Broadway Astoria Arts

23-56 BROADWAY, ASTORIA, NEW YORK

Remedial Investigation Work Plan

NYSDEC BCP Site No.: TBD
AKRF Project Number: 250825

Prepared For:

New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau B
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Prepared On Behalf Of:

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1.0 INTRODUCTION

This Remedial Investigation Work Plan (RIWP) has been prepared by AKRF, Inc. (AKRF) on behalf of Broadway Astoria Arts LLC (the Volunteer) for the Broadway Astoria Arts property located at 23-56 Broadway in the Astoria neighborhood of Queens, New York (hereafter referred to as the "Site"). The Site is identified by the City of New York as Borough of Queens, Tax Map 4, Block 556, Lot 50. The Volunteer is seeking to enroll the Site in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) [BCP Site No. TBD]. The BCP Site Location is presented on Figure 1 and the Site Plan is shown on Figure 2.

Currently, the Site comprises a rectangular-shaped, 6,385-square-foot (sf) lot located at the intersection of Broadway and Cresent Street. The Site contains a vacant one-story, 8,670-gross-square-foot (gsf) commercial building with two partial cellars, which occupies a majority of the lot footprint. A small concrete-paved exterior loading dock area is located in the southeastern corner of the Site along Cresent Street. According to a Phase I Environmental Site Assessment (ESA) prepared by American Environmental Assessment & Solutions, Inc. (AEAS) and dated November 2024, the Site was historically used for dry cleaning and cable and power tool manufacturing but was most recently used as a community center. Partial Cellar No. 1, located in the southwestern portion of the Site, contains a 250-gallon petroleum aboveground storage tank (AST) within a vault. Partial Cellar No. 2 is vacant and is located in the eastern portion of the Site.

A subsurface (Phase II) investigation was conducted by AKRF at the Site in September 2025, as documented in a Phase II ESA Report dated December 2025. The subsurface investigation identified elevated levels of chlorinated volatile organic compounds (CVOCs), including cis-1,2-dichloroethylene, tetrachloroethylene (PCE), trans-1,2-dichloroethene, and trichloroethylene (TCE), in groundwater; elevated CVOCs and petroleum volatile organic compounds (VOCs) in soil vapor; and elevated levels of metals (copper, lead, mercury, and zinc) in soil. The Phase II sampling locations are presented on Figure 2.

This RIWP describes the procedures to be used to further define the nature and extent of contamination at the Site. The data compiled from the Remedial Investigation (RI), as described in this RIWP, will be used to prepare an RI Report (RIR). All work will be completed in accordance with this RIWP, which includes a Quality Assurance Project Plan (QAPP) (Appendix A), a Health and Safety Plan (HASP) (Appendix B) and a Community Air Monitoring Plan (CAMP) (Appendix C). The CAMP will be implemented during all subsurface investigation activities involving soil disturbance at the Site.

Contact information for the parties responsible for the work described in this RIWP is included in Table 1:

Table 1
Remedial Investigation Personnel Contact Information

Company	Individual Name	Title	Contact Number
NYSDEC	TBD	Project Manager	TBD
NYSDOH	TBD	Project Manager	TBD
AKRF	Deborah Shapiro, QEP	QA/QC Officer	(646) 388-9544
	Patrick Diggins	Project Manager	(603) 494-7090
	Tom Giordano	Deputy Project Manager	(609) 575-0796
	Rebecca Kinal, PE	Remediation Engineer	(914) 922-2362
	Mackenzie Miller	Field Team Leader/SSO	(631) 357-9404
	Giovanni De Marzo	Alternate Field Team Leader/SSO	(516) 983-0917
Broadway Astoria Arts LLC	Katrina Costello	Volunteer's Sponsor	(917) 279-6880
The Coast Group, Inc.	Gerald Sammarco	Client Representative	(646) 418-0820

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description and Surrounding Land Use

The Site consists of a 6,385-sf (approximately 0.15-acre) parcel located at 23-56 Broadway in the Astoria section of Queens, New York, and is identified by the City of New York as Queens Borough Tax Map 4, Block 556, Lot 50. Currently, the Site comprises a vacant one-story building with two partial cellars. The Site is bounded by single and multi-family residential buildings to the west, followed by 23rd Street; by Broadway to the north, followed by a supermarket; by Cresent Street to the east, following by commercial and residential buildings; and by a multi-family residential building to the south, followed by 33rd Avenue. The surrounding neighborhood uses are primarily residential and commercial. A surrounding land use map is provided as Figure 3.

2.2 Site Geology, Hydrogeology, and Subsurface Characteristics

Based on the United States Geological Survey (USGS), Central Park, NY 2013 Quadrangle map and the New York City Planimetrics Database[1], the Site is approximately 30 feet above the North American Vertical Datum of 1988 (NAVD88), an approximation of mean sea level. During the Phase II ESA, the Site subsurface consisted of fill material (sand, gravel, and silt with trace amounts of brick) to approximately 12 feet below ground surface (bgs) at sidewalk grade, underlain by apparent native grey and/or brown sand and gravel with trace silt to 25 feet bgs (the terminus of the deepest boring). Bedrock was not encountered during the investigation; however, based on the 2023 USGS Bedrock Elevation of Queens County, New York map, bedrock is expected to be approximately 30 feet bgs at the Site.

During the Phase II ESA, depth to groundwater beneath the Site ranged between 19 and 20 feet below sidewalk grade across the Site, as measured from temporary monitoring wells. Based upon a review of topographical data, groundwater is assumed to flow in a west/northwesterly direction toward the East River, approximately one mile west of the Site; however, actual groundwater flow at the Site can be affected by many factors, including past filling activities, underground utilities, and other subsurface openings or obstructions such as basements or nearby subway lines. There are no surface water bodies or streams on or immediately adjacent to the Site. Groundwater in this portion of Queens is not used as a source of potable water.

2.3 Proposed Development Plan

Proposed redevelopment of the Site includes demolition of the existing structure and construction of a new mixed-use, multi-story commercial and residential building with a theater on the ground floor and cellar levels and a mixture of affordable and market rate residential units above.

2.4 Site History

Available records indicate that the Site was developed with commercial uses between at least 1948 and 2023. Historical uses include cable and power tool manufacturing (approx. 1960 through 1965), a plumbing supply store (approx. 1970 through 1975), a dry cleaner (approx. 1956 through 1980) and a community center (approx. 1980 through 2023).

[1] NYC Planimetric Database: Elevation Points | NYC Open Data

3.0 PREVIOUS ENVIRONMENTAL REPORTS

Copies of previous reports prepared for the Site are included in Appendix D, and summarized below:

Phase I Environmental Site Assessment – 23-56 Broadway, Astoria, NY, American Environmental Assessment & Solutions, Inc., November 2024

AEAS prepared a Phase I ESA for the Site in November 2024 in accordance with the requirements of the American Society for Testing and Materials (ASTM) Standard E1527-13 (the applicable standard at that time). The Phase I ESA included a review of current and historical Sanborn Fire Insurance maps, state and federal environmental regulatory databases, and local records, as well as a reconnaissance of the Site and its surroundings. The following Recognized Environmental Conditions (RECs) were identified:

- Historical usage of the Site included dry cleaning activities and cable and power tools manufacturing;
- The presence of an AST at the Site; and
- A review of historical Sanborn maps, city directories, and the environmental databases identified automotive and dry-cleaning uses in the surrounding area.

