (**X**) Half-Face Respirator OR (**X**) Full Face Respirator	( ) Particulate Cartridge ( ) Organic Cartridge (**X**) Dual Organic/	If PID > 10 ppm or particulate > 5 µg/m^3 in (breathing zone)

LEVEL OF PROTECTION & PPE		**Excavation/ Sampling**
( ) Full-Face PAPR	Particulate Cartridge	
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breathe or any odors detected).		

2.7 General Work Practices

To protect the health and safety of the field personnel, field personnel will adhere to the guidelines listed below during activities involving subsurface disturbance:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited, except in designated areas on the Site. These areas will be designated by the SSO.
- Workers must wash their hands thoroughly on leaving the work area and before eating, drinking, or any other such activity.
- The workers should shower as soon as possible after leaving the Site. Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat/cold stress.

3.0 EMERGENCY PROCEDURES AND EMERGENCY RESPONSE PLAN

The field crew will be equipped with emergency equipment, such as a first aid kit and disposable eye washes. In the case of a medical emergency, the SSO will determine the nature of the emergency and he/she will have someone call for an ambulance, if needed. If the nature of the injury is not serious, i.e., the person can be moved without expert emergency medical personnel, he/she should be taken to a hospital by on-site personnel. Directions to the hospital are provided below, and a hospital route map is provided as Figure 2.

3.1 Hospital Directions

Hospital Name:	Brookdale Hospital – The Radutzky Emergency Care Pavilion
Phone Number:	(718) 240-5363
Address/Location:	1 Brookdale Plaza, Brooklyn, New York 11212
Directions:	1. Starting on Glenmore Avenue, continue east towards Snediker Avenue 2. Turn RIGHT onto Hinsdale Street 3. Turn RIGHT onto New Lots Avenue 4. Turn LEFT onto Junius Street 5. Slight RIGHT onto Gregory “Jocko” Jackson Blvd/Linden Blvd 6. Slight RIGHT toward Linden Blvd 7. Slight LEFT onto Linden Blvd 8. The emergency room will be on the RIGHT

3.2 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF	Deborah Shapiro, QEP	QA/QC Officer	646-388-9544 (office)
	Rebecca Kinal, PE	Remedial Engineer	914-922-2362 (office)
	Bryan Zieroff	Project Manager	914-922-2383 (office) 203-246-1566 (mobile)
	Mark Jepsen	Project Manager Alternate	646-388-9567 (office) 614-560-5425 (mobile)
	Antonio Cardenas	Field Team Leader/SSO	(718) 551-7193 (mobile)
	Tim Larigan	Alternate Field Team Leader/SSO	862-368-8791 (mobile)
Glenmore Owner LLC	Joanna Kandel	BCP Volunteer	(646) 849-4289 (office)
Ambulance, Fire Department & Police Department	-	-	911
NYSDEC Spill Hotline	-	-	800-457-7362

4.0 APPROVAL & ACKNOWLEDGMENTS OF HASP

APPROVAL

Signed: ___________________________________ Date: ____________________________________

AKRF Project Manager

Signed: ___________________________________ Date: ____________________________________

AKRF Health and Safety Officer

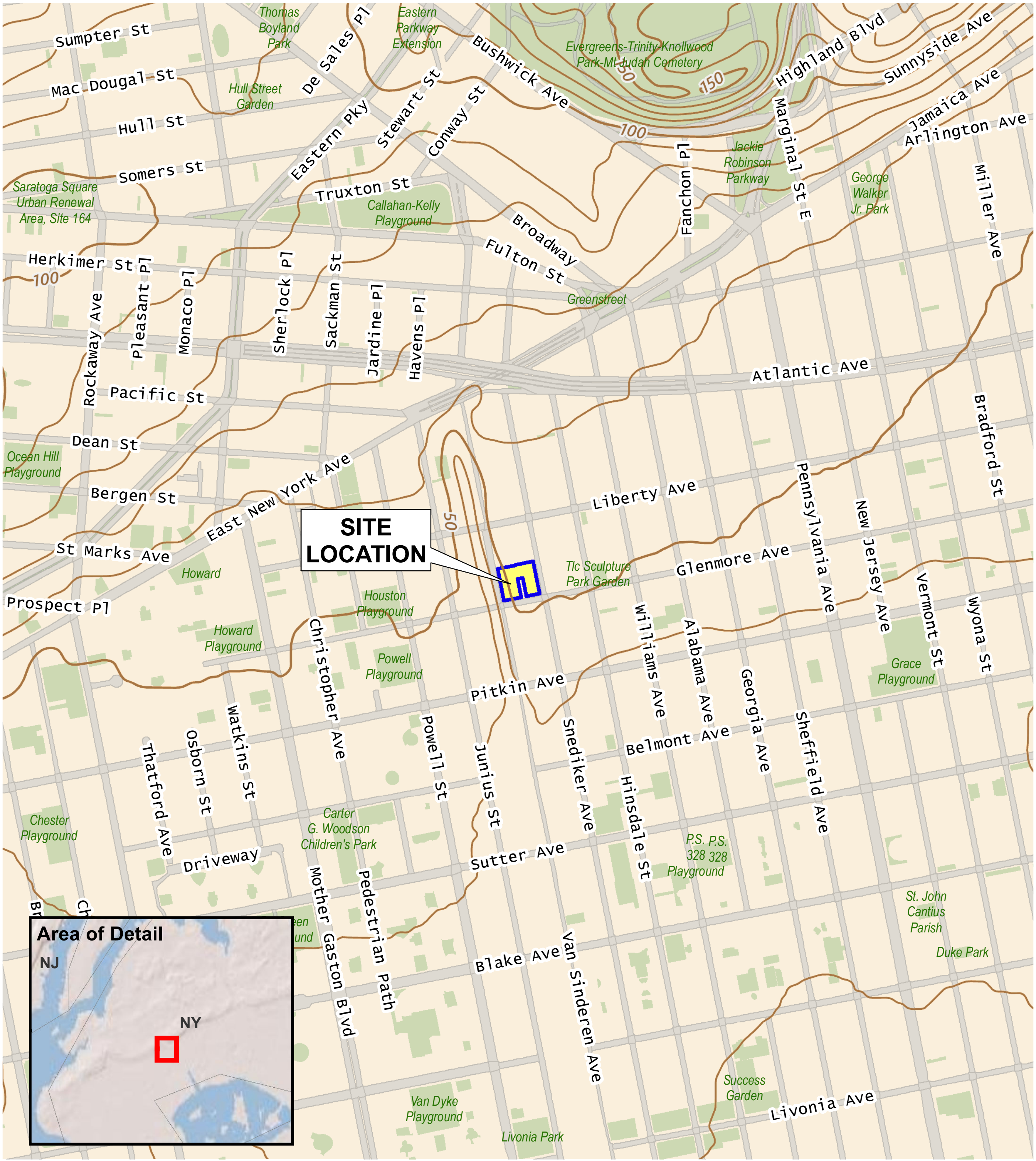
Below is an affidavit that must be signed by all workers who enter the site. A copy of the HASP must be on-site at all times and will be kept by the SSO.

AFFIDAVIT

I,_________________________(name), of_______________________________(company name), have read the Health and Safety Plan (HASP) for the property located at 221-241 Glenmore Avenue, Brooklyn, New York. I agree to conduct all on-site work in accordance with the requirements set forth in this HASP and understand that failure to comply with this HASP could lead to my removal from the site.

Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________
Signed:	__________________________	Company:	________________________	Date:	_________

FIGURES



Service Layer Credits: USGS The National Map: 3d Elevation Program, Data Refreshed July, 2021

0 800 1,600

SCALE IN FEET

AKRF

440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site

221-241 Glenmore Avenue

Brooklyn, New York

SITE LOCATION

DATE

12/16/2022

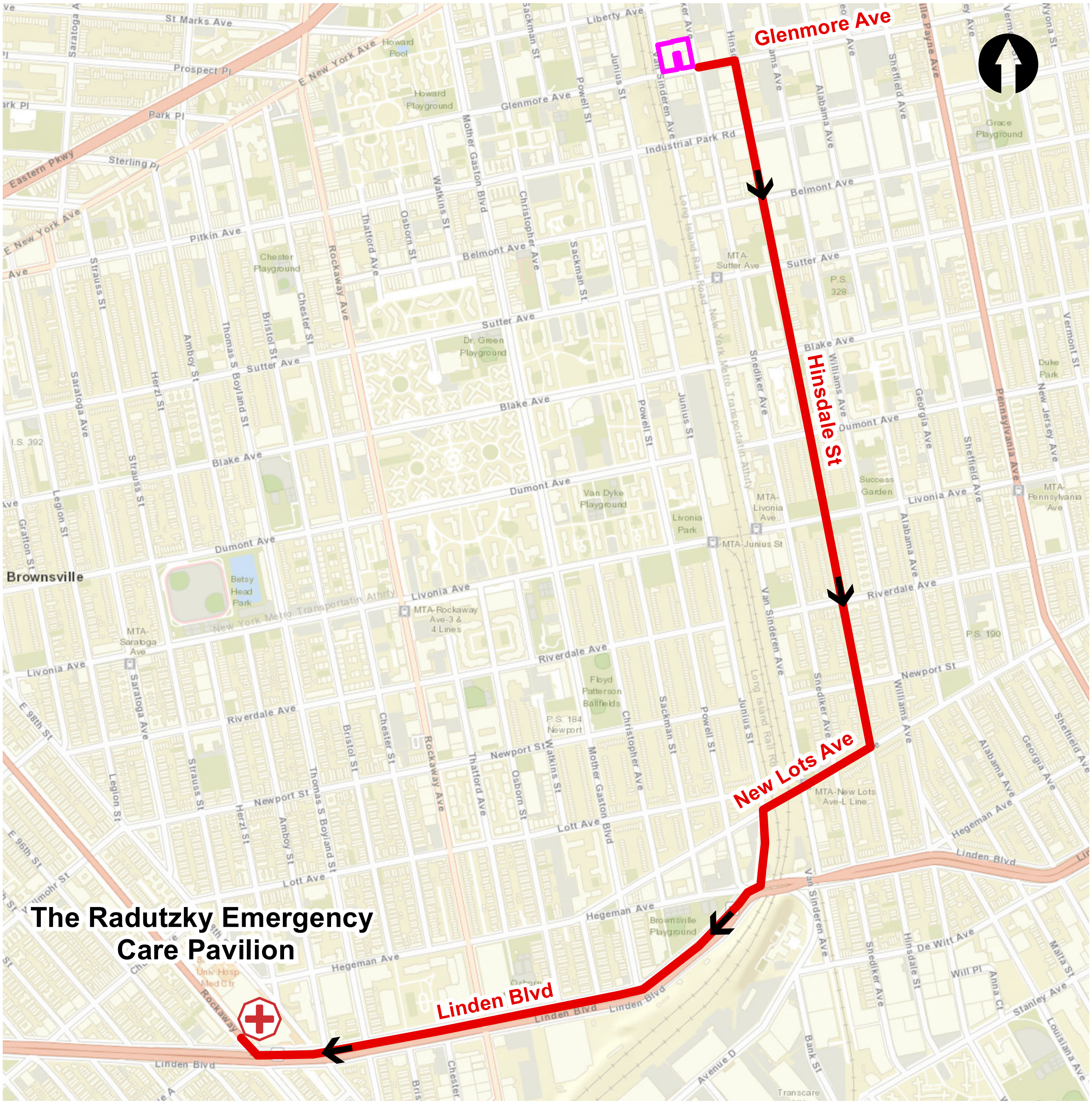
PROJECT NO.

220249

FIGURE

1

©2022 AKRF Q:\Projects\220249 - 221 GLENMORE AVENUE\Technical\GIS and Graphics\SAR\RIR\220249 Fig 1 Site Location.mxd12/16/2022 11:07:18 AM mveilleux



Service Layer Credits: ESRI World Street Map 2021

LEGEND

☐ PROJECT SITE BOUNDARY

← ROUTE TO HOSPITAL

✚ HOSPITAL LOCATION

The Radutzky Emergency Care Pavilion
1 Brookdale Plaza
Brooklyn, NY 11212
(718) 240-5363

0 1,000 2,000
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site
221-241 Glenmore Avenue
Brooklyn, New York

HOSPITAL ROUTE MAP

DATE
12/7/2022

PROJECT NO.
220249

FIGURE
2

APPENDIX A

POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

BENZENE
CAS # 71-43-2

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1997**

This fact sheet answers the most frequently asked health questions (FAQs) about benzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 813 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is benzene?
(Pronounced bĕn′zēn′)

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

What happens to benzene when it enters the environment?

- ☐ Industrial processes are the main source of benzene in the environment.
- ☐ Benzene can pass into the air from water and soil.
- ☐ It reacts with other chemicals in the air and breaks down within a few days.
- ☐ Benzene in the air can attach to rain or snow and be carried back down to the ground.
- ☐ It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- ☐ Benzene does not build up in plants or animals.

How might I be exposed to benzene?

- ☐ Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- ☐ Indoor air generally contains higher levels of benzene from products that contain it such as glues, paints, furniture wax, and detergents.
- ☐ Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- ☐ Leakage from underground storage tanks or from hazardous waste sites containing benzene can result in benzene contamination of well water.
- ☐ People working in industries that make or use benzene may be exposed to the highest levels of it.
- ☐ A major source of benzene exposures is tobacco smoke.

How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

The major effect of benzene from long-term (365 days or longer) exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene exposure affects the developing fetus in pregnant women or fertility in men.

Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

How likely is benzene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that benzene is a known human carcinogen. Long-term exposure to high levels of benzene in the air can cause leukemia, cancer of the blood-forming organs.

Is there a medical test to show whether I've been exposed to benzene?

Several tests can show if you have been exposed to benzene. There is test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood, however, since benzene disappears rapidly from the blood, measurements are accurate only for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum permissible level of benzene in drinking water at 0.005 milligrams per liter (0.005 mgL). The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 1 part of benzene per million parts of air (1 ppm) in the workplace during an 8-hour workday, 40-hour workweek.

Glossary

Anemia: A decreased ability of the blood to transport oxygen.

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Chromosomes: Parts of the cells responsible for the development of hereditary characteristics.

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Benzene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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AGENCY FOR TOXIC SUBSTANCES
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CARBON DISULFIDE

CAS # 75-15-0

Agency for Toxic Substances and Disease Registry ToxFAQs September 1997

This fact sheet answers the most frequently asked health questions (FAQs) about carbon disulfide. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to carbon disulfide can occur by breathing it in the air and by drinking water or eating foods that contain it. Breathing very high levels can be life threatening because of its effects on the nervous system. Breathing low levels for long periods may result in headaches, tiredness, trouble sleeping, and slight changes in the nerves. Carbon disulfide has been found in at least 210 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is carbon disulfide?