Subsurface (Phase II) Investigation Report – 23-56 Broadway, Astoria, NY, AKRF, Inc., December 2025

AKRF conducted a Phase II investigation at the Site in September 2025. Field activities included a geophysical survey, the advancement of four soil borings, and the installation of three temporary wells and three soil vapor probes, with the collection of nine soil samples, three groundwater samples, and three soil vapor samples, as well as one ambient air sample, for laboratory analysis. A summary of the findings is provided below:

- The Site subsurface consisted of fill materials (sand, gravel, and silt with trace amounts of brick) to approximately 11 feet bgs, underlain by apparent native grey and/or brown sand and gravel with trace silt to 25 feet bgs (the terminus of the deepest boring). Bedrock was not encountered during the investigation but is expected to be approximately 30 feet bgs at the Site.
- Groundwater was encountered at the Site at approximately 19 to 20 feet bgs at sidewalk grade. Based on the regional topography, groundwater is expected to generally flow in a west/northwesterly direction toward the East River.
- Petroleum-like odors and elevated photoionization detector (PID) readings were observed in soil borings SB-01 and SB-03 [up to 25 parts per million (ppm) in SB-03].
- Two soil samples were collected from each boring with an extra sample taken at SB-03 at the 11- to 13-foot bgs interval (for a total of nine samples). Soil samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and metals. The nine soil samples were compared to the NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs), Restricted Residential Soil Cleanup Objectives (RRSCOs), and Restricted Commercial Use Soil Cleanup Objectives (CSCOs). SCO exceedances in soil samples are presented on Figure 4 and detailed below:
    - Nine VOCs were detected in one or more of the soil samples at concentrations ranging from an estimated 0.00034 milligrams per kilogram (mg/kg) (PCE in sample SB-02_0-2_20250929) to 0.19 mg/kg (sec-butylbenzene in sample SB-03_13-15_20250930). All detections were below the UUSCOs, RRSCOs, and CSCOs.
    - Eleven SVOCs, mostly polycyclic aromatic hydrocarbons (PAHs), a class of SVOCs associated with petroleum and combustion engines, were detected in one or more of the soil samples at concentrations ranging from an estimated 0.0084 mg/kg (benzo[k]fluoranthene in sample SB-

03_11-13_20250930) to 0.65 mg/kg (phenanthrene in sample SB-03_13-15_20250930). All detections were below the UUSCOs, RRSCOs, and CSCOs.

- Twenty-three metals were detected in the soil samples. Four metals (copper, lead, mercury, and zinc) were detected at concentrations above the UUSCOs, RRSCOs, and/or CSCOs in at least one soil sample.
- PCBs were not detected in the soil samples collected from the Site.

- The CVOCs PCE, TCE, cis-1,2-dichloroethylene, and trans-1,2-dichloroethene were detected in groundwater across the Site at variable concentrations above the Ambient Water Quality Standards and Guidance Values (AWQSGVs), with a maximum detection of 140 micrograms per liter (µg/L) (PCE in sample TW-01_20250930). AWQSGV exceedances in groundwater samples are presented on Figure 5.
- Several CVOCs, including PCE [maximum (max.) 600 micrograms per cubic meter (µg/m^3)], TCE (max. 78 µg/m^3), and cis-1,2-dichloroethylene (max. 4.4 µg/m^3)], were detected in the soil vapor samples. The petroleum-related VOCs benzene, toluene, ethylbenzene, and xylenes (collectively referred to as BTEX) were detected in one or more of the soil vapor samples with total BTEX concentrations up to 686 µg/m^3 (SV-03_20250930). Soil vapor detections are presented on Figure 6.

3.1 Areas of Concern (AOCs)

Based on the Site's history and previous reports prepared for the Site, the AOCs for the RI include:

1. On-site historical manufacturing and dry-cleaning uses.
2. Current and historical on-site petroleum storage.
3. The presence of fill material at the Site containing variable concentrations of VOCs, PAHs, and metals.
4. CVOCs, including PCE and its breakdown compounds, at elevated concentrations in groundwater (above AWQSGVs) and soil vapor across the Site.

4.0 FIELD PROGRAM

The RI field program will focus on collecting soil, groundwater, and soil vapor data to further define and characterize the nature and extent of Site contamination and to assist with determining the appropriate remedial action.

4.1 Field Program Summary

The field program scope of work (SOW) includes: the advancement of eight soil borings with the collection and laboratory analysis of at least two soil samples from each soil boring; the installation of six permanent groundwater monitoring wells with the collection and laboratory analysis of one groundwater sample per well; and the installation of six temporary soil vapor probes with the collection and laboratory analysis of six soil vapor samples. The proposed sample locations are shown on Figure 7.

The soil boring and temporary soil vapor point locations will be surveyed using a Global Positioning System (GPS) and will be measured off of fixed points in the field. The groundwater monitoring wells will be surveyed by a New York State-licensed surveyor. Any field evidence of contamination (visual, olfactory, and/or elevated PID readings) will be recorded on logs for inclusion in the RIR. All sampling equipment will be either dedicated or decontaminated between sampling locations.

The aforementioned SOW will be conducted by AKRF and its subcontractors. Qualifications for AKRF personnel are included in Attachment A of the QAPP. The following sections describe the methods that will be used to complete the aforementioned SOW. The rationale for the proposed soil, groundwater, and/or soil vapor sample locations is summarized in Table 2

Table 2
Proposed RI Sample Rationale

Sample Location	Soil Sample Intervals for Laboratory Analysis[1]	Groundwater Sample Interval for Laboratory Analysis	Soil Vapor Sample Interval for Laboratory Analysis[2]	Location	Rationale
RI-SB-01/ RI-MW-01/ RI-SV-01	0 to 2 feet and the 2-foot interval above groundwater (expected to be 19 to 20 feet bgs at this location)	17 to 22 feet	0 to 0.5 feet	Northwest	Evaluate soil, groundwater, and soil vapor conditions along the northwestern Site boundary.
RI-SB-02/ RI-MW-02/ RI-SV-02	0 to 2 feet and the 2-foot interval above groundwater (expected to be 9 to 10 feet below cellar grade at this location)	17 to 22 feet	0 to 0.5 feet	Northeast (within Partial Cellar No. 2)	Evaluate soil, groundwater, and soil vapor conditions along the northeastern Site boundary.
RI-SB-03/ RI-MW-03/ RI-SV-03	0 to 2 feet and the 2-foot interval above groundwater (expected to be 19 to 20 feet bgs at this location)	17 to 22 feet	0 to 0.5 feet	West	Evaluate soil, groundwater, and soil vapor conditions along the western Site boundary.
RI-SB-04/ RI-MW-04/ RI-SV-04	0 to 2 feet and the 2-foot interval above groundwater (expected to be 19 to 20 feet bgs at this location)	17 to 22 feet	0 to 0.5 feet	Central	Evaluate soil, groundwater, and soil vapor conditions within the central portion of the Site.
RI-SB-05/ RI-MW-05/ RI-SV-05	0 to 2 feet and the 2-foot interval above groundwater (expected to be 19 to 20 feet bgs at this location)	17 to 22 feet	16.5 to 17 feet	Southwest	Evaluate soil, groundwater, and soil vapor conditions along the southwestern Site boundary.
RI-SB-06/ RI-MW-06/ RI-SV-06	0 to 2 feet and the 2-foot interval above groundwater (expected to be 19 to 20 feet bgs at this location)	17 to 22 feet	16.5 to 17 feet	Southeast	Evaluate soil, groundwater, and soil vapor conditions along the southeastern Site boundary.
RI-SB-07	0 to 2 feet and the 2-foot interval above groundwater (expected to be 19 to 20 feet bgs at this location)	17 to 22 feet	0 to 0.5 feet	North	Evaluate soil conditions along the northern Site boundary.
RI-SB-08	0 to 2 feet and the 2-foot interval above groundwater (expected to be 9 to 10 feet below cellar grade at this location)	17 to 22 feet	0 to 0.5 feet	Southwest (within Partial Cellar No. 1)	Evaluate soil conditions within the southwestern portion of the Site.