(Pronounced kär′bən dī-sŭl′fīd′)

Pure carbon disulfide is a colorless liquid with a pleasant odor that is like the smell of chloroform. The impure carbon disulfide that is usually used in most industrial processes is a yellowish liquid with an unpleasant odor, like that of rotting radishes.

Carbon disulfide evaporates at room temperature, and the vapor is more than twice as heavy as air. It easily explodes in air and also catches fire very easily.

In nature, small amounts of carbon disulfide are found in gases released to the earth's surface as, for example, in volcanic eruptions or over marshes. Commercial carbon disulfide is made by combining carbon and sulfur at very high temperatures.

What happens to carbon disulfide when it enters the environment?

☐ The amount of carbon disulfide released into the air through natural processes is difficult to judge because it is so small.

☐ Carbon disulfide evaporates rapidly when released to the environment.

☐ Most carbon disulfide in the air and surface water is from manufacturing and processing activities.

☐ It is found naturally in coastal and ocean waters.

☐ Carbon disulfide does not stay dissolved in water very long, and it also moves through soils fairly quickly.

☐ Carbon disulfide does not appear to be taken up in significant amounts by the organisms living in water.

How might I be exposed to carbon disulfide?

☐ The people most often exposed to carbon disulfide are workers in plants that use carbon disulfide in their manufacturing processes.

☐ People may be exposed by breathing air, drinking water, or eating foods that contain it.

☐ People may also be exposed through skin contact with soil, water, or other substances that contain carbon disulfide.

How can carbon disulfide affect my health?

At very high levels, carbon disulfide may be life-threatening because of its effects on the nervous system. People who breathed carbon disulfide near an accident involving a railroad car showed changes in breathing and some chest pains.

Some workers who breathed high levels during working hours for at least 6 months had headaches, tiredness, and trouble sleeping. However, these workers may have been exposed to other chemicals besides carbon disulfide. Among workers who breathed lower levels, some developed very slight changes in their nerves.

Studies in animals indicate that carbon disulfide can affect the normal functions of the brain, liver, and heart. After pregnant rats breathed carbon disulfide in the air, some of the newborn rats died or had birth defects.

High concentrations of carbon disulfide have caused skin burns when the chemical accidentally touched people's skin.

How likely is carbon disulfide to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified carbon disulfide for carcinogenicity.

There are no definitive data in humans or animals that indicate a carcinogenic potential for carbon disulfide.

Is there a medical test to show whether I've been exposed to carbon disulfide?

One chemical test using urine can be done to tell whether the levels of breakdown substances from carbon disulfide are higher than normal. However, the test is not specific for carbon disulfide exposure.

A second test based on a specific breakdown substance is more sensitive and specific. It also requires special equipment and cannot tell you exactly how much carbon disulfide you were exposed to or predict whether harmful effects will occur.

These tests aren't available at most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA requires that spills or accidental releases into the environment of 100 pounds or more of carbon disulfide be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a limit of 20 parts of carbon disulfide per million parts of air (20 ppm) for an 8-hour workday for a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that workroom air levels of carbon disulfide not exceed 1 ppm for a 10-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: Ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Dissolve: To disappear gradually.

Evaporate: To change into vapor or a gas.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for Carbon Disulfide produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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CARBON TETRACHLORIDE

CAS # 56-23-5

Division of Toxicology ToxFAQs™ **August 2005**

This fact sheet answers the most frequently asked health questions (FAQs) about carbon tetrachloride. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Carbon tetrachloride does not occur naturally. Exposure to this substance results mostly from breathing air, drinking water, or coming in contact with soil that is contaminated with it. Exposure to very high amounts of carbon tetrachloride can damage the liver, kidneys, and nervous system. Carbon tetrachloride can cause cancer in animals. Carbon tetrachloride has been found in at least 425 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is carbon tetrachloride?

Carbon tetrachloride is a manufactured chemical that does not occur naturally. It is a clear liquid with a sweet smell that can be detected at low levels. It is also called carbon chloride, methane tetrachloride, perchloromethane, tetrachloroethane, or benziform.

Carbon tetrachloride is most often found in the air as a colorless gas. It is not flammable and does not dissolve in water very easily. It was used in the production of refrigeration fluid and propellants for aerosol cans, as a pesticide, as a cleaning fluid and degreasing agent, in fire extinguishers, and in spot removers. Because of its harmful effects, these uses are now banned and it is only used in some industrial applications.

What happens to carbon tetrachloride when it enters the environment?

❑ It moves very quickly into the air upon release, so most of it is in the air.

❑ It evaporates quickly surface water.

❑ Only a small amount sticks to soil particles; the rest evaporates or moves into the groundwater.

❑ It is very stable in air (lifetime 30-100 years).

❑ It can be broken down or transformed in soil and water within several days.

❑ When it does break down, it forms chemicals that can destroy ozone in the upper atmosphere.

❑ It does not build up in animals. We do not know if it build up in plants.

How might I be exposed to carbon tetrachloride?

❑ Breathing contaminated air near manufacturing plants or waste sites.

❑ Breathing workplace air when it is used.

❑ Drinking contaminated water near manufacturing plants and waste sites.

❑ Breathing contaminated air and skin contact with water while showering or cooking with contaminated water.

❑ Swimming or bathing in contaminated water.

❑ Contact with or eating contaminated soil (pica child) at waste sites.

How can carbon tetrachloride affect my health?

High exposure to carbon tetrachloride can cause liver, kidney, and central nervous system damage. These effects can occur after ingestion or breathing carbon tetrachloride, and possibly from exposure to the skin. The liver is especially sensitive to carbon tetrachloride because it enlarges and cells are damaged or destroyed. Kidneys also are damaged, causing a build up of wastes in the blood. If exposure is low and brief, the liver and kidneys can repair the damaged cells and function normally again. Effects of carbon tetrachloride are more severe in persons who drink large amounts of alcohol.

If exposure is very high, the nervous system, including the brain, is affected. People may feel intoxicated and experience headaches, dizziness, sleepiness, and nausea and vomiting. These effects may subside if exposure is stopped, but in severe cases, coma and even death may occur.

There have been no studies of the effects of carbon tetrachloride on reproduction in humans, but studies in rats showed that long-term inhalation may cause decreased fertility.

How likely is carbon tetrachloride to cause cancer?

Studies in humans have not been able to determine whether or not carbon tetrachloride can cause cancer because usually there has been exposure to other chemicals at the same time. Swallowing or breathing carbon tetrachloride for years caused liver tumors in animals. Mice that breathed carbon tetrachloride also developed tumors of the adrenal gland.

The Department of Health and Human Services (DHHS) has determined that carbon tetrachloride may reasonably be anticipated to be a carcinogen. The International Agency for Research on Cancer (IARC) has determined that carbon tetrachloride is possibly carcinogenic to humans, whereas the EPA determined that carbon tetrachloride is a probable human carcinogen.

How can carbon tetrachloride affect children?

The health effects of carbon tetrachloride have not been studied in children, but they are likely to be similar to those seen in adults exposed to the chemical. We do not know whether children differ from adults in their susceptibility to carbon tetrachloride.

A few survey-type studies suggest that maternal drinking water exposure to carbon tetrachloride might possibly be related to certain birth defects. Studies in animals showed that carbon tetrachloride can cause early fetal deaths, but did not cause birth defects. A study with human breast milk in a test tube suggested that it would be possible for carbon tetrachloride to pass from the maternal circulation to breast milk, but there is no direct demonstration of this occurring.

How can families reduce the risks of exposure to carbon tetrachloride?

❏ Discard any product that contains carbon tetrachloride that you may have at home and may have used in the past.

❏ Household chemicals should be stored out of the reach of children in their original containers.

❏ Sometimes older children sniff household chemical products to get high. Talk to your children about the dangers of sniffing chemicals.

Is there a medical test to determine whether I've been exposed to carbon tetrachloride?

Several sensitive and specific tests are available to measure carbon tetrachloride in exposed persons. The most convenient way is simply to measure carbon tetrachloride in the exhaled air. Carbon tetrachloride also can be measured in blood, fat, or other tissues. These tests are not usually done in the doctor's office because they require special equipment. Although these tests can show that a person has been exposed to carbon tetrachloride, the results cannot be used to reliably predict whether any adverse health effect might result. Because carbon tetrachloride leaves the body fairly quickly, these methods are best suited to detecting exposures that have occurred within the last several days.

Has the federal government made recommendations to protect human health?

The EPA has set a limit for carbon tetrachloride in drinking water of 5 parts of carbon tetrachloride per billion parts of water (5 ppb). The EPA has also set limits on how much carbon tetrachloride can be released from an industrial plant into waste water and is preparing to set limits on how much carbon tetrachloride can escape from an industrial plant into outside air.

The Occupational Safety and Health Administration (OSHA) set a limit of 10 ppm for carbon tetrachloride in workplace air for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Carbon Tetrachloride (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-0093. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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COPPER

CAS # 7440-50-8

Division of Toxicology ToxFAQs™ **September 2002**

This fact sheet answers the most frequently asked health questions (FAQs) about copper. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Copper is a reddish metal that occurs naturally in the environment. It also occurs naturally in plants and animals. Low levels of copper are essential for maintaining good health. High levels can cause harmful effects such as irritation of the nose, mouth and eyes, vomiting, diarrhea, stomach crumps, and nausea. Copper has been found in at least 884 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is copper?

Copper is a reddish metal that occurs naturally in rocks, soil, water, and air. Copper also occurs naturally in plants and animals.

Metallic copper can be easily molded or shaped. Metallic copper can be found in the U.S. penny, electrical wiring, and some water pipes. Metallic copper is also found in mixtures (called alloys) with other metals such as brass and bronze. Copper is also found as part of other compounds forming salts. Copper salts occur naturally, but are also manufactured. The most common copper salt is copper sulfate. Most copper compounds are blue-green in color. Copper compounds are commonly used in agriculture to treat plant diseases like mildew, for water treatment and, as preservatives for wood, leather, and fabrics.

What happens to copper when it enters the environment?

☐ Copper can enter the environment from the mining of copper and other metals and from factories that make or use metallic copper or copper compounds.
☐ It can also enter the environment through domestic waste water, combustion of fossil fuels and wastes, wood production, phosphate fertilizer production, and natural sources (e.g., windblown dust from soils, volcanoes, decaying vegetation, forest fires, and sea spray).
☐ Copper in soil strongly attaches to organic material and minerals.
☐ Copper that dissolves in water becomes rapidly bound to particles suspended in the water.
☐ Copper does not typically enter groundwater.
☐ Copper carried by particles emitted from smelters and ore processing plants is carried back to the ground by gravity or in rain or snow.
☐ Copper does not break down in the environment.

How might I be exposed to copper?

☐ Breathing air, drinking water, eating food, and by skin contact with soil, water, or other copper-containing substances.
☐ Some copper in the environment can be taken up by plants and animals.
☐ Higher exposure may occur if your water is corrosive and you have copper plumbing and brass water fixtures. ☐ You may be exposed to higher amounts of copper if you drink water or swim in lakes or reservoirs recently treated with copper to control algae or receive cooling water from a power plant that may have high amounts of dissolved copper.
☐ Using some garden products (e.g., fungicides) to control plant diseases.
☐ Living near bronze and brass production facilities may expose you to higher copper levels in soil.
☐ You may breathe copper-containing dust or have skin contact if you work in the industry of mining copper or

processing the ore. You may breathe high levels if you grind or weld copper metal.

How can copper affect my health?

Copper is essential for good health, but high amounts can be harmful. Long-term exposure to copper dust can irritate your nose, mouth, and eyes, and cause headaches, dizziness, nausea, and diarrhea.

Drinking water with higher than normal levels of copper may cause vomiting, diarrhea, stomach cramps, and nausea. Intentionally high intakes of copper can cause liver and kidney damage and even death.

How likely is copper to cause cancer?

We do not know whether copper can cause cancer in humans. The EPA has determined that copper is not classifiable as to carcinogenicity.

How can copper affect children?

Exposure to high levels of copper will result in the same type of effects in children and adults. Studies in animals suggest that the young children may have more severe effects than adults; we do not know if this would also be true in humans. There is a very small percentage of infants and children who are unusually sensitive to copper.

We do not know if copper can cause birth defects or other developmental effects in humans. Studies in animals suggest that ingestion of high levels of copper may cause a decrease in fetal growth.

How can families reduce the risk of exposure to copper?

☐ The greatest potential source of copper exposure is through drinking water, especially in water that is first drawn in the morning after sitting in copper pipes and brass faucets overnight.

☐ To reduce exposure, run the water for at least 15-30 seconds before using it.

☐ If you are exposed to copper at work, you may carry copper home on your skin, clothes, or tools. You can avoid this by showering, and changing clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to copper?

Copper is normally found in all tissues of the body, blood, urine, feces, hair, and nails. High levels of copper in these samples can show that you have been exposed to higher than normal levels of copper. Tests to measure copper levels in the body are not routinely available at the doctor's office because they require special equipment. These tests cannot tell the extent of exposure or whether you will experience harmful effects.

Has the federal government made recommendations to protect human health?

The EPA has determined that drinking water should not contain more than 1.3 milligrams of copper per liter of water (1.3 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.1 mg per cubic meter (0.1 mg/m^3) of copper fumes (vapor generated from heating copper) and 1 mg/m^3 of copper dusts (fine metallic copper particles) and mists (aerosol of soluble copper) in workroom air during an 8-hour work shift, 40-hour workweek.

The Food and Nutrition Board of the Institute of Medicine recommends dietary allowances (RDAs) of 340 micrograms (340 µg) of copper per day for children aged 1-3 years, 440 µg/day for children aged 4-8 years, 700 µg/day for children aged 9-13 years, 890 µg/day for children aged 14-18 years, and 900 µg/day for adults.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Copper (Draft for Public Comment). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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DDT, DDE, AND DDD

CAS # 50-29-3, 72-55-9, 72-54-8

Division of Toxicology ToxFAQs™ **September 2002**

This fact sheet answers the most frequently asked health questions (FAQs) about DDT, DDE, and DDD. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to DDT, DDE, and DDD occurs mostly from eating foods containing small amounts of these compounds, particularly meat, fish and poultry. High levels of DDT can affect the nervous system causing excitability, tremors and seizures. In women, DDE can cause a reduction in the duration of lactation and an increased chance of having a premature baby. DDT, DDE, and DDD have been found in at least 441 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are DDT, DDE, and DDD?

DDT (dichlorodiphenyltrichloroethane) is a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria. DDT is a white, crystalline solid with no odor or taste. Its use in the U.S. was banned in 1972 because of damage to wildlife, but is still used in some countries.

DDE (dichlorodiphenyldichloroethylene) and DDD (dichlorodiphenyldichloroethane) are chemicals similar to DDT that contaminate commercial DDT preparations. DDE has no commercial use. DDD was also used to kill pests, but its use has also been banned. One form of DDD has been used medically to treat cancer of the adrenal gland.