Notes:
1. Additional samples will be collected if field evidence of contamination is observed.
2. Sub-slab soil vapor samples will be collected from the 6-inch interval directly beneath the existing at-grade and partial cellar slabs, and soil vapor samples will be collected approximately 2 feet above groundwater in exterior areas.

4.2 Utility Location Survey

On September 29, 2025, a geophysical survey was conducted across accessible areas of the Site to clear the proposed boring locations for utilities and/or buried structures, and to search for potential buried storage tanks or other underground structures. During the geophysical survey, the locations of linear anomalies consistent with utilities were flagged or spraypainted on the pavement. Boring locations were adjusted as needed to avoid conflicts with the identified utilities. No evidence of buried tanks was identified by the geophysical survey. In addition, at least three days prior to implementation of the Phase II investigation, the project driller, Eastern Environmental Solutions, Inc. notified New York One Call of the pending subsurface investigation and requested a utility mark out. The geophysical survey report was included as Appendix B of the Phase II ESA Report (Appendix D of this RIWP).

4.3 Soil Boring Advancement and Soil Sampling

A track-mounted Geoprobe® Direct-Push Probe (DPP) and/or Geoprobe® mobile access DPP will be used to advance eight soil borings (denoted as RI-SB-01 through RI-SB-08) at the approximate locations shown on Figure 7. Continuous soil cores will be collected in 5-foot-long, 2-inch-diameter, stainless steel macrocore piston rod samplers fitted within internal, dedicated acetate liners. Soil borings will be advanced to the groundwater table, estimated between approximately 19 to 20 feet below sidewalk grade at the Site. Soil samples will be inspected by AKRF field personnel for evidence of contamination (e.g., odors, staining, etc.), screened for the presence of VOCs with a calibrated PID, and logged using the modified Burmister soil classification system. Soil boring logs will be included as an appendix to the RIR.

At least two soil samples will be collected from each soil boring location: one soil sample will be collected for analysis from the two feet immediately beneath either existing exterior pavement or the interior building slab, and a second sample will be collected from the two-foot interval immediately above groundwater. If evidence of contamination is observed, an additional sample will be collected from this interval within the soil boring.

Soil samples will be labeled, placed in laboratory-supplied containers, and shipped via courier with chain-of-custody (COC) documentation in accordance with appropriate United States Environmental Protection Agency (EPA) protocols to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory.

Soil samples will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, PCBs by EPA Method 8082, pesticides by EPA Method 8081, Target Analyte List (TAL) metals by EPA Method 6000/7000 series, hexavalent chromium by EPA Method 7196A, per- and polyfluorinated compounds (PFAS) by Modified EPA 1633A, and 1,4-dioxane by EPA Method 8270.

After each boring is completed, the boreholes will be filled with on-site materials (if not noticeably contaminated) in accordance with Section 3.3(e) of Division of Environmental Remediation (DER)-10. Soil cuttings displaying field evidence of contamination will be containerized in properly labeled Department of Transportation (DOT)-approved 55-gallon drums for off-site disposal at a permitted facility. Boreholes that require drill cutting disposal will be filled with bentonite chips (hydrated). Disposable sampling equipment that comes in contact with environmental media will be double bagged and disposed of as non-hazardous refuse in municipal trash.

4.4 Groundwater Monitoring Well Installation and Development

Six soil borings will be converted into six permanent monitoring wells (denoted as RI-MW-01 through RI-MW-06). The wells will be installed using a track-mounted or mobile access Geoprobe®

DPP at the proposed locations shown on Figure 7. At each location, the well screen will be set approximately 5 feet below the water table (approximately 25 feet below sidewalk grade at the Site).

The monitoring wells will be constructed with 10 feet of 2-inch-diameter, 0.002-inch slotted polyvinyl chloride (PVC) well screen. A No. 2 morie sand pack will be installed from the base of the well to approximately 2 feet above the well screen. The annular space around the solid well riser above the sand pack will be sealed with approximately 2 feet of bentonite followed by a non-shrinking grout/cement mixture to approximately one foot below grade. Each of the wells will be finished with a locking j-plug and flush-mounted well cover with a concrete pad. Well construction logs will be prepared and included as an appendix to the RIR.

Following installation, each groundwater monitoring well will be developed via pumping and surging to remove any accumulated fines and establish a hydraulic connection with the surrounding aquifer. Development will continue until turbidity within the well is less than 50 nephelometric turbidity units (NTUs) for three successive readings; and until water quality indicators have stabilized to within 10% for pH, temperature, and specific conductivity for three successive readings. In the event that 50 NTUs cannot be achieved, at least three well volumes will be purged from the well. Well development details will be noted on groundwater development logs, included as an appendix to the RIR.

The rationale for the proposed groundwater sample locations is summarized in Table 2.

4.5 Groundwater Elevation Survey

The groundwater monitoring wells will be surveyed by a New York State-licensed surveyor to determine their accurate location and elevation. Two elevation measurements will be taken at each well location—the at-grade elevation, and the elevation of the top of PVC casing (north side at marking)—to facilitate preparation of a groundwater contour map and to determine the direction of groundwater flow. The elevation datum for the sampling points will be based on NAVD 88 Elevation Datum. The groundwater elevation survey will be included as an appendix to the RIR.

4.6 Groundwater Sampling

In accordance with EPA low-flow sampling protocols, the wells will be sampled one to two weeks following their development. Prior to sampling, an electronic interface meter will be used to measure water levels and a bailer will be used to measure any separate phase liquid. The purge water will be monitored for turbidity and water quality indicators [i.e., pH, dissolved oxygen, oxidation-reduction potential (ORP), temperature, and specific conductivity] with measurements collected approximately every five minutes. The criteria for stabilization will be three successive readings within ±10% for pH, temperature, and specific conductivity. All purge water will be containerized in properly labeled, DOT-approved 55-gallon drums for off-site disposal at a permitted facility.

Groundwater samples will be placed in laboratory-supplied containers and shipped in accordance with appropriate EPA protocols to a NYSDOH ELAP-certified laboratory. The samples collected will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, PCBs by EPA Method 8082, pesticides by EPA Method 8081, total and dissolved TAL metals by EPA Method 6000/7000 series, PFAS by EPA Method 1633A, and 1,4-dioxane by EPA Method 8270 selected ion monitoring (SIM) using Category B deliverables. Filtering will occur in the field. Sampling for PFAS will be conducted in accordance with the April 2023 NYSDEC-issued sampling protocol, except that a low-density polyethylene (LDPE) bladder will be used as no industry-approved high-density polyethylene (HDPE) alternative currently exists. Monitoring well sampling details will be noted on groundwater sampling logs, included as an appendix to the RIR.

4.7 Sub-Slab Soil Vapor and Soil Vapor Sampling

Four sub-slab soil vapor samples (denoted as RI-SV-01 through RI-SV-04) will be collected from four temporary sub-slab soil vapor monitoring points and two soil vapor samples (denoted as RI-SV-05 and RI-SV-06) will be collected from two temporary soil vapor monitoring points at the approximate locations shown on Figure 7. The sub-slab soil vapor sample points will be installed to a depth of no more than 6 inches below the interior building slab and the soil vapor points will be installed to two feet above the groundwater table. Sub-slab soil vapor and soil vapor sampling will be performed in accordance with the guidelines provided in the NYSDOH document entitled, "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006, revised 2017 and 2024.

The temporary sub-slab and soil vapor points will be installed by advancing an expendable drive point using either a direct-push drill rig, slide hammer, or hammer drill to the target sampling depth. At each monitoring point, a 6-inch stainless steel screen implant connected to Teflon tubing will be installed by hand or through the drilling rods and threaded into the drive point. The sampling tubing will extend from the end of the screen to above grade. The push probe rods will then be removed and the boring will be backfilled with clean silica sand to 3 to 6 inches above the screen. Hydrated bentonite will be used to fill the remaining void around the sampling tubing to the ground surface.