What happens to DDT, DDE, and DDD when they enter the environment?

❑ DDT entered the environment when it was used as a pesticide; it still enters the environment due to current use in other countries.
❑ DDE enters the environment as contaminant or breakdown product of DDT; DDD also enters the environment as a breakdown product of DDT.
❑ DDT, DDE, and DDD in air are rapidly broken down by sunlight. Half of what's in air breaks down within 2 days.
❑ They stick strongly to soil; most DDT in soil is broken down slowly to DDE and DDD by microorganisms; half the DDT in soil will break down in 2-15 years, depending on the type of soil.
❑ Only a small amount will go through the soil into groundwater; they do not dissolve easily in water.
❑ DDT, and especially DDE, build up in plants and in fatty tissues of fish, birds, and other animals.

How might I be exposed to DDT, DDE, and DDD?

❑ Eating contaminated foods, such as root and leafy vegetables, fatty meat, fish, and poultry, but levels are very low.
❑ Eating contaminated imported foods from countries that still allow the use of DDT to control pests.
❑ Breathing contaminated air or drinking contaminated water near waste sites and landfills that may contain higher levels of these chemicals.
❑ Infants fed on breast milk from mothers who have been exposed.
❑ Breathing or swallowing soil particles near waste sites or landfills that contain these chemicals.

How can DDT, DDE, and DDD affect my health?

DDT affects the nervous system. People who accidentally swallowed large amounts of DDT became excitable and had tremors and seizures. These effects went away after the exposure stopped. No effects were seen in people who took small daily doses of DDT by capsule for 18 months.

A study in humans showed that women who had high amounts of a form of DDE in their breast milk were unable to breast feed their babies for as long as women who had little DDE in the breast milk. Another study in humans showed that women who had high amounts of DDE in breast milk had an increased chance of having premature babies.

In animals, short-term exposure to large amounts of DDT in food affected the nervous system, while long-term exposure to smaller amounts affected the liver. Also in animals, short-term oral exposure to small amounts of DDT or its breakdown products may also have harmful effects on reproduction.

How likely are DDT, DDE, and DDD to cause cancer?

Studies in DDT-exposed workers did not show increases in cancer. Studies in animals given DDT with the food have shown that DDT can cause liver cancer.

The Department of Health and Human Services (DHHS) determined that DDT may reasonable be anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) determined that DDT may possibly cause cancer in humans. The EPA determined that DDT, DDE, and DDD are probable human carcinogens.

How can DDT, DDE, and DDD affect children?

There are no studies on the health effects of children exposed to DDT, DDE, or DDD. We can assume that children exposed to large amounts of DDT will have health effects similar to the effects seen in adults. However, we do not know whether children differ from adults in their susceptibility to these substances.

There is no evidence that DDT, DDE, or DDD cause birth defects in people. A study showed that teenage boys whose mothers had higher DDE amounts in the blood when they were pregnant were taller than those whose mothers had lower DDE levels. However, a different study found the opposite in preteen girls. The reason for the discrepancy between these studies is unknown.

Studies in rats have shown that DDT and DDE can mimic the action of natural hormones and in this way affect the development of the reproductive and nervous systems. Puberty was delayed in male rats given high amounts of DDE as juveniles. This could possibly happen in humans.

A study in mice showed that exposure to DDT during the first weeks of life may cause neurobehavioral problems later in life.

How can families reduce the risk of exposure to DDT,DDE, and DDE?

❏ Most families will be exposed to DDT by eating food or drinking liquids contaminated with small amounts of DDT.

❏ Cooking will reduce the amount of DDT in fish.

❏ Washing fruit and vegetables will remove most DDT from their surface.

❏ Follow health advisories that tell you about consumption of fish and wildlife caught in contaminated areas.

Is there a medical test to show whether I've been exposed to DDT, DDE, and DDD?

Laboratory tests can detect DDT, DDE, and DDD in fat, blood, urine, semen, and breast milk. These tests may show low, moderate, or excessive exposure to these compounds, but cannot tell the exact amount you were exposed to, or whether you will experience adverse effects. These tests are not routinely available at the doctor's office because they require special equipment.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) sets a limit of 1 milligram of DDT per cubic meter of air (1 mg/m^3) in the workplace for an 8-hour shift, 40-hour workweek.

The Food and Drug Administration (FDA) has set limits for DDT, DDE, and DDD in foodstuff at or above which the agency will take legal action to remove the products from the market.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for DDT/DDE/DDD (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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ETHYLBENZENE
CAS # 100-41-4

Agency for Toxic Substances and Disease Registry ToxFAQs **June 1999**

This fact sheet answers the most frequently asked health questions (FAQs) about ethylbenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Ethylbenzene is a colorless liquid found in a number of products including gasoline and paints. Breathing very high levels can cause dizziness and throat and eye irritation. Ethylbenzene has been found in at least 731 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is ethylbenzene?
(Pronounced ĕth′ əl bĕn′ zēn′)

Ethylbenzene is a colorless, flammable liquid that smells like gasoline. It is found in natural products such as coal tar and petroleum and is also found in manufactured products such as inks, insecticides, and paints.

Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.

What happens to ethylbenzene when it enters the environment?

- Ethylbenzene moves easily into the air from water and soil.
- It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.
- Ethylbenzene may be released to water from industrial discharges or leaking underground storage tanks.
- In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.
- In soil, it is broken down by soil bacteria.

How might I be exposed to ethylbenzene?

- Breathing air containing ethylbenzene, particularly in areas near factories or highways.
- Drinking contaminated tap water.
- Working in an industry where ethylbenzene is used or made.
- Using products containing it, such as gasoline, carpet glues, varnishes, and paints.

How can ethylbenzene affect my health?

Limited information is available on the effects of ethylbenzene on people's health. The available information shows dizziness, throat and eye irritation, tightening of the chest, and a burning sensation in the eyes of people exposed to high levels of ethylbenzene in air.

Animals studies have shown effects on the nervous system, liver, kidneys, and eyes from breathing ethylbenzene in air.

How likely is ethylbenzene to cause cancer?

The EPA has determined that ethylbenzene is not classifiable as to human carcinogenicity.

No studies in people have shown that ethylbenzene exposure can result in cancer. Two available animal studies suggest that ethylbenzene may cause tumors.

How can ethylbenzene affect children?

Children may be exposed to ethylbenzene through inhalation of consumer products, including gasoline, paints, inks, pesticides, and carpet glue. We do not know whether children are more sensitive to the effects of ethylbenzene than adults.

It is not known whether ethylbenzene can affect the development of the human fetus. Animal studies have shown that when pregnant animals were exposed to ethylbenzene in air, their babies had an increased number of birth defects.

How can families reduce the risk of exposure to ethylbenzene?

Exposure to ethylbenzene vapors from household products and newly installed carpeting can be minimized by using adequate ventilation.

Household chemicals should be stored out of reach of children to prevent accidental poisoning. Always store household chemicals in their original containers; never store them in containers children would find attractive to eat or drink from, such as old soda bottles. Gasoline should be stored in a gasoline can with a locked cap.

Sometimes older children sniff household chemicals, including ethylbenzene, in an attempt to get high. Talk with your children about the dangers of sniffing chemicals.

Is there a medical test to show whether I've been exposed to ethylbenzene?

Ethylbenzene is found in the blood, urine, breath, and some body tissues of exposed people. The most common way to test for ethylbenzene is in the urine. This test measures substances formed by the breakdown of ethylbenzene. This test needs to be done within a few hours after exposure occurs, because the substances leave the body very quickly.

These tests can show you were exposed to ethylbenzene, but cannot predict the kind of health effects that might occur.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 0.7 milligrams of ethylbenzene per liter of drinking water (0.7 mg/L).

The EPA requires that spills or accidental releases into the environment of 1,000 pounds or more of ethylbenzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 100 parts of ethylbenzene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for ethylbenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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FUEL OILS

CAS # 8008-20-6, 70892-10-3, 68476-30-2, 68476-34-6, 68476-31-3

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1996**

This fact sheet answers the most frequently asked health questions (FAQs) about fuel oils. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Fuel oils are liquid mixtures produced from petroleum, and their use mostly involves burning them as fuels. Drinking or breathing fuel oils may cause nausea or nervous system effects. However, exposure under normal use conditions is not likely to be harmful. Fuel oils have been found in at least 26 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are fuel oils?

(Pronounced fyo͞o′əl oilz)

Fuel oils are a variety of yellowish to light brown liquid mixtures that come from crude petroleum. Some chemicals found in fuel oils may evaporate easily, while others may more easily dissolve in water.

Fuel oils are produced by different petroleum refining processes, depending on their intended uses. Fuel oils may be used as fuel for engines, lamps, heaters, furnaces, and stoves, or as solvents.

Some commonly found fuel oils include kerosene, diesel fuel, jet fuel, range oil, and home heating oil. These fuel oils differ from one another by their hydrocarbon compositions, boiling point ranges, chemical additives, and uses.

What happens to fuel oils when they enter the environment?

- Some chemicals found in fuel oils may evaporate into the air from open containers or contaminated soil or water.
- Some chemicals found in fuel oils may dissolve in water after spills to surface waters or leaks from underground storage tanks.
- Some chemicals found in fuel oils may stick to particles in water, which will eventually cause them to settle to the bottom sediment.
- Some of the chemicals found in fuel oils may be broken down slowly in air, water, and soil by sunlight or small organisms.
- Some of the chemicals found in fuel oils may build up significantly in plants and animals.

How might I be exposed to fuel oils?

- Using a home kerosene heater or stove, or using fuel oils at work.
- Breathing air in home or building basements that has been contaminated with fuel oil vapors entering from the soil.
- Drinking or swimming in water that has been contaminated with fuel oils from a spill or a leaking underground storage tank.
- Touching soil contaminated with fuel oils.
- Using fuel oils to wash paint or grease from skin or equipment.

How can fuel oils affect my health?

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene stoves for cooking do not seem to have any health problems related to their exposure.

Breathing some fuel oils for short periods may cause nausea, eye irritation, increased blood pressure, headache, lightheadedness, loss of appetite, poor coordination, and difficulty concentrating. Breathing diesel fuel vapors for long periods may cause kidney damage and lower your blood's ability to clot.

Drinking small amounts of kerosene may cause vomiting, diarrhea, coughing, stomach swelling and cramps, drowsiness, restlessness, painful breathing, irritability, and unconsciousness. Drinking large amounts of kerosene may cause convulsions, coma, or death. Skin contact with kerosene for short periods may cause itchy, red, sore, or peeling skin.

How likely are fuel oils to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that some fuel oils (heavy) may possibly cause cancer in humans, but for other fuel oils (light) there is not enough information to make a determination. IARC has also determined that occupational exposures to fuel oils during petroleum refining are probably carcinogenic in humans.

Some studies with mice have suggested that repeated contact with fuel oils may cause liver or skin cancer. However, other mouse studies have found this not to be the case. No studies are available in other animals or in people on the carcinogenic effects of fuel oils.

Is there a medical test to show whether I've been exposed to fuel oils?

There is no medical test that shows if you have been exposed to fuel oils. Tests are available to determine if some of the chemicals commonly found in fuel oils are in your blood. However, the presence of these chemicals in blood may not necessarily mean that you have been exposed to fuel oils.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) and the Air Force Office of Safety and Health (AFOSH) have set a permissible exposure level (PEL) of 400 parts of petroleum distillates per million parts of air (400 ppm) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that average workplace air levels not exceed 350 milligrams of petroleum distillates per cubic meter of air (350 mg/m^3) for a 40-hour workweek.

The Department of Transportation (DOT) lists fuel oils as hazardous materials and, therefore, regulates their transportation.

Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for fuel oils. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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LEAD

CAS # 7439-92-1

Division of Toxicology and Environmental Medicine ToxFAQs™ August 2007

This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,272 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

❑ Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.

❑ When lead is released to the air, it may travel long distances before settling to the ground.

❑ Once lead falls onto soil, it usually sticks to soil particles.

❑ Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

❑ Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.

❑ Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.

❑ Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.

❑ Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

❏ Avoid exposure to sources of lead.

❏ Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.

❏ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.

❏ Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children

❏ If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 µg/dL to be a level of concern for children.

EPA limits lead in drinking water to 15 µg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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MERCURY
CAS # 7439-97-6

Agency for Toxic Substances and Disease Registry ToxFAQs **April 1999**

This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List sites identified by the Environmental Protection Agency.

What is mercury?
(Pronounced mũ̄r′kyə-rē)

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

What happens to mercury when it enters the environment?

- ☐ Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- ☐ It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.
- ☐ Methylmercury may be formed in water and soil by small organisms called bacteria.
- ☐ Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

- ☐ Eating fish or shellfish contaminated with methylmercury.
- ☐ Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels.
- ☐ Release of mercury from dental work and medical treatments.
- ☐ Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- ☐ Practicing rituals that include mercury.

How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also can pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

Is there a medical test to show whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m^3) and 0.05 mg/m^3 of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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METHYLENE CHLORIDE

CAS # 75-09-2

Division of Toxicology ToxFAQs™ **February 2001**

This fact sheet answers the most frequently asked health questions (FAQs) about methylene chloride. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to methylene chloride occurs mostly from breathing contaminated air, but may also occur through skin contact or by drinking contaminated water. Breathing in large amounts of methylene chloride can damage the central nervous system. Contact of eyes or skin with methylene chloride can result in burns. Methylene chloride has been found in at least 882 of 1,569 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is methylene chloride?

Methylene chloride is a colorless liquid with a mild, sweet odor. Another name for it is dichloromethane. Methylene chloride does not occur naturally in the environment.

Methylene chloride is used as an industrial solvent and as a paint stripper. It may also be found in some aerosol and pesticide products and is used in the manufacture of photographic film.

What happens to methylene chloride when it enters the environment?

❑ Methylene chloride is mainly released to the environment in air. About half of the methylene chloride in air disappears in 53 to 127 days.

❑ Methylene chloride does not easily dissolve in water, but small amounts may be found in drinking water.

❑ We do not expect methylene chloride to build up in plants or animals.

How might I be exposed to methylene chloride?

❑ The most likely way to be exposed to methylene chloride is by breathing contaminated air.

❑ Breathing the vapors given off by products containing methylene chloride. Exposure to high levels of methylene chloride is likely if methylene chloride or a product containing it is used in a room with inadequate ventilation.

How can methylene chloride affect my health?

If you breathe in large amounts of methylene chloride you may feel unsteady, dizzy, and have nausea and a tingling or numbness of your finger and toes. A person breathing smaller amounts of methylene chloride may become less attentive and less accurate in tasks requiring hand-eye coordination. Skin contact with methylene chloride causes burning and redness of the skin.

How likely is methylene chloride to cause cancer?

We do not know if methylene chloride can cause cancer in humans. An increased cancer risk was seen in mice breathing large amounts of methylene chloride for a long time.

The World Health Organization (WHO) has determined that methylene chloride may cause cancer in humans.