The sub-slab soil vapor and soil vapor samples will be collected over a 2-hour time period from each monitoring point using a 6-Liter, batch-certified SUMMA® canister equipped with a vacuum gauge and flow regulator set at a maximum rate of 0.2 liter per minute.

Prior to sample collection, the sub-slab soil vapor and soil vapor sampling points will be purged of three sample volumes using a GilAir® air sampling pump. During purging, a shroud will be placed over the sampling point and helium gas will be introduced to saturate the atmosphere around the sample port with helium gas. Purged vapors will be collected into a Tedlar™ bag and field-screened for organic vapors using a PID. The purged air will also be monitored using a portable helium detector to check for short-circuiting of ambient air into the vapor sampling point. If the purged soil vapor contains greater than 10% helium, additional bentonite will used to enhance the surface seal, and the point will be retested.

Following purging, a sub-slab soil vapor or soil vapor sample will be collected using the vacuum from the SUMMA® canister. Immediately after opening the flow control valve equipped with a two-hour regulator, the initial SUMMA® canister vacuum (inches of mercury) will be noted. After two hours, the flow controller valve will be closed, the final vacuum noted, and the canister placed in a shipping carton for delivery to the laboratory.

The sub-slab soil vapor and soil vapor samples will be analyzed for VOCs by EPA Method TO-15 by a NYSDOH ELAP-certified laboratory with Category B deliverables. Samples will be shipped to the laboratory with appropriate COC documentation.

The rationale for the proposed soil vapor samples is summarized in Table 2.

4.8 Quality Assurance/Quality Control (QA/QC)

The analytical results will be reported using Category B deliverables. As required by the Category B sampling techniques, additional analysis will be included for QC measures. The QA/QC samples for soil and groundwater will include one field blank, one trip blank, one matrix spike/matrix spike duplicate (MS/MSD), and one blind duplicate sample at a frequency of one sample per 20 field samples per media. The field blank, blind duplicate, and MS/MSD samples will be analyzed for the same analyte list as the accompanying field samples. The laboratory-prepared trip blanks will be submitted for analysis of VOCs only to determine the potential for cross-contamination. QA/QC

samples accompanying the soil and groundwater samples will also be analyzed for PFAS by EPA Method 1633A and 1,4-dioxane by EPA Method 8270 (SIM analysis will be used for groundwater samples). Additionally, one equipment blank will be collected for each day of groundwater sampling and analyzed for PFAS by EPA Method 1633A only.

Upon receipt of the analytical data from the laboratory, it will be reviewed by a third-party data validator, who will prepare a Data Usability summary Report (DUSR). The QAPP, included as Appendix A, describes the QA/QC protocols and procedures that will be followed during implementation of this RIWP.

4.9 Decontamination Procedures

All non-dedicated sampling equipment will be decontaminated between sampling locations using the following procedure:

1. Scrub equipment with a bristle brush using a tap water/Alconox® solution.
2. Rinse with tap water.
3. Scrub again with a bristle brush using a tap water/Alconox® solution.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air-dry the equipment.

Non-dedicated equipment used for soil and groundwater sampling of emerging contaminants will be decontaminated with laboratory-certified PFAS-free water.

4.10 Management of Investigation-Derived Waste (IDW)

IDW that does not exhibit field evidence of contamination will be used to backfill the corresponding borehole that generated it to within 12 inches of the surface. Soil IDW exhibiting evidence of gross contamination will be containerized in DOT-approved 55-gallon drums. All development and purge groundwater will be containerized in 55-gallon drums. The drums will be sealed at the end of each workday and labeled with the date, the well or boring number(s), the type of waste (i.e., drill cuttings, decontamination fluids, development water, or purge water), and the name of an AKRF point-of-contact. All drums will be labeled “pending analysis” until laboratory data is available. All boreholes will be restored after backfill. Handling of IDW and backfilling of boreholes will be conducted in accordance with Section 3.3(e) of DER-10.

5.0 REPORTING REQUIREMENTS

5.1 Daily Field Reports

During the field activities, daily reports will be submitted to the NYSDEC and NYSDOH Project Managers by noon the following day, and will include:

- A summary of progress made during the reporting day (e.g., borings advanced, monitoring wells installed, sample collection, etc.);
- An updated Site plan;
- A summary of CAMP data and response actions (if necessary);
- An explanation of notable findings; and
- Photographs of the Site documenting daily activities.

Daily reports are not intended to be the mode of communication for notification to NYSDEC of emergencies (accident, spill), requests for changes to the RIWP, or other sensitive or time critical information. However, such conditions will also be included in the daily reports. Emergency conditions and changes to the RIWP will be addressed directly with the NYSDEC Project Manager via personal communication.

5.2 Remedial Investigation Report (RIR)

Upon completion of all field work and receipt of laboratory analytical results, an RIR will be prepared that will: document field activities; present field and laboratory data; evaluate exposure pathways in an exposure assessment; identify and characterize the source(s) of contamination; provide a summary of the overall nature and extent of contamination using the applicable standards, criteria, and guidance; and discuss conclusions and recommendations drawn from the results of the RI.

5.2.1 Description of Field Activities

The RIR will include a section that describes the field methods used to characterize the Site conditions, including: sampling techniques; field screening equipment; drilling and excavation equipment; monitoring well installation procedures; and management of IDW. This section will also include descriptions of hydrogeologic factors of the Site.

5.2.2 Soil Assessment

The RIR will include a section that presents field and laboratory data for soil results. The section will include a description of soil characteristics and figures will be provided that illustrate soil boring locations. Field and laboratory analytical results will be presented in the body of the report and summarized in tables and figures, and the detected concentrations will be compared to regulatory standards and/or guidance values. Soil boring logs and laboratory analytical reports will be provided as attachments. Category B deliverables will be provided by the laboratory and a third-party DUSR will be prepared and discussed.

5.2.3 Groundwater Assessment

The RIR will include a section that presents field and laboratory data for groundwater results. The section will include a description of groundwater characteristics and figures will be provided that illustrate monitoring well locations. Well survey data and water level measurements will be used to create a groundwater elevation contour map and determine the inferred groundwater flow direction. Field and laboratory analytical results will be

presented and compared with regulatory standards and/or guidance values. Well construction, well development, and groundwater sampling logs will be provided as attachments, along with the laboratory analytical reports. Category B deliverables will be provided by the laboratory and a third-party DUSR will be prepared and discussed.

5.2.4 Sub-Slab Soil Vapor and Soil Vapor Assessment

The RIR will include a section that presents field and laboratory data for the sub-slab soil vapor and soil vapor results. The section will include a description of sub-slab soil vapor and soil vapor characteristics and provide a summary of sub-slab soil vapor and soil vapor sample analytical data and a comparison with regulatory standards and/or guidance values. Figures will be provided that illustrate the sub-slab soil vapor and soil vapor point locations. Sub-slab soil vapor and soil vapor sample logs and laboratory analytical reports will be provided as attachments. Category B deliverables will be provided by the laboratory and a third-party DUSR will be prepared and discussed.

5.2.5 Fish and Wildlife Resources Impact Analysis (FWRIA)

The RIR will include a FWRIA, which will be performed in accordance with DER-10 Section 3.10.1.

5.2.6 Qualitative Human Health Exposure Assessment (QHHEA)

The RIR will include a QHHEA, which will be performed in accordance with DER-10 Section 3.3(c)4 and Appendix 3B.