The Department of Health and Human Services (DHHS) has determined that methylene chloride can be reasonably anticipated to be a cancer-causing chemical.

The EPA has determined that methylene chloride is a probable cancer-causing agent in humans.

How can methylene chloride affect children?

It is likely that health effects seen in children exposed to high amounts of methylene chloride will be similar to the effects seen in adults. We do not know if methylene chloride can affect the ability of people to have children or if it causes birth defects. Some birth defects have been seen in animals inhaling very high levels of methylene chloride.

How can families reduce the risk of exposure to methylene chloride?

❑ Families may be exposed to methylene chloride while using products such as paint removers. Such products should always be used in well-ventilated areas and skin contact should be avoided.
❑ Children should not be allowed to remain near indoor paint removal activities.

Is there a medical test to show whether I've been exposed to methylene chloride?

❑ Several tests can measure exposure to methylene chloride. These tests are not routinely available in your doctor's office.
❑ Methylene chloride can be detected in the air you breathe out and in your blood. These tests are only useful for detecting exposures that have occurred within a few days.
❑ It is also possible to measure carboxyhemoglobin (a chemical formed in the blood as methylene chloride breaks down in the body) in the blood or formic acid (a breakdown product of methylene chloride) in the urine. These tests are not specific for methylene chloride.

Has the federal government made recommendations to protect human health?

❑ The EPA requires that releases of methylene chloride of 1,000 pounds or more be reported to the federal government.
❑ The EPA recommends that exposure of children to methylene chloride be limited to less than 10 milligrams per liter of drinking water (10 mg/L) for 1 day or 2 mg/L for 10 days.
❑ The Food and Drug Administration (FDA) has established limits on the amounts of methylene chloride that can remain after processing of spices, hops extract, and decaffeinated coffee.
❑ The Occupational Safety and Health Administration (OSHA) has set limits of 25 parts methylene chloride per million parts of workplace air (25 ppm) for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for methylene chloride. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1996**

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- ☐ PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- ☐ PAHs can occur in air attached to dust particles.
- ☐ Some PAH particles can readily evaporate into the air from soil or surface waters.
- ☐ PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- ☐ PAHs enter water through discharges from industrial and wastewater treatment plants.
- ☐ Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- ☐ Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- ☐ In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- ☐ PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- ☐ Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- ☐ Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- ☐ Coming in contact with air, water, or soil near hazardous waste sites.
- ☐ Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- ☐ Drinking contaminated water or cow's milk.

- ☐ Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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POLYCHLORINATED BIPHENYLS

Division of Toxicology ToxFAQs™
February 2001

This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

❏ PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
❏ PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
❏ PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
❏ PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

❏ Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
❏ Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
❏ Breathing air near hazardous waste sites and drinking contaminated well water.
❏ In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risk of exposure to PCBs?

❏ You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.

❏ Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.

❏ Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.

❏ If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to PCBs?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
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TRICHLOROETHYLENE
CAS # 79-01-6

Division of Toxicology ToxFAQs™ July 2003

This fact sheet answers the most frequently asked health questions (FAQs) about trichloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Trichloroethylene is a colorless liquid which is used as a solvent for cleaning metal parts. Drinking or breathing high levels of trichloroethylene may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, and possibly death. Trichloroethylene has been found in at least 852 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is trichloroethylene?

Trichloroethylene (TCE) is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers.

Trichloroethylene is not thought to occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical.

What happens to trichloroethylene when it enters the environment?

❑ Trichloroethylene dissolves a little in water, but it can remain in ground water for a long time.

❑ Trichloroethylene quickly evaporates from surface water, so it is commonly found as a vapor in the air.

❑ Trichloroethylene evaporates less easily from the soil than from surface water. It may stick to particles and remain for a long time.

❑ Trichloroethylene may stick to particles in water, which will cause it to eventually settle to the bottom sediment.

❑ Trichloroethylene does not build up significantly in plants and animals.

How might I be exposed to trichloroethylene?

❑ Breathing air in and around the home which has been contaminated with trichloroethylene vapors from shower water or household products such as spot removers and typewriter correction fluid.

❑ Drinking, swimming, or showering in water that has been contaminated with trichloroethylene.

❑ Contact with soil contaminated with trichloroethylene, such as near a hazardous waste site.

❑ Contact with the skin or breathing contaminated air while manufacturing trichloroethylene or using it at work to wash paint or grease from skin or equipment.

How can trichloroethylene affect my health?

Breathing small amounts may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating.

Breathing large amounts of trichloroethylene may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and liver damage.

Drinking large amounts of trichloroethylene may cause nausea, liver damage, unconsciousness, impaired heart function, or death.

Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear.

Skin contact with trichloroethylene for short periods may cause skin rashes.

How likely is trichloroethylene to cause cancer?

Some studies with mice and rats have suggested that high levels of trichloroethylene may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of trichloroethylene in drinking water or in workplace air have found evidence of increased cancer. Although, there are some concerns about the studies of people who were exposed to trichloroethylene, some of the effects found in people were similar to effects in animals.

In its 9th Report on Carcinogens, the National Toxicology Program (NTP) determined that trichloroethylene is "reasonably anticipated to be a human carcinogen." The International Agency for Research on Cancer (IARC) has determined that trichloroethylene is "probably carcinogenic to humans."

Is there a medical test to show whether I've been exposed to trichloroethylene?

If you have recently been exposed to trichloroethylene, it can be detected in your breath, blood, or urine. The breath test, if it is performed soon after exposure, can tell if you have been exposed to even a small amount of trichloroethylene.

Exposure to larger amounts is assessed by blood and urine tests, which can detect trichloroethylene and many of its breakdown products for up to a week after exposure. However, exposure to other similar chemicals can produce the same breakdown products, so their detection is not absolute proof of exposure to trichloroethylene. This test isn't available at most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level for trichloroethylene in drinking water at 0.005 milligrams per liter (0.005 mg/L) or 5 parts of TCE per billion parts water.

The EPA has also developed regulations for the handling and disposal of trichloroethylene.

The Occupational Safety and Health Administration (OSHA) has set an exposure limit of 100 parts of trichloroethylene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: The ability of a substance to cause cancer.
CAS: Chemical Abstracts Service.
Evaporate: To change into a vapor or gas.
Milligram (mg): One thousandth of a gram.
Nonflammable: Will not burn.
ppm: Parts per million.
Sediment: Mud and debris that have settled to the bottom of a body of water.
Solvent: A chemical that dissolves other substances.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Trichloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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TETRACHLOROETHYLENE
CAS # 127-18-4

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1997**

This fact sheet answers the most frequently asked health questions (FAQs) about tetrachloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Tetrachloroethylene has been found in at least 771 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is tetrachloroethylene?

(Pronounced tĕt′rə-klôr′ ō-ĕth′ə-lēn′)

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels.

What happens to tetrachloroethylene when it enters the environment?

- ❑ Much of the tetrachloroethylene that gets into water or soil evaporates into the air.
- ❑ Microorganisms can break down some of the tetrachloroethylene in soil or underground water.
- ❑ In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain.
- ❑ It does not appear to collect in fish or other animals that live in water.

How might I be exposed to tetrachloroethylene?

- ❑ When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- ❑ When you drink water containing tetrachloroethylene, you are exposed to it.

How can tetrachloroethylene affect my health?

High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death.

Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high."

In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of tetrachloroethylene are not known.

Results from some studies suggest that women who work in dry cleaning industries where exposures to tetrachloroethylene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. However, it is not known if tetrachloroethylene was responsible for these problems because other possible causes were not considered.

Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that tetrachloroethylene can cause liver and kidney damage. Exposure to very high levels of tetrachloroethylene can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

How likely is tetrachloroethylene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Tetrachloroethylene has been shown to cause liver tumors in mice and kidney tumors in male rats.

Is there a medical test to show whether I've been exposed to tetrachloroethylene?

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood.

Because it is stored in the body's fat and slowly released into the bloodstream, tetrachloroethylene can be detected in the breath for weeks following a heavy exposure.

Tetrachloroethylene and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform. These tests aren't available at most doctors' offices, but can be performed at special laboratories that have the right equipment.

Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been exposed to tetrachloroethylene or the other chemicals.

Has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Tetrachloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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AGENCY FOR TOXIC SUBSTANCES
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TOLUENE
CAS # 108-88-3

Division of Toxicology ToxFAQs™ **February 2001**

This fact sheet answers the most frequently asked health questions (FAQs) about toluene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to toluene occurs from breathing contaminated workplace air, in automobile exhaust, some consumer products paints, paint thinners, fingernail polish, lacquers, and adhesives. Toluene affects the nervous system. Toluene has been found at 959 of the 1,591 National Priority List sites identified by the Environmental Protection Agency

What is toluene?

Toluene is a clear, colorless liquid with a distinctive smell. Toluene occurs naturally in crude oil and in the tolu tree. It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal.

Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

What happens to toluene when it enters the environment?

❑ Toluene enters the environment when you use materials that contain it. It can also enter surface water and groundwater from spills of solvents and petrolieum products as well as from leasking underground storage tanks at gasoline stations and other facilities.

❑ When toluene-containing products are placed in landfills or waste disposal sites, the toluene can enter the soil or water near the waste site.

❑ Toluene does not usually stay in the environment long.

❑ Toluene does not concentrate or buildup to high levels in animals.

How might I be exposed to toluene?

❑ Breathing contaminated workplace air or automobile exhaust.

❑ Working with gasoline, kerosene, heating oil, paints, and lacquers.

❑ Drinking contaminated well-water.

❑ Living near uncontrolled hazardous waste sites containing toluene products.

How can toluene affect my health?

Toluene may affect the nervous system. Low to moderate levles can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite, and hearing and color vision loss. These symptoms usually disappear when exposure is stopped.

Inhaling High levels of toluene in a short time can make you feel light-headed, dizzy, or sleepy. It can also cause unconsciousness, and even death.

High levels of toluene may affect your kidneys.

How likely is toluene to cause cancer?

Studies in humans and animals generally indicate that toluene does not cause cancer.

The EPA has determined that the carcinogenicity of toluene can not be classified.

How can toluene affect children?

It is likely that health effects seen in children exposed to toluene will be similar to the effects seen in adults.
Some studies in animals suggest that babies may be more sensitive than adults.

Breathing very high levels of toluene during pregnancy can result in children with birth defects and retard mental abilities, and growth. We do not know if toluene harms the unborn child if the mother is exposed to low levels of toluene during pregnancy.

How can families reduce the risk of exposure to toluene?

❑ Use toluene-containing products in well-ventilated areas.

❑ When not in use, toluene-containing products should be tightly covered to prevent evaporation into the air.

Is there a medical test to show whether I've been exposed to toluene?

There are tests to measure the level of toluene or its breakdown products in exhaled air, urine, and blood. To determine if you have been exposed to toluene, your urine or blood must be checked within 12 hours of exposure. Several other chemicals are also changed into the same breakdown products as toluene, so some of these tests are not specific for toluene.

Has the federal government made recommendations to protect human health?

EPA has set a limit of 1 milligram per liter of drinking water (1 mg/L).

Discharges, releases, or spills of more than 1,000 pounds of toluene must be reported to the National Response Center.

The Occupational Safety and Health Administration has set a limit of 200 parts toluene per million of workplace air (200 ppm).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Toluene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

XYLENE

CAS # 1330-20-7

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1996**

This fact sheet answers the most frequently asked health questions (FAQs) about xylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. This substance has been found in at least 658 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is xylene?

(Pronounced zī′lēn)

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar and is formed during forest fires. You can smell xylene in air at 0.08–3.7 parts of xylene per million parts of air (ppm) and begin to taste it in water at 0.53–1.8 ppm.

Chemical industries produce xylene from petroleum. It's one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

What happens to xylene when it enters the environment?

☐ Xylene has been found in waste sites and landfills when discarded as used solvent, or in varnish, paint, or paint thinners.

☐ It evaporates quickly from the soil and surface water into the air.

☐ In the air, it is broken down by sunlight into other less harmful chemicals.

☐ It is broken down by microorganisms in soil and water.

☐ Only a small amount of it builds up in fish, shellfish, plants, and animals living in xylene-contaminated water.

How might I be exposed to xylene?

☐ Breathing xylene in workplace air or in automobile exhaust.

☐ Breathing contaminated air.

☐ Touching gasoline, paint, paint removers, varnish, shellac, and rust preventatives that contain it.

☐ Breathing cigarette smoke that has small amounts of xylene in it.

☐ Drinking contaminated water or breathing air near waste sites and landfills that contain xylene.

☐ The amount of xylene in food is likely to be low.

How can xylene affect my health?

Xylene affects the brain. High levels from exposure for short periods (14 days or less) or long periods (more than 1 year) can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

How likely is xylene to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that xylene is not classifiable as to its carcinogenicity in humans.

Human and animal studies have not shown xylene to be carcinogenic, but these studies are not conclusive and do not provide enough information to conclude that xylene does not cause cancer.

Is there a medical test to show whether I've been exposed to xylene?

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 10 ppm of xylene in drinking water.

The EPA requires that spills or accidental releases of xylenes into the environment of 1,000 pounds or more must be reported.

The Occupational Safety and Health Administration (OSHA) has set a maximum level of 100 ppm xylene in workplace air for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) also recommend exposure limits of 100 ppm in workplace air.

NIOSH has recommended that 900 ppm of xylene be considered immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Evaporate: To change from a liquid into a vapor or a gas.

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for xylenes (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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ZINC

CAS # 7440-66-6

Division of Toxicology ToxFAQs™ August 2005

This fact sheet answers the most frequently asked health questions (FAQs) about zinc. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Zinc is a naturally occurring element. Exposure to high levels of zinc occurs mostly from eating food, drinking water, or breathing workplace air that is contaminated. Low levels of zinc are essential for maintaining good health. Exposure to large amounts of zinc can be harmful. It can cause stomach cramps, anemia, and changes in cholesterol levels. Zinc has been found in at least 985 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is zinc?

Zinc is one of the most common elements in the earth's crust. It is found in air, soil, and water, and is present in all foods. Pure zinc is a bluish-white shiny metal.

Zinc has many commercial uses as coatings to prevent rust, in dry cell batteries, and mixed with other metals to make alloys like brass, and bronze. A zinc and copper alloy is used to make pennies in the United States.

Zinc combines with other elements to form zinc compounds. Common zinc compounds found at hazardous waste sites include zinc chloride, zinc oxide, zinc sulfate, and zinc sulfide. Zinc compounds are widely used in industry to make paint, rubber, dyes, wood preservatives, and ointments.

What happens to zinc when it enters the environment?

❑ Some is released into the environment by natural processes, but most comes from human activities like mining, steel production, coal burning, and burning of waste.

❑ It attaches to soil, sediments, and dust particles in the air.

❑ Rain and snow remove zinc dust particles from the air.

❑ Depending on the type of soil, some zinc compounds can move into the groundwater and into lakes, streams, and rivers.