6.0 PROPOSED PROJECT SCHEDULE

Table 3
Proposed Project Schedule

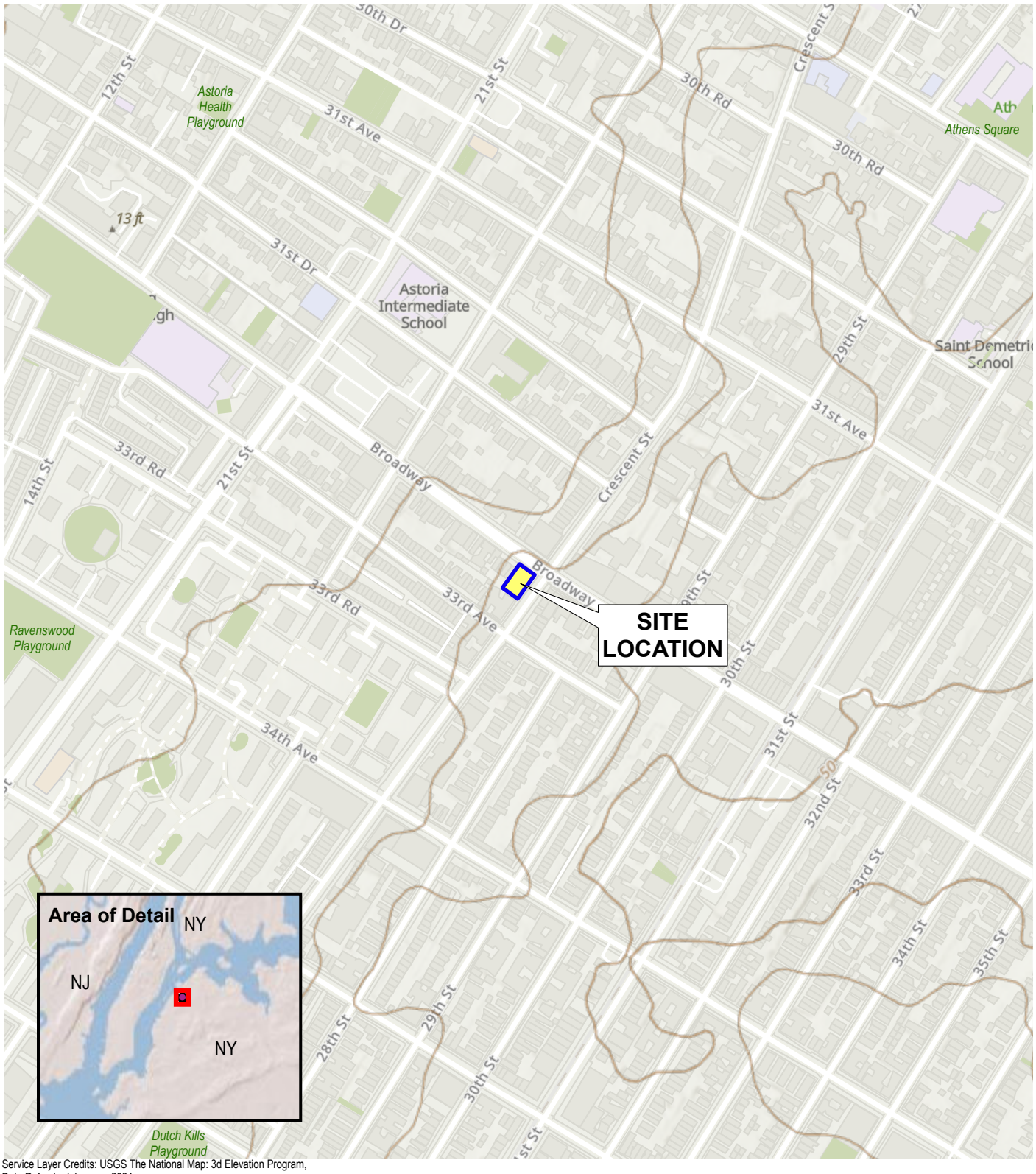
Activity	Time To Complete
Submittal of BCP Application with Draft RIWP	April 1, 2026
30-day Completeness Review	May 1, 2026
30-day Public Notice/Public Comment Period is Initiated	June 10, 2026
30-day Public Notice/Public Comment Period Ends	July 10, 2026
Brownfield Cleanup Agreement (BCA) Execution	August 2026
Submittal of Citizen Participation Plan (CPP)	August 2026
RIWP Approved	September 2026
Remedial Investigation	October 2026
Draft RIR Submitted to NYSDEC	January 2027
Draft Remedial Action Work Plan (RAWP) Submitted to NYSDEC	February 2027
NYSDEC/NYSDOH Issues RIR Comments	February 2027
Revised RIR Submitted to NYSDEC	March 2027
NYSDEC Approves RIR	April 2027
45-day Public Comment Period for RAWP	April-May 2027
NYSDEC Approves RAWP and Issues Decision Document	July 2027
Issue Remedial/Construction Notice Fact Sheet	August 2027
Begin Redevelopment (Construction) with Implementation of RAWP	August 2027
Execution of Environmental Easement (if required)	June 2028
Draft Site Management Plan (SMP) Submitted to NYSDEC	August 2028
Draft Final Engineering Report (FER) and Fact Sheet	September 2028
Certificate of Completion and Fact Sheet	December 2028
Completion of Building (first occupancy)	December 2030

7.0 CERTIFICATION

I, Deborah Shapiro, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation 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).

Deborah Shapiro	DRAFT	03.24.2026
Name	*Signature*	*Date*

FIGURES



Service Layer Credits: USGS The National Map: 3d Elevation Program, Data Refreshed January, 2024

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SCALE IN FEET

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440 Park Avenue South, New York, NY 10016