❑ Most of the zinc in soil stays bound to soil particles and does not dissolve in water.

❑ It builds up in fish and other organisms, but it does not build up in plants.

How might I be exposed to zinc?

❑ Ingesting small amounts present in your food and water.

❑ Drinking contaminated water or a beverage that has been stored in metal containers or flows through pipes that have been coated with zinc to resist rust.

❑ Eating too many dietary supplements that contain zinc.

❑ Working on any of the following jobs: construction, painting, automobile mechanics, mining, smelting, and welding; manufacture of brass, bronze, or other zinc-containing alloys; manufacture of galvanized metals; and manufacture of machine parts, rubber, paint, linoleum, oilcloths, batteries, some kind of glass, ceramics, and dyes.

How can zinc affect my health?

Zinc is an essential element in our diet. Too little zinc can cause problems, but too much zinc is also harmful.

Harmful effects generally begin at levels 10-15 times higher than the amount needed for good health. Large doses taken by mouth even for a short time can cause stomach cramps, nausea, and vomiting. Taken longer, it can cause anemia and decrease the levels of your good cholesterol. We do not know if high levels of zinc affect reproduction in humans. Rats that were fed large amounts of zinc became infertile.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service
Agency for Toxic Substances and Disease Registry

ToxFAQs^{TM} Internet address is http://www.atsdr.cdc.gov/toxfaq.html

Inhaling large amounts of zinc (as dusts or fumes) can cause a specific short-term disease called metal fume fever. We do not know the long-term effects of breathing high levels of zinc.

Putting low levels of zinc acetate and zinc chloride on the skin of rabbits, guinea pigs, and mice caused skin irritation. Skin irritation will probably occur in people.

How likely is zinc to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified zinc for carcinogenicity. Based on incomplete information from human and animal studies, the EPA has determined that zinc is not classifiable as to its human carcinogenicity.

How can zinc affect children?

Zinc is essential for proper growth and development of young children. It is likely that children exposed to very high levels of zinc will have similar effects as adults. We do not know whether children are more susceptible to the effects of excessive intake of zinc than the adults.

We do not know if excess zinc can cause developmental effects in humans. Animal studies have found decreased weight in the offspring of animals that ingested very high amounts of zinc.

How can families reduce the risks of exposure to zinc?

❏ Children living near waste sites that contain zinc may be exposed to higher levels of zinc through breathing contaminated air, drinking contaminated drinking water, touching or eating contaminated soil.
❏ Discourage your children from eating soil or putting their hands in their mouths and teach them to wash their hands frequently and before eating.
❏ If you use medicines or vitamin supplements containing zinc, make sure you use them appropriately and keep them out of the reach of children.

Is there a medical test to determine whether I've been exposed to zinc?

There are tests available to measure zinc in your blood, urine, hair, saliva, and feces. These tests are not usually done in the doctor's office because they require special equipment. High levels of zinc in the feces can mean high recent zinc exposure. High levels of zinc in the blood can mean high zinc consumption and/or high exposure. Tests to measure zinc in hair may provide information on long-term zinc exposure; however, the relationship between levels in your hair and the amount of zinc you were exposed to is not clear.

Has the federal government made recommendations to protect human health?

The EPA recommends that drinking water should contain no more than 5 milligrams per liter of water (5 mg/L) because of taste. The EPA requires that any release of 1,000 pounds (or in some cases 5,000 pounds) into the environment be reported to the agency.

To protect workers, the Occupational Safety and Health Administration (OSHA) has set an average limit of 1 mg/m^3 for zinc chloride fumes and 5 mg/m^3 for zinc oxide (dusts and fumes) in workplace air during an 8-hour workday, 40-hour workweek.

Similarly, the National Institute for Occupational Safety and Health (NIOSH) has set the same standards for up to a 10-hour workday over a 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Zinc (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Cadmium- ToxFAQs™

CAS # 7440-43-9

This fact sheet answers the most frequently asked health questions (FAQs) about cadmium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to cadmium happens mostly in the workplace where cadmium products are made. The general population is exposed from breathing cigarette smoke or eating cadmium contaminated foods. Cadmium damages the kidneys, lungs, and bones. Cadmium has been found in at least 1,014 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is cadmium?

Cadmium is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), or sulfur (cadmium sulfate, cadmium sulfide).

All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals like zinc, lead, and copper. Cadmium does not corrode easily and has many uses, including batteries, pigments, metal coatings, and plastics.

What happens to cadmium when it enters the environment?

- Cadmium enters soil, water, and air from mining, industry, and burning coal and household wastes.
- Cadmium does not break down in the environment, but can change forms.
- Cadmium particles in air can travel long distances before falling to the ground or water.
- Some forms of cadmium dissolve in water.
- Cadmium binds strongly to soil particles.
- Fish, plants, and animals take up cadmium from the environment.

How might I be exposed to cadmium?

- Eating foods containing cadmium; low levels are found in all foods (highest levels are found in leafy vegetables, grains, legumes, and kidney meat).
- Smoking cigarettes or breathing cigarette smoke.
- Breathing contaminated workplace air.
- Drinking contaminated water.
- Living near industrial facilities which release cadmium into the air.

How can cadmium affect my health?

Breathing high levels of cadmium can severely damage the lungs. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea.

Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones.

How likely is cadmium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have determined that cadmium and cadmium compounds are human carcinogens. The EPA determined that cadmium is a probable human carcinogen (group B1).

CAS # 7440-43-9

How can cadmium affect children?

The health effects in children are expected to be similar to the effects seen in adults (kidney and lung damage depending on the route of exposure).

A few studies in animals indicate that younger animals absorb more cadmium than adults. Animal studies also indicate that the young are more susceptible than adults to a loss of bone and decreased bone strength from exposure to cadmium.

We don't know if cadmium causes birth defects in people. Studies in animals exposed to high levels of cadmium during pregnancy have resulted in harmful effects to the young. Young animals exposed to cadmium before birth have shown effects on behavior and learning. There is also some information from animal studies that high enough exposures to cadmium before birth can reduce body weights and affect the skeleton in the developing young.

How can families reduce the risk of exposure to cadmium?

- Do not allow children to play with batteries. Dispose of nickel-cadmium batteries properly.
- Cadmium is a component of tobacco smoke. Avoid smoking and smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- If you work with cadmium, use all safety precautions to avoid carrying cadmium-containing dust home from work on your clothing, skin, hair, or tools.
- A balanced diet can reduce the amount of cadmium taken into the body from food and drink.

Is there a medical test to determine whether I've been exposed to cadmium?

Cadmium can be measured in blood, urine, hair, or nails. Urinary cadmium has been shown to accurately reflect the amount of cadmium in the body.

The amount of cadmium in your blood shows your recent exposure to cadmium. The amount of cadmium in your urine shows both your recent and your past exposure.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to cadmium in drinking water at concentrations of 0.04 milligrams per liter (0.04 mg/L) for up to 10 days is not expected to cause any adverse effects in a child.

The EPA has determined that lifetime exposure to 0.005 mg/L cadmium is not expected to cause any adverse effects.

The Food and Drug Administration (FDA) has determined that the cadmium concentration in bottled drinking water should not exceed 0.005 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 5 μg/m^3 for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Cadmium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs^{TM} Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Chromium - ToxFAQs™

CAS # 7440-47-3

This fact sheet answers the most frequently asked health questions (FAQs) about chromium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and cause cancer. Ingesting high levels of chromium(VI) may result in anemia or damage to the stomach or intestines. Chromium(III) is an essential nutrient. Chromium has been found in at least 1,127 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, and soil. It can exist in several different forms. Depending on the form it takes, it can be a liquid, solid, or gas. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- Chromium can be found in air, soil, and water after release from the manufacture, use, and disposal of chromium-based products, and during the manufacturing process.
- Chromium does not usually remain in the atmosphere, but is deposited into the soil and water.
- Chromium can easily change from one form to another in water and soil, depending on the conditions present.
- Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

- Eating food containing chromium(III).
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Drinking contaminated well water.
- Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the lining of the nose, nose ulcers, runny nose, and breathing problems, such as asthma, cough, shortness of breath, or wheezing. The concentrations of chromium in air that can cause these effects may be different for different types of chromium compounds, with effects occurring at much lower concentrations for chromium(VI) compared to chromium(III).

The main health problems seen in animals following ingestion of chromium(VI) compounds are irritation and ulcers in the stomach and small intestine and anemia. Chromium(III) compounds are much less toxic and do not appear to cause these problems.

Sperm damage and damage to the male reproductive system have also been seen in laboratory animals exposed to chromium(VI).

Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive tochromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

How likely is chromium to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have determined that chromium(VI) compounds are known human carcinogens.

In workers, inhalation of chromium(VI) has been shown to cause lung cancer. Chromium(VI) also causes lung cancer in animals. An increase in stomach tumors was observed in humans and animals exposed to chromium(VI) in drinking water.

How can chromium affect children?

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Some developmental effects have been observed in animals exposed to chromium(VI).

How can families reduce the risk of exposure to chromium?

- Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.
- Chromium is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

Is there a medical test to determine whether I've been exposed to chromium?

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. Chromium can be measured in hair, urine, and blood.

Higher than normal levels of chromium in blood or urine may indicate that a person has been exposed to chromium. However, increases in blood and urine chromium levels cannot be used to predict the kind of health effects that might develop from that exposure.

Has the federal government made recommendations to protect human health?

The EPA has established a maximum contaminant level of 0.1 mg/L for total chromium in drinking water.

The FDA has determined that the chromium concentration in bottled drinking water should not exceed 0.1 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 0.005 mg/m^3 chromium(VI), 0.5 mg/m^3 chromium(III), and 1.0 mg/m^3 chromium(0) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Chromium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

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BARIUM

CAS # 7440-39-3

Division of Toxicology and Human Health Sciences ToxFAQs™ **June 2013**

This fact sheet answers the most frequently asked health questions (FAQs) about barium and barium compounds. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to barium occurs mostly in the workplace or from drinking contaminated water. Ingesting drinking water containing levels of barium above the EPA drinking water guidelines for relatively short periods of time can cause gastrointestinal disturbances and muscle weakness. Ingesting high levels for a long time can damage the kidneys. Barium and barium compounds have been found in at least 798 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is barium?

Barium is a silvery-white metal which exists in nature only in ores containing mixtures of elements. It combines with other chemicals such as sulfur or carbon and oxygen to form barium compounds.

Barium compounds are used by the oil and gas industries to make drilling muds. Drilling muds make it easier to drill through rock by keeping the drill bit lubricated. They are also used to make paint, bricks, ceramics, glass, and rubber.

Barium sulfate is sometimes used by doctors to perform medical tests and to take x-rays of the gastrointestinal tract.

What happens to barium when it enters the environment?

- Barium gets into the air during the mining, refining, and production of barium compounds, and from the burning of coal and oil.
- The length of time that barium will last in air, land, water, or sediments depends on the form of barium released.
- Barium compounds, such as barium sulfate and barium carbonate, which do not dissolve well in water, can last a long time in the environment.
- Barium compounds, such as barium chloride, barium nitrate, or barium hydroxide, that dissolve easily in water usually do not last in these forms for a long time in the environment. The barium in these compounds that is dissolved in water quickly combines with sulfate or carbonate that are naturally found in water and become the longer lasting forms (barium sulfate and barium carbonate).
- Fish and aquatic organisms can accumulate barium.

How might I be exposed to barium?

- Ingesting small amounts present in your food and water or breathing air containing very low levels of barium.
- Living in areas with unusually high natural levels of barium in the drinking water.
- Working in a job that involves barium production or use.
- Living or working near waste sites where barium has been disposed of.

How can barium affect my health?

The health effects of the different barium compounds depend on how well the compound dissolves in water or in the stomach contents. Barium compounds that do not dissolve well, such as barium sulfate, are not generally harmful.

Barium has been found to potentially cause gastrointestinal disturbances and muscular weakness when people are exposed to it at levels above the EPA drinking water standards for relatively short periods of time. Some people who eat or drink amounts of barium above background levels found in food and water for a short period may experience vomiting, abdominal cramps, diarrhea, difficulties in breathing, increased or decreased blood pressure, numbness around the face, and muscle weakness. Eating or drinking very large amounts of barium compounds that easily dissolve can cause changes in heart rhythm or paralysis and possibly death. Animals that drank barium over long periods had damage to the kidneys, decreases in body weight, and some died.

How likely is barium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified barium as to its carcinogenicity. The EPA has determined that barium is not likely to be carcinogenic to humans following ingestion and that there is insufficient information to determine whether it will be carcinogenic to humans following inhalation exposure.

How can barium affect children?

We do not know whether children will be more or less sensitive than adults to barium toxicity. A study in rats that swallowed barium found a decrease in newborn body weight; we do not know if a similar effect would be seen in humans.

How can families reduce the risk of exposure to barium?

- The greatest potential source of barium exposure is through food and drinking water. However, the amount of barium in foods and drinking water are typically too low to be of concern.

Is there a medical test to determine whether I've been exposed to barium?

There is no routine medical test to determine whether you have been exposed to barium. Doctors can measure barium in body tissues and fluids, such as bones, blood, urine, and feces, using very complex instruments. These tests cannot be used to predict the extent of the exposure or potential health effects.

The geometric mean barium level measured in the U.S. general population aged 6 and older is reported by the Centers for Disease Control and Prevention (CDC) as 1.56 µg/g creatinine (measured in urine).

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2.0 milligrams of barium per liter of drinking water (2.0 mg/L), which is the same as 2 ppm.

The Occupational Safety and Health Administration (OSHA) has set Permissible Exposure Limits (PELs) of 0.5 milligrams of soluble barium compounds per cubic meter of workplace air (0.5 mg/m^3) for 8 hour shifts and 40 hour work weeks. The OSHA limits for barium sulfate dust are 15 mg/m^3 of total dust and 5 mg/m^3 for respirable fraction.

The National Institute for Occupational Safety and Health (NIOSH) has set Recommended Exposure Limits (RELs) of 0.5 mg/m^3 for soluble barium compounds. The NIOSH has set RELs of 10 mg/m^3 (total dust) for barium sulfate and 5 mg/m^3 (respirable fraction).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Barium and Compounds (*Update*). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

http://www.cdc.gov/exposurereport/pdf/FourthReport_UpdatedTables_Sep2012.pdf

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

APPENDIX B

REPORT FORMS

WEEKLY SAFETY REPORT FORM

Week Ending: ________________ Project Name/Number: ________________________________

Report Date: ________________ Project Manager Name: ________________________________

Summary of any violations of procedures occurring that week:

____

____

____

Summary of any job related injuries, illnesses, or near misses that week:

____

____

____

____

Summary of air monitoring data that week (include and sample analyses, action levels exceeded, and actions taken):

____

____

____

Comments:

____

____

____

Name: ____________________________ Company: ________________________________

Signature: ____________________________ Title: ________________________________

INCIDENT REPORT FORM

Date of Report: ______________________________

Injured: ______________________________

Employer: ______________________________

Site: ______________________ Site Location: ______________________

Report Prepared By: ______________________ ______________________
Signature Title

ACCIDENT/INCIDENT CATEGORY (check all that applies)

___Injury
__ Property Damage
__ On-site Equipment
__ Mechanical

___ Illness
___ Fire
___ Motor Vehicle
___ Spill

___ Near Miss
___ Chemical Exposure
___ Electrical
___ Other

DATE AND TIME OF ACCIDENT/INCIDENT: Narrative report of Accident/Incident: Identify: 1) actions leading to or contributing to the accident/incident; 2) the accident/incident occurrence; and 3) actions following the accident/incident.