Broadway Astoria Arts

23-56 Broadway Queens, New York

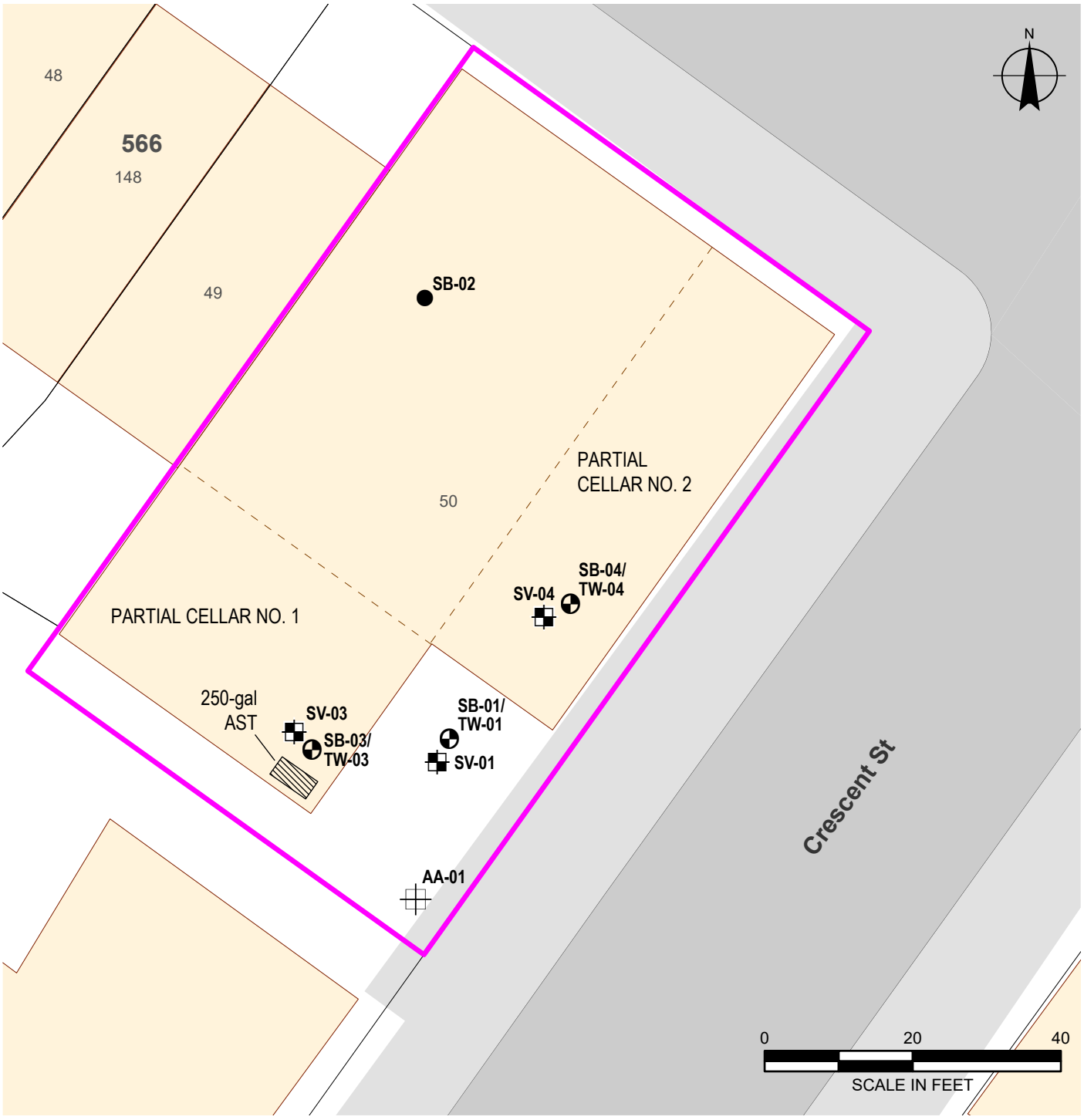
BCP SITE LOCATION

DATE **12/15/2025**

PROJECT NO. **250825**

FIGURE **1**

AKRF O:\Projects\250825 - 23-56 BROADWAY\SAR\250825 Phase II Figures aprx1/19/2022 5:36 PM250825 Fig 1 site locationjszalus



Aerial Source:
2023 New York State ITS GIS Orthoimagery

LEGEND

- SITE BOUNDARY
- 50 LOT BOUNDARY AND TAX LOT NUMBER
- 566 BLOCK NUMBER
- BUILDING
- SOIL BORING
- SOIL BORING/TEMPORARY WELL
- SOIL VAPOR POINT
- AMBIENT AIR SAMPLING LOCATION

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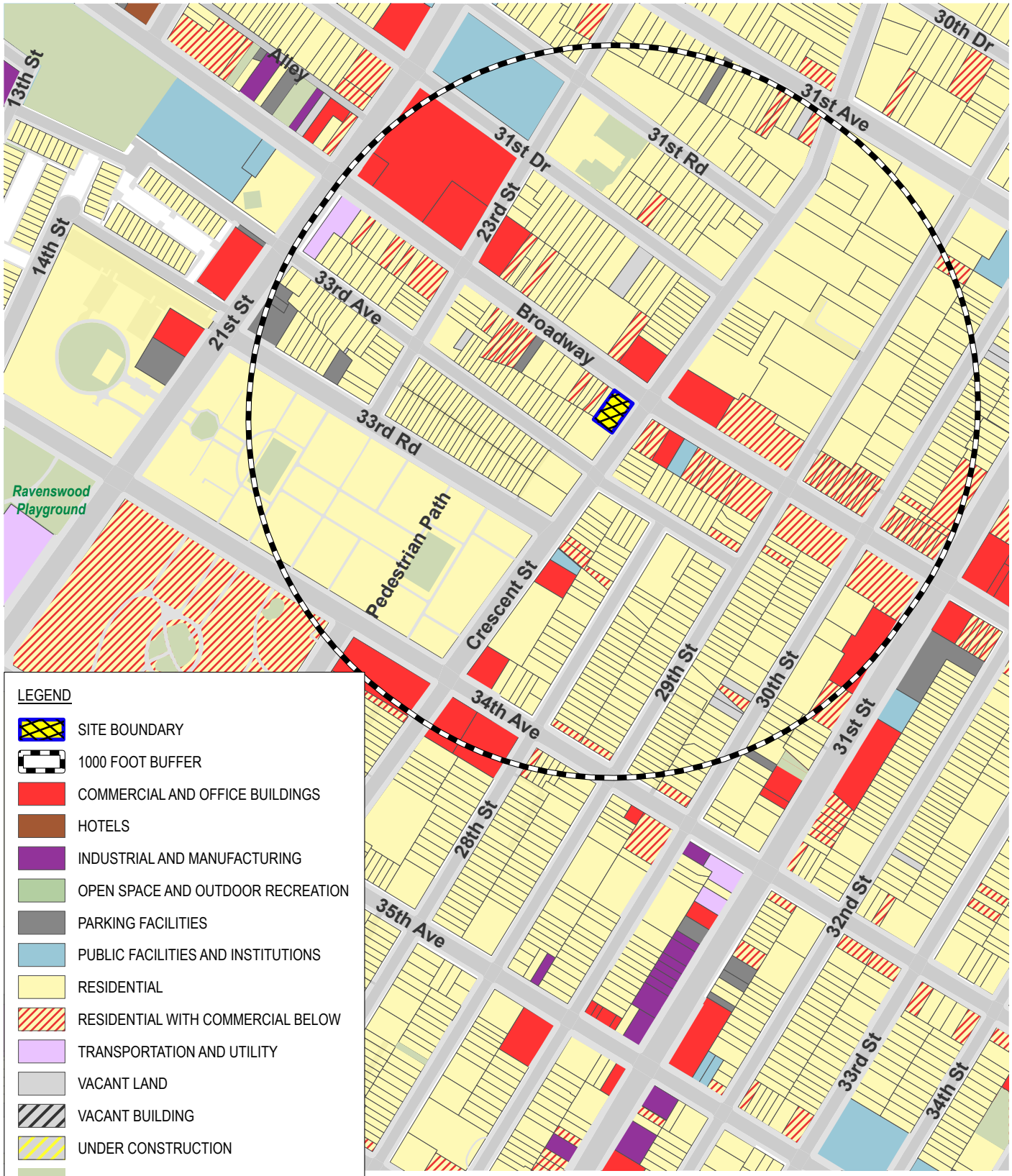
BCP SITE PLAN AND PHASE II SAMPLING LOCATIONS

DATE
3/24/2026
PROJECT NO.
250825
FIGURE
2

AKRF O:\Projects\250825 - 23-56 BROADWAY\SAR\250825 Phase II Figures.aprx12/11/2025 11:32 PM250825 Fig 2 Site Plan and sampling locationsjszalus



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

AKRF O:\Projects\250825 - 23-56 BROADWAY\SAR\250825 BCP RIWP.aprx3/24/2026 10:04 AM250825 Fig 3 Surrounding Land Use\szalus