____
____
____
____
____
____
____
____
____
____

WITNESS TO ACCIDENT/INCIDENT:

Name: ______________________ Company: ______________________
Address: ______________________ Address: ______________________
Phone No.: ______________________ Phone No.: ______________________
Name: ______________________ Company: ______________________
Address: ______________________ Address: ______________________
Phone No.: ______________________ Phone No.: ______________________

INJURED - ILL:

Name: ____________________ SSN: ____

Address: ____________________ Age: ____

Length of Service: ____________________ Time on Present Job: ____________________________

Time/Classification: ____

SEVERITY OF INJURY OR ILLNESS:

____ Disabling ___ Non-disabling ___ Fatality

____ Medical Treatment ___ First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: ______________________________

NATURE OF INJURY OR ILLNESS: ____

____

____

____

CLASSIFICATION OF INJURY:

__ Abrasions

__ Bites

__ Blisters

__ Bruises

__ Chemical Burns

__ Cold Exposure

__ Concussion

__ Lacerations

_____ Dislocations

_____ Faint/Dizziness

_____ Fractures

_____ Frostbite

_____ Heat Burns

_____ Heat Exhaustion

_____ Heat Stroke

____ Punctures

____ Radiation Burns

____ Respiratory Allergy

____ Sprains

____ Toxic Resp. Exposure

____ Toxic Ingestion

____ Dermal Allergy

Part of Body Affected: ____

Degree of Disability: ____

Date Medical Care was Received: ____

Where Medical Care was Received: ____

Address (if off-site): ____

(If two or more injuries, record on separate sheets)

PROPERTY DAMAGE:

Description of Damage: ____________________

____

Cost of Damage: $ ____________________

ACCIDENT/INCIDENT LOCATION: ____________________

ACCIDENT/INCIDENT ANALYSIS: Causative agent most directly related to accident/incident (Object, substance, material, machinery, equipment, conditions)

____

____

____

____

Was weather a factor?: ____________________

____

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

____

____

____

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

____

____

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

____

____

Modifications:

____

Was injured using required equipment?:

____

____

If not, how did actual equipment use differ from plan?:

____

____

ACTION TAKEN TO PREVENT RECURRENCE: (Be specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?

ACCIDENT/INCIDENT REPORT REVIEWED BY:

SSO Name Printed

SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature	Title
Signature	Title
Signature	Title

ACCIDENT/INCIDENT FOLLOW-UP: Date:

Outcome of accident/incident:

Physician's recommendations:

Date injured returned to work:

Follow-up performed by:

Signature	Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

APPENDIX C

EMERGENCY HAND SIGNALS

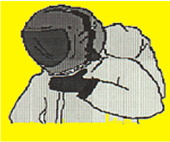
EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communications is not available, the following air-horn and/or hand signals will be used:

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATHE!



Hand gripping throat

LEAVE AREA IMMEDIATELY, NO DEBATE!

(No Picture) Grip partner's wrist or place both hands around waist

NEED ASSISTANCE!

Hands on top of head

OKAY! – I'M ALL RIGHT!

- I UNDERSTAND!

Thumbs up

NO! - NEGATIVE!

Thumbs down

APPENDIX B

COMMUNITY AIR MONITORING PLAN

114 SNEDIKER AVENUE SITE

221-241 GLENMORE AVENUE
BROOKYLN, NEW YORK

Community Air Monitoring Plan

BCP Site No.: C224385
AKRF Project Number: 220249

Prepared For:

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

Prepared On Behalf Of:

Glenmore Owner LLC
116 East 27th Street, 11th Floor
New York, NY 10016

Prepared by:

AKRF

440 Park Avenue South, 7th Floor
New York, NY 10016
212-696-0670

MAY 2023

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FIGURES

TABLES

1.0 INTRODUCTION

This Community Air Monitoring Plan (CAMP) has been developed for implementation of the Interim Remedial Measures (IRM) Work Plan activities conducted by all personnel on-site, both AKRF employees and others, at the 114 Snediker Avenue Site located at 221-241 Glenmore Avenue in the New Lots subsection of the East New York neighborhood of Brooklyn, New York, hereafter referred to as the “Site”. The approximately 0.823-acre Site is identified by the City of New York as Borough of Brooklyn, Block 3697, Lots 1 and 33. The Requestor applied to remediate the Site under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) in December 2022. On May 27, 2023, a Brownfield Cleanup Agreement (BCA) was executed between the Volunteer and the NYSDEC to complete remediation and investigation activities at the Site under purview of the NYSDEC BCP (BCP Site No. C224385).

The Site is developed with three adjoining buildings: a two-story building on Lot 33, formerly utilized as storage and workshop spaces on the first floor and management offices on the second floor (southeast portion of the Site, 241 Glenmore Avenue); a single-story former manufacturing building on the northeastern portion of Lot 1 (northeast portion of Site, 221 Glenmore Avenue); and, a single-story former manufacturing building on the western portion of Lot 1, which previously operated as the lighting manufacturing area (western portion of the Site, 221 Glenmore Avenue). The three adjoining buildings were occupied by Legion Lighting Co. Inc. (Legion), an industrial lighting manufacturer. Manufacturing operations ceased in May 2022 and the Site has only been used for storage since. A small sub-grade cellar located in the southwestern corner of Lot 1 (221 Glenmore Avenue) contains an encased 1,000-gallon No. 2 fuel oil aboveground storage tank (AST) and two fuel-oil fired boilers. A Site Location map is provided as Figure 1.

The Site is abutted to the north by light manufacturing and a multi-family residential building; to the east by Snediker Avenue followed by a five-story office building occupied by the New York City Police Department and an asphalt-paved parking lot followed by light manufacturing with commercial, industrial, and residential uses beyond; to the south by Glenmore Avenue followed by mixed-use industrial, residential, and commercial properties; and to the west by Van Sinderen Avenue and an elevated railway for the L-line of the NYC Metropolitan Transit Authority. An adjacent property (Lot 36) divides a portion of Lot 1 along Glenmore Avenue forming a “U” shape and includes a 1-story metal frame garage and driveway. The surrounding area was primarily commercial and industrial properties with sparse residential development. One sensitive receptor (Brooklyn Children Learning Academy) is located at 91 Junius Street, approximately 262 feet to the west.

A Phase II Environmental Site Assessment (ESA) was conducted by Impact Environmental Closures, Inc, (IEC) in May 2022 and a Remedial Investigation were conducted by AKRF in October 2022 and February through April 2023. The investigations have identified elevated levels of chlorinated volatile organic compounds (CVOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) and metals in soil, chlorinated VOCs, metals and PFOS/PFOA in groundwater and chlorinated VOCs in soil vapor.

2.0 COMMUNITY AIR MONITORING PROGRAM (CAMP)

The purpose of the CAMP is to outline appropriate monitoring, mitigation measures, and reporting requirements to ensure that the surrounding community is not affected during implementation of the Interim Remedial Measures field activities. Community air monitoring will be conducted during all intrusive Site activities in compliance with the New York State Department of Health (NYSDOH) Generic CAMP. Results of the air monitoring will be used to determine the appropriate response action, if needed. Field personnel will be trained in the proper operation of all field instruments at the start of the program. The equipment will be calibrated according to manufacturer specifications at the start of each day of fieldwork. If an instrument fails calibration, the project manager will be contacted immediately to obtain a replacement instrument and arrange for repairs. Real-time air monitoring for volatile compounds and particulates at the perimeter of the exclusion zone will be performed as described below.

2.1 Volatile Organic Compounds and Particulates

Continuous monitoring for VOCs will be conducted during all ground intrusive activities, including soil excavation. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations. VOCs will be monitored continuously at the downwind perimeter of the exclusion zone. Monitoring will be conducted with a photoionization detector (PID) equipped with a 10.6 eV lamp capable of calculating 15-minute running average concentrations and equipped with an audible alarm to indicate exceedances of action levels. An inspection of the monitoring stations will be conducted on at least an hourly basis. All 15-minute average PID readings will be recorded and available for NYSDEC and NYSDOH personnel to review. The action levels and their respective required responses are summarized in Table 1.

Continuous monitoring for particulates will be conducted during all ground intrusive activities, which will involve the measurement of respirable dust. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations. Particulates will be monitored continuously at the downwind perimeter of the exclusion zone. Community air monitoring for dust particulates will be conducted using a DustTrak® or equivalent to measure the concentration of airborne respirable particulates less than 10 micrometers in size (PM_{10}). The dust monitor will be capable of calculating 15-minute running average concentrations and equipped with an audible alarm to indicate exceedance of action levels. An inspection of the monitoring stations will be conducted on at least an hourly basis. All 15-minute average readings will be recorded and available for NYSDEC and NYSDOH personnel to review.

The action levels and their respective required responses are summarized in Table 1.

2.2 Action Levels and Required Actions

The action levels and required responses are listed in Table 1 below:

Table 1
CAMP Action Levels and Required Responses

Monitoring	**Action Level**[1]	**Response Action**
Particulates	15-minute average between 0.100 mg/m^3 and 0.150 mg/m^3 above background	Implement dust suppression measures and continue monitoring. Work may continue if levels remain below 0.150 mg/m^3 and no visible dust is migrating from the work area.
	15-minute average greater than 0.150 mg/m^3 above background	Stop work until dust suppression measures mitigate levels to below 0.150 mg/m^3.
Volatile Organic Compounds (VOCs)	15-minute average between 5 and 25 ppm	Stop work, identify source of vapors and mitigate. Work may continue if instantons readings rapidly decrease below 5 ppm above background.
	15-minute average more than 25 ppm	Shutdown of work. Mitigate levels to below 5 ppm.

Notes:
[1] - 15-minute time-weighted average
parts per million = ppm
milligrams per cubic meter = mg/m^3

2.3 Special Requirements for Work within 20 Feet of Potentially Exposes Individuals or Structures

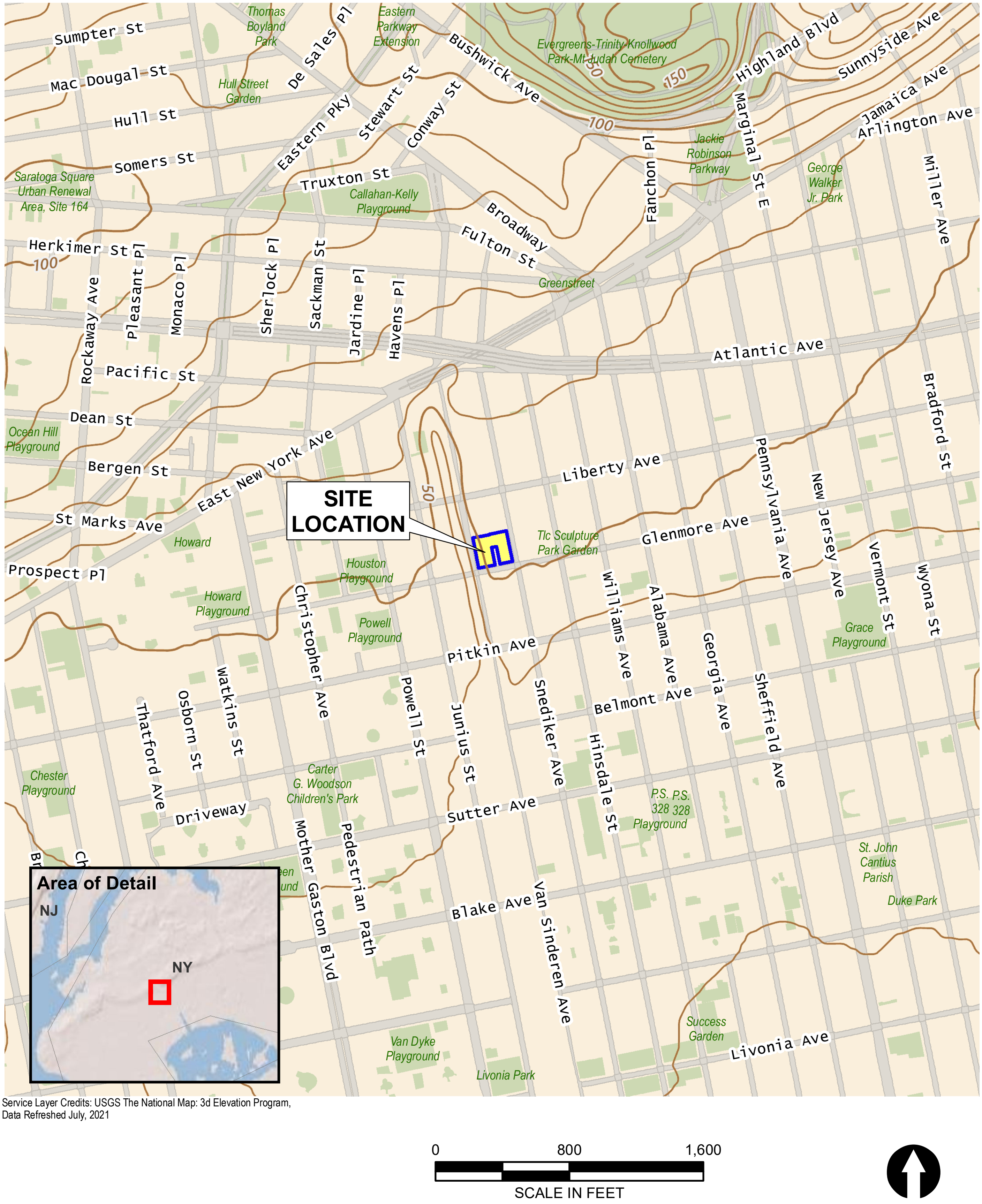
When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices would be considered to prevent exposures related to work activities and to control dust and odors. Considerations would be given to implementing the planned activities when potentially exposed populations are at a minimum, such as weekends or evening hours in non-residential settings.