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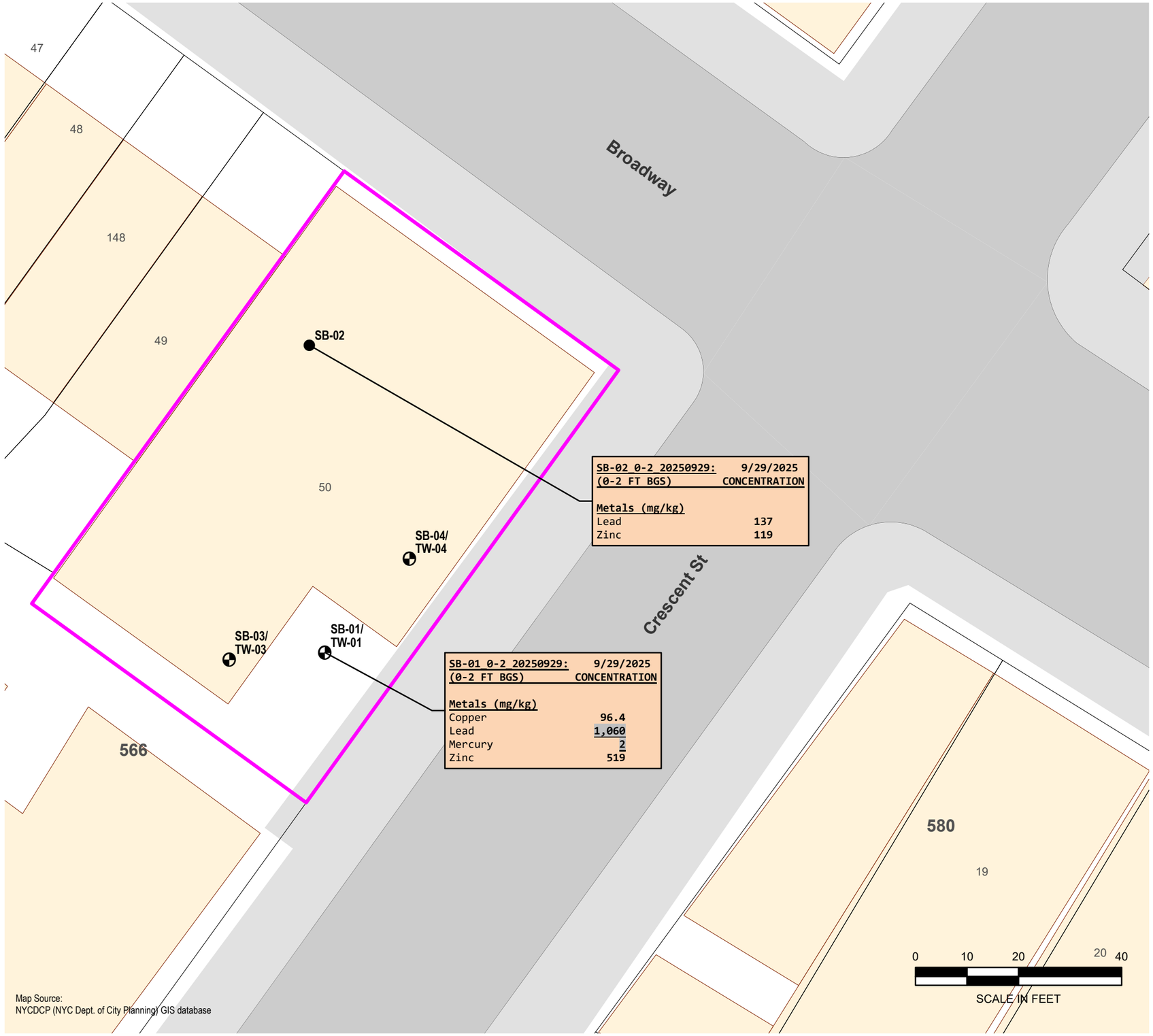
Queens, New York

SURROUNDING LAND USE

DATE
3/24/2026

PROJECT NO.
250825

FIGURE
3



LEGEND

- SITE BOUNDARY
- 50 LOT BOUNDARY AND TAX LOT NUMBER
- 566 BLOCK NUMBER
- SOIL BORING
- SOIL BORING/TEMPORARY WELL

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).

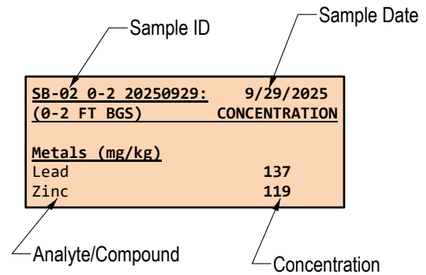
Exceedances of NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs) are presented in bold font.

Exceedances of NYSDEC Restricted Residential Soil Cleanup Objectives (RRSCOs) are highlighted in grey shading.

Exceedances of NYSDEC Protection of Groundwater Soil Cleanup Objectives (PGWSCOs) are underlined.

mg/kg:milligrams per kilogram = parts per million (ppm)

	PART 375 PROTECTION OF GROUNDWATER (mg/kg)	PART 375 RESTRICTED RESIDENTIAL (mg/kg)	PART 375 UNRESTRICTED USE (mg/kg)
Metals			
Copper	1,720	270	50
Lead	450	400	63
Mercury	0.73	0.81	0.18
Zinc	2,480	10,000	109



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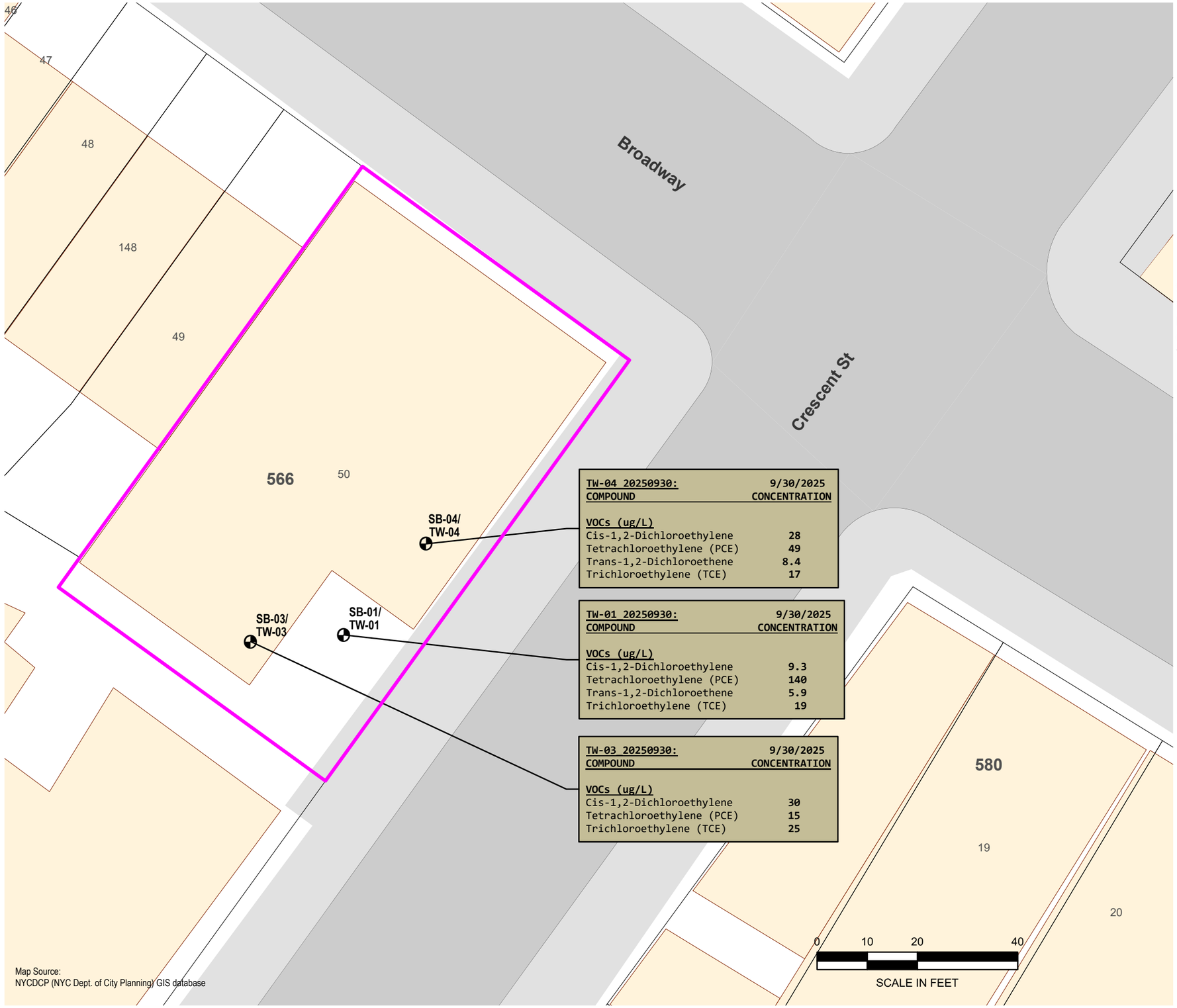
23-56 Broadway, Queens, New York