1. If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring would occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions would be predetermined). Background readings in the occupied spaces would be taken prior to commencement of the planned work. Any unusual background readings would be discussed with NYSDOH prior to commencement of the work.
2. If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 0.150 micrograms per cubic meter (µg/m^3), work activities should be suspended until controls are implemented and are successful in reducing particulate concentrations to 0.150 µg/m^3 or less at the monitoring point.
3. Depending on the nature of contamination and remedial activities, other parameters (e.g. explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

2.4 Reporting

CAMP summary reports will be prepared and submitted to NYSDEC and NYSDOH for review as part of the daily and monthly reports. In the event there is an action level exceedance or complaint, NYSDEC and NYSDOH will be notified within 24 hours (same day to the extent possible) of the exceedance or complaint. The notification will include a description of the exceedance or complaint, the cause of the exceedance, and any corrective actions taken. All recorded CAMP data will be included in the Construction Completion Report (CCR).

FIGURE



Service Layer Credits: USGS The National Map: 3d Elevation Program,
Data Refreshed July, 2021

©2022 AKRF Q:\Projects\220249 - 221 GLENMORE AVENUE\Technical\GIS and Graphics\SAR\RIR\220249 Fig 1 Site Location.mxd12/16/2022 11:07:18 AM mveilleux

AKRF
440 Park Avenue South, New York, NY 10016

114 Snediker Avenue Site
221-241 Glenmore Avenue
Brooklyn, New York

SITE LOCATION

DATE
12/16/2022

PROJECT NO.
220249

FIGURE
1

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

(To Be Submitted as Separate Standalone Report)

APPENDIX D

IRM AIR FILTRATION EQUIPMENT SPECIFICATION SHEETS AND USER MANUAL

AllerAir
Air Purifiers

AirMedic Pro 6 HD Vocarb




Heavy-Duty Air Filtration for Contaminated Environments

Designed for spaces where very heavy concentrations of volatile organic compounds and other chemicals and odors are the primary concern. This unit features a special VOC blend of carbon in an extra deep bed filter for superior adsorption of harmful toxins. A 21st century technology superHEPA for particles completes this powerful unit.

Why AllerAir Air Purifiers

Backed by unparalleled expertise in air quality control and a superior filtration system, AllerAir air cleaners are individually customized to target the airborne pollutants of concern in the environment. Our units offer more filtration media than any other manufacturer, with the deepest carbon bed filters for chemicals, gases and odors, and superior superHEPA filters for particle control.

Cleaner Indoor Air

Clean air is recognized as a vital component for overall comfort, workplace health and safety as well as productivity. According to research from leading organizations like the EPA, WHO and Health Canada, indoor air pollution may pose more of a public health risk in North America than outdoor air pollution.

Green Features

- All-metal housing
- Ozone-free filtration technology
- Energy efficient
- Refillable carbon canisters
- Styrofoam free
- North American sourced parts and materials
- North American assembly

Technical Specifications

Carbon Filter	27-29 lb., 3.5" depth
HEPA Filter & Pre-filters	superHEPA wrap, Pre-filter
Options	UV Light, Custom Carbon Blends, Photocatalytic
CFM	560 Free flow
Voltage	115V/60Hz or 230V/50Hz
Dimensions	23.5" (height) x 15" (diameter)
Shipping Weight	Approx. 59 lbs. 2 boxes
Available Colors	Black, White, Sandstone

1.888.852.8247
www.allerair.com

AirMedic Pro 6 Ultra Vocarb

Heavy-Duty Air Filtration for Contaminated Environments

Designed for spaces where very heavy concentrations of volatile organic compounds and other chemicals and odors are the primary concern. This unit features a special VOC blend of carbon in an extra deep bed filter for superior adsorption of harmful toxins. A superHEPA for particles completes this powerful unit.

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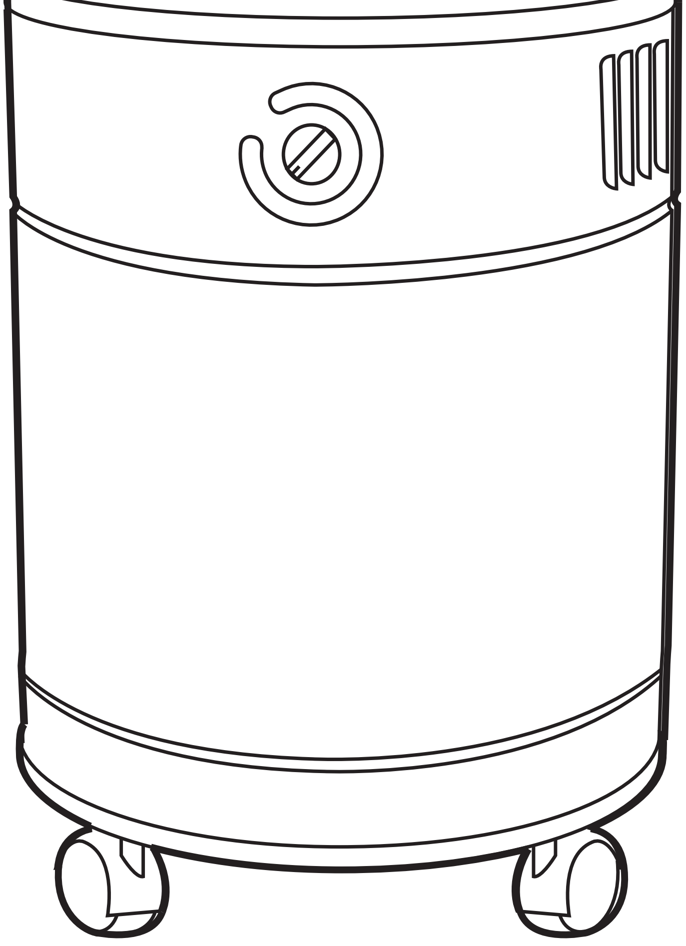
CFM	400 Free flow
Voltage	115V/60Hz or 230V/50Hz
Dimensions	23.5" (height) x 15" (diameter)
Shipping Weight	Approx. 70 lbs. 2 boxes
Available Colors	Black, White, Sandstone

1.888.852.8247
www.allerair.com

AllerAir®
Air Purifiers

AIRMEDIC PRO 5/6 SERIES

USER MANUAL



Changing lives through cleaner air (Since 1996).

Congratulations!

“ You are moments away from fresher, cleaner indoor air. Your new AllerAir unit will combat many of the chemicals, gases, odors and particles responsible for poor indoor air quality (IAQ). Poor IAQ may cause or worsen allergies, asthma, multiple chemical sensitivity (MCS) and sick building syndrome. We recommend proper maintenance of your unit to keep it running efficiently for years to come.”

Allerair Team

Allerair air purifiers play a valuable role in helping improve indoor air quality. To achieve optimal results air cleaning should be used in conjunction with pollution source control and ventilation, wherever possible.

Ways to improve indoor air

Control the source of the air pollutant by eliminating or reducing it as much as possible.

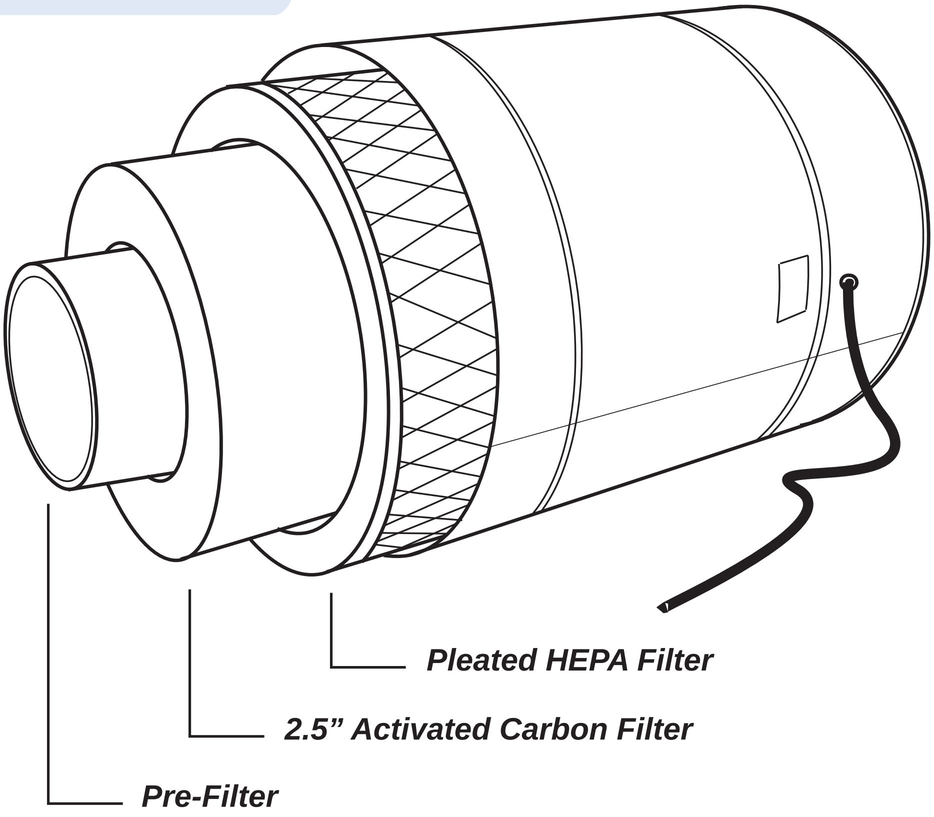
Ventilate your environment by introducing outdoor fresh air regularly. Stand alone air purifiers are not designed to replenish the oxygen level indoors or eliminate carbon monoxide. They cycle the air within the space reducing the VOCs, dust and other pollutants. When allowing fresh air you are allowing in oxygen into the environment for better breathing.***

AllerAir recommends a minimum of two air exchanges per hour. This has a direct influence on the size and/or the number of air purifiers required for optimum indoor filtration. To ensure you have the proper levels of air turnover please contact AllerAir with volume of your indoor space.

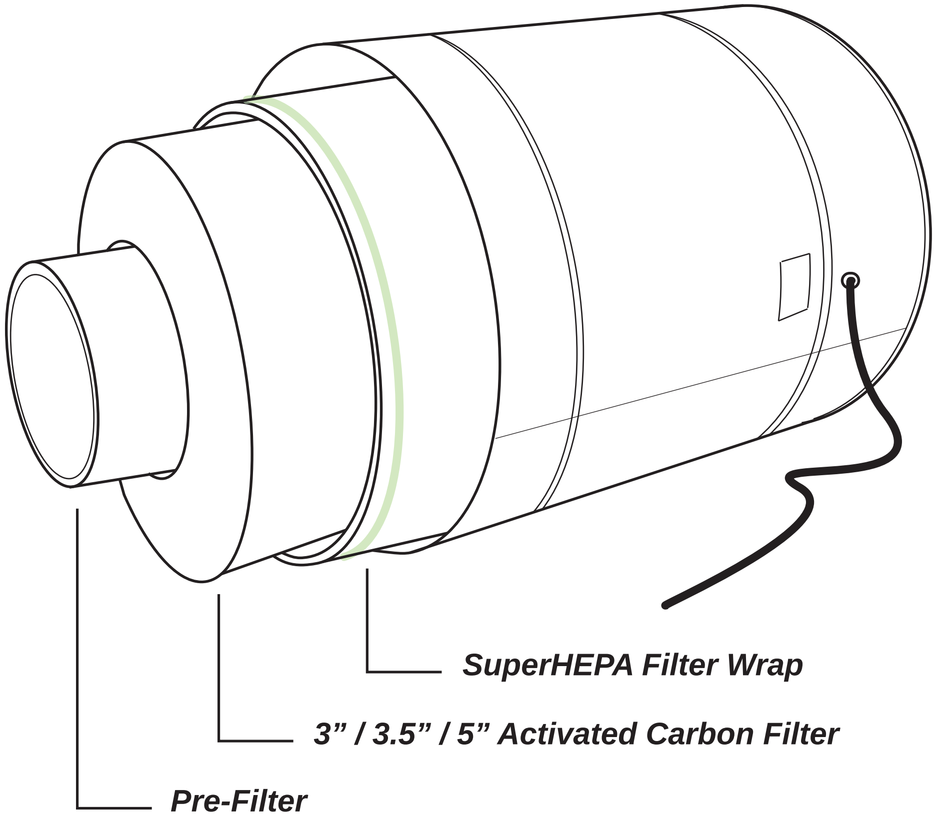
*Improvement in indoor air quality by using AllerAir units depends to a significant degree on circumstantial factors which are out of the control of the manufacturer or distributors. For specific indoor environments and to deal with particular air quality problems, the manufacturer and/or distributors make no claim as to the air cleaning results that are accomplished under the user’s individual operating circumstances.****

** Contact Allerair for more information on the different types of pollutants*
*** Air purifiers do not create fresh oxygen.*
**** Based on environment, level and type of pollutants results may vary.*

AirMedic Pro 5/6



AirMedic Pro 5/6 Plus/HD/Ultra

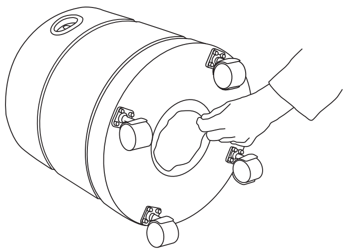


Replacement Filter Guide

Filter	Types and sizes	Recommended replacement
Pre-filter	Regular	2-3 months
	Tar- Trap	
	MCS filter	
HEPA	MG HEPA	2-3 Years
	SUPER HEPA	1-2 years*
Activated Carbon	2.5" Carbon filter	2-3 years ** [shelf life 5 years]
	3" Plus Carbon filter	
	3.5" HD Carbon filter	
	5" Ultra Carbon filter	
UV	UV-C Germicidal lamp	16000 hours or 1 year
* Recommended to change with the Carbon filter		
** Every application is different when it comes to maintenance. For best performance change every 1-2 years. Carbon shelf life is up to 5 years.		

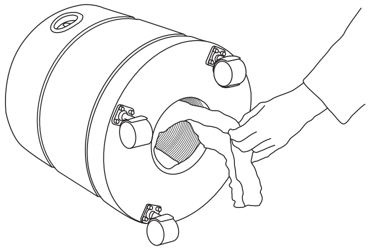
TO ORDER :
CALL ALLERAIR TOLL-FREE 1-888-852-8247
EMAIL US AT: SALES@ALLERAIR.COM
OR FILL OUR ONLINE FILTER FORM

AirMedic Pro 5/6 *Quick Pre-filter Replacement*



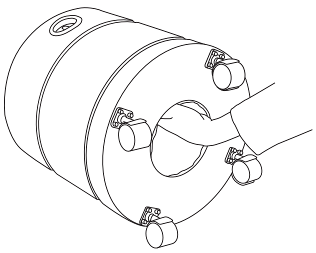
STEP 1

Turn the unit **OFF**, unplug it, and gently lay it on its side.



STEP 2

Slowly remove the dirty pre-filter to avoid dispersing its contents.

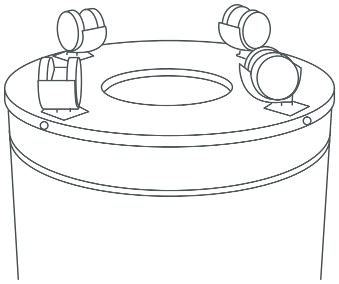


STEP 3

Insert the new pre-filter and press it outwards to occupy the available space against the carbon filter. Return the unit to an upright position.

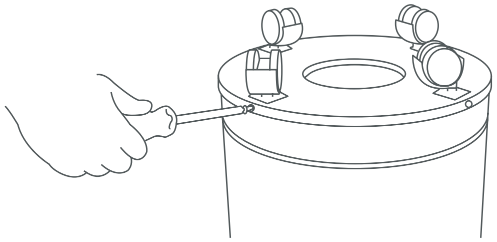
AirMedic Pro 5/6

HEPA & Carbon filter Replacement



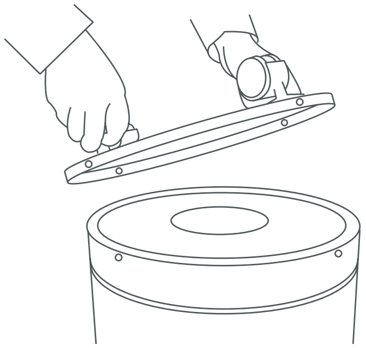
STEP 1

Make sure the unit is Turned **OFF** and the unit is unplugged. Place the unit upside down, so that the wheels face up.



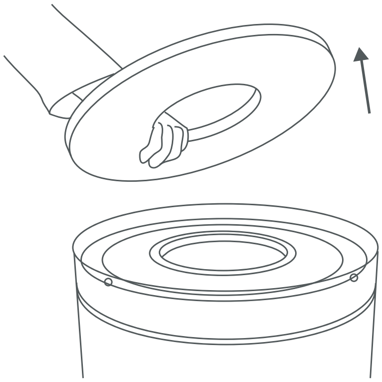
STEP 2

Using a #2 Philips screwdriver, remove the four screws that hold the base onto the unit.



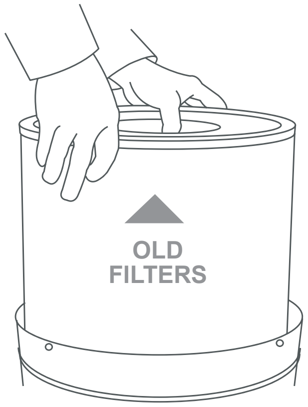
STEP 3

Grab the wheels. Remove the base by pulling gently on the wheels.



STEP 4

Remove the gasket to access the filters.

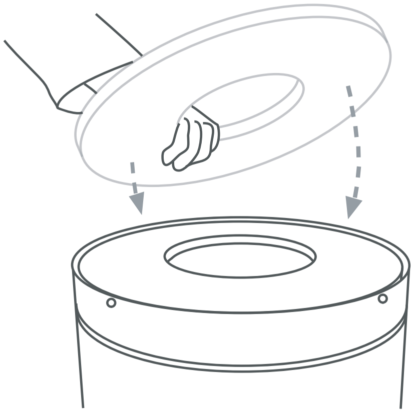


STEP 5

Reach inside the unit, and remove the HEPA & Activated Carbon filter by pulling them upwards. Note that there should be one gasket located at the bottom of the filters.

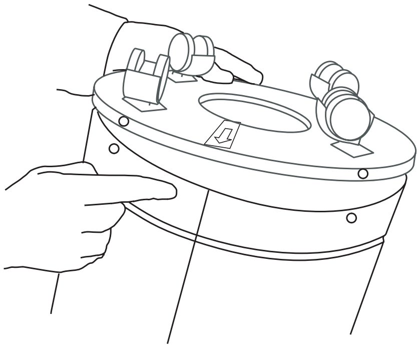
STEP 6

Place the new HEPA & Activated Carbon filter inside. Ensure that there is one gasket at the bottom of the filters.



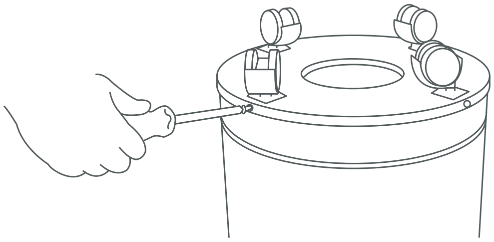
STEP 7

Put back the gasket removed in STEP 4.



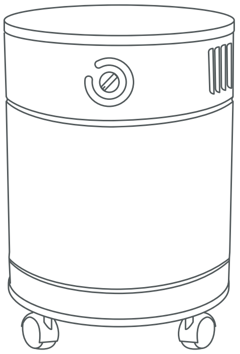
STEP 8

Place the base back, making sure the arrow on the sticker lines up with the unit’s rear seam.



STEP 9

Using a #2 Philips screwdriver, install the four screws to hold the base onto the unit.

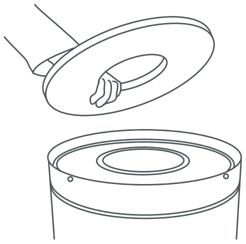


STEP 10

Flip the unit back in its upright position. Plug it in and run it on high for a few minutes then set it to your desired speed.

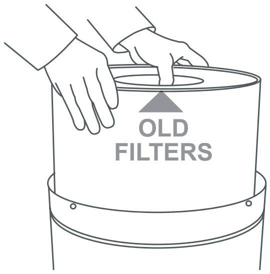
AirMedic Pro 5/6 Plus/HD/Ultra

SuperHEPA & Carbon Filter Replacement



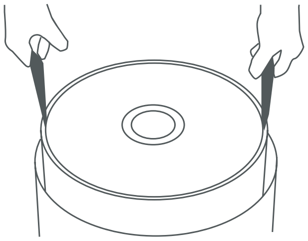
STEP 1

Follow steps 1-4 from [AirMedic Pro 5/6 HEPA & Carbon filter Replacement] to access the filters.



STEP 2A

Remove the carbon filter along with the SuperHEPA filter. ***(Follow STEP 2B if you have the Ultra 5” filter)***



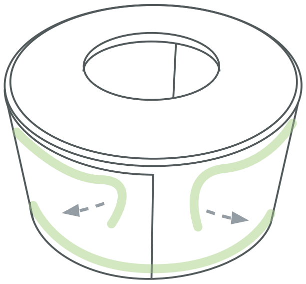
STEP 2B

Using the two straps on the sides of the 5” Ultra Carbon filter pull/lift up both Carbon and SuperHEPA filter together.

AirMedic Pro 5/6 PLus/HD/Ultra

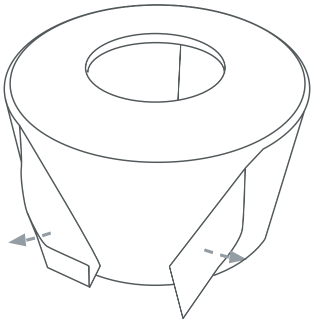
SuperHEPA filter Replacement

NOTE: SuperHEPA is pre-installed by Allerair when you place purchase both Carobon and SupeHEPA together.



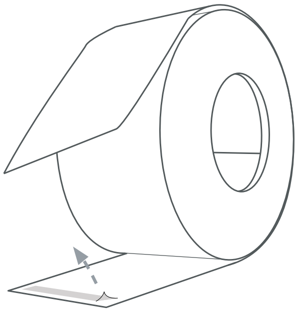
STEP 1

Follow steps 1-4 from [AirMedic Pro 5/6 HEPA & Carbon filter Replacement] to access the filters. Remove green velcro straps



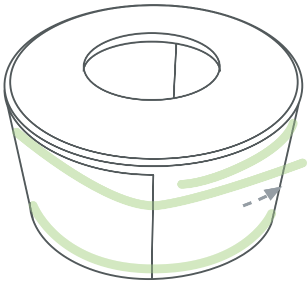
STEP 2

Remove the old SuperHEPA by unwrapping it from around the Carbon filter. (DO NOT Remove the thinner layer carbon wrap from around the carbon filter)



STEP 3

Wrap the SuperHEPA around the carbon filter by rolling the canister onto the Superhepa to ensure it is tight. Remove the sticker off the double sided tape of the SuperHEPA and secure it in place.



STEP 4

Re-attach the green velcro straps that were removed in step 1

STEP 5

Put the Carbon with the SuperHEPA filter back in the unit.

STEP 6

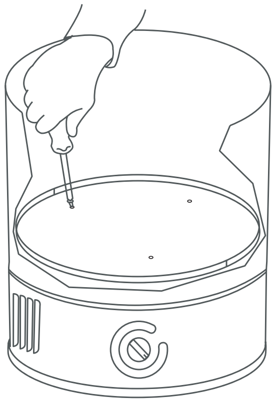
Place the Gasket back on the top and close up the unit.

AirMedic Pro 5/6 & PLus/HD/Ultra

UV-C light Replacement

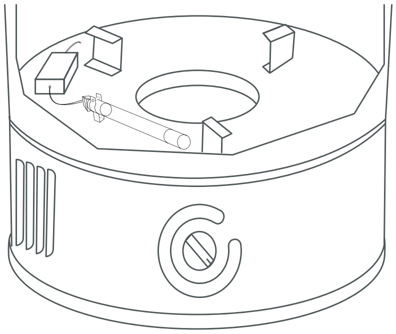
STEP 1

Follow steps 1-5 from [AirMedic Pro 5/6 HEPA & Carbon filter Replacement] and removr the bottom gasket to access the separator plate.



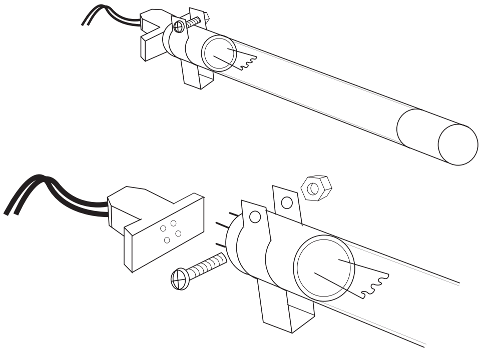
STEP 2

Using a #2 Philips screwdriver, remove the three screws holding the separator plate to access the UV light.



STEP 3

locate the UV-C light bulb. Using a #2 Philips Screwdriver, remove the screw and nut that is holding the UV bulb down as demonstrated in step 4.



STEP 4

Unplug the UV-C bulb from its socket to replace with the new one. Note: do not apply force as you may risk breaking the bulb or the pins.

Tips

Replacing the filters will extend the life of your AllerAir unit. Be sure to follow the Replacement Filter Guide on page 5 to replace your filters.

Place the unit near the source of the Contaminants.

Keep the unit running 24/7 on the lowest setting.

Particles paint may clog your HEPA filter, therefore we recommend that users unplug their units and remove the HEPA filter, storing it off-site until the paint job is complete. Due to the serious toxic nature of paint it is also recommended that your carbon filter be replaced or refilled in the weeks after the paint job is complete.

THE ALLERAIR AIR FILTRATION SYSTEM

ACTIVATED CARBON

Your AllerAir air purifier contains activated carbon that traps dangerous airborne chemicals, gases and odors. This vital filter should be changed approximately every two to three years, depending on the environment in which the unit is operating in. You can also upgrade your unit at any time to accommodate a larger and deeper bed carbon filter that is suitable for removing heavier concentrations of chemicals, gases and odors.

PRE-FILTER

The pre-filter included with your unit removes larger particles and helps prolong the life of your HEPA filter. The pre-filer should be replaced every two to three months.

HEPA

HEPA or high-efficiency particulate air filters were originally developed by the military to remove radio-active dust, and are now the primary particle filtration systems used in hospitals, laboratories, electronic clean rooms and any application where clean air is critical. Today, HEPA filters are widely recommended by allergists, doctors and indoor air quality experts for home and office. They trap an amazing 99.97% of airborne particles at 0.3 microns, including dust, hair, pollen and even some bacteria and viruses. SuperHEPA in AllerAir units traps 99.99% of fine particles at 0.1 microns in size.

ENVIRONMENTS

The AllerAir advantage provides its users with easy and flexible customization options. You can easily change your filters to suit your requirements and needs by upgrading or reducing the filters within the same unit. Some sample environments you can use your air purifier in are: living space, office space, smoking lounge, operatories, clinics, class rooms, salons, restaurants, shops, gyms, studios, and many more…

WARRANTY

Your AllerAir unit comes with a 10-year limited warranty excluding expendable parts such as pre-filters and filters. This warranty provides for the repair of any defective components for 5 years from the date of delivery and includes labor. An additional 5-year warranty is provided on parts. This product is not covered against damage resulting from misuse. This warranty does not cover damage, fault or failure due to alteration or repairs made by anyone other than AllerAir or the use of supplies and acccessories other than those manufactured by AllerAir. This warranty is provided to the original purchaser and may not be transferred. A return authorization number is required for warranty repairs.

WARNING

NO USER SERVICEABLE PARTS INSIDE.

RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS THROUGH MISUSE.

THIS IS AN ELECTRICAL APPLIANCE. IT IS NOT INTENDED FOR USE BY PERSONS (INCLUDING CHILDREN) WITH REDUCED PHYSICAL, SENSORY OR MENTAL CAPABILITIES, OR LACK OF EXPERIENCE AND KNOWLEDGE, UNLESS THEY HAVE BEEN GIVEN PRIOR INSTRUCTIONS CONCERNING USE OF THE APPLIANCE OR THEY ARE BEING SUPERVISED BY A PERSON REPONSIBLE FOR THEIR SAFETY.

CHILDREN SHOULD BE SUPERVISED TO ENSURE THAT THEY DO NOT PLAY WITH THE APPLIANCE

DO NOT OPERATE ANY UNIT WITH A DAMAGED CORD OR PLUG. DISCARD UNIT OR RETURN TO ALLERAIR FOR EXAMINATION AND/OR REPAIR.

REFRAIN FROM POKING OR STICKING ANY OBJECT INTO THE UNIT'S AIR VENT DISCHARGE. DO NOT OBSTRUCT THE AIR INLET AND AIR OUTLET.

DO NOT USE ANY PARTS, ATTACHMENTS OR FILTERS NOT RECOMMENDED BY ALLERAIR

DO NOT IMMERSE THE APPLIANCE IN WATER OR OTHER LIQUIDS.

DO NOT USE APPLIANCE IN ENVIRONMENTS WITH HIGH CONCENTRATIONS OF DUSTY AND/OT POWDER.

DO NOT USE OUTDOORS.

DO NOT USE APPLIANCE IN EXPLOSIVE ENVIRONMENTS.

DO NOT PLACE IN HIGHLY HUMAD ENVIRONMENTS OR NEXT TO A HUMIDIFIER.

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE.

For more information please visit our website www.Allerair.com or call us
Toll-free at 1-888-852-8247
you can also email us at Info@allerair.com

NOTES:

MODEL NO #

SERIAL MO #

www.Allerair.com
1-888-852-8247