PHASE II SAMPLES ABOVE NYSDEC AND UUSCOS, RRSCOSS, AND PGWSCOs

DATE
3/24/2026

PROJECT NO.
250852

FIGURE
4



N

LEGEND

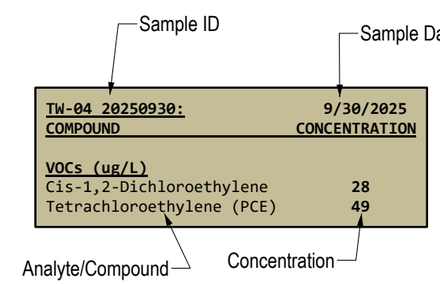
- SITE BOUNDARY
- 50 LOT BOUNDARY AND TAX LOT NUMBER
- 566 BLOCK NUMBER
- SOIL BORING/TEMPORARY WELL

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):

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

Only Exceedances of NYSDEC AWQSGVs are shown in bold font.

	NYSDEC AWQSGVs (ug/l)
VOCs	
Cis-1,2-Dichloroethylene	5
Tetrachloroethylene (PCE)	5
Trans-1,2-Dichloroethene	5
Trichloroethylene (TCE)	5



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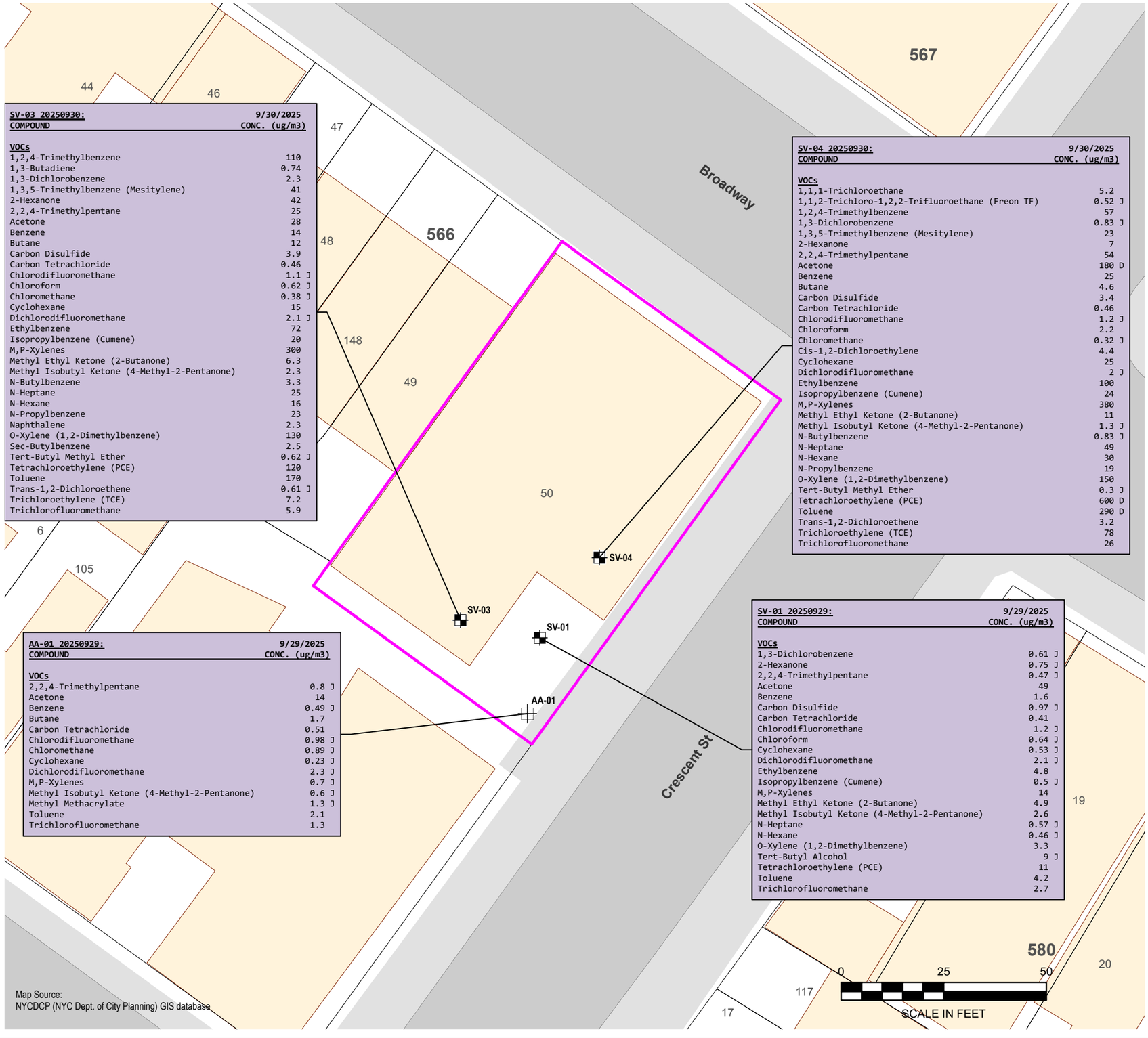
23-56 Broadway
Queens, New York

PHASE II GROUNDWATER EXCEEDANCES (AWQSGVS)

DATE
12/15/2025

PROJECT NO.
250852

FIGURE
5



SV-03 20250930: 9/30/2025

COMPOUND	CONC. (ug/m3)
VOCs	
1,2,4-Trimethylbenzene	110
1,3-Butadiene	0.74
1,3-Dichlorobenzene	2.3
1,3,5-Trimethylbenzene (Mesitylene)	41
2-Hexanone	42
2,2,4-Trimethylpentane	25
Acetone	28
Benzene	14
Butane	12
Carbon Disulfide	3.9
Carbon Tetrachloride	0.46
Chlorodifluoromethane	1.1 J
Chloroform	0.62 J
Chloromethane	0.38 J
Cyclohexane	15
Dichlorodifluoromethane	2.1 J
Ethylbenzene	72
Isopropylbenzene (Cumene)	20
M,P-Xylenes	300
Methyl Ethyl Ketone (2-Butanone)	6.3
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	2.3
N-Butylbenzene	3.3
N-Heptane	25
N-Hexane	16
N-Propylbenzene	23
Naphthalene	2.3
O-Xylene (1,2-Dimethylbenzene)	130
Sec-Butylbenzene	2.5
Tert-Butyl Methyl Ether	0.62 J
Tetrachloroethylene (PCE)	120
Toluene	170
Trans-1,2-Dichloroethene	0.61 J
Trichloroethylene (TCE)	7.2
Trichlorofluoromethane	5.9

SV-04 20250930: 9/30/2025

COMPOUND	CONC. (ug/m3)
VOCs	
1,1,1-Trichloroethane	5.2
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon TF)	0.52 J
1,2,4-Trimethylbenzene	57
1,3-Dichlorobenzene	0.83 J
1,3,5-Trimethylbenzene (Mesitylene)	23
2-Hexanone	7
2,2,4-Trimethylpentane	54
Acetone	180 D
Benzene	25
Butane	4.6
Carbon Disulfide	3.4
Carbon Tetrachloride	0.46
Chlorodifluoromethane	1.2 J
Chloroform	2.2
Chloromethane	0.32 J
Cis-1,2-Dichloroethylene	4.4
Cyclohexane	25
Dichlorodifluoromethane	2 J
Ethylbenzene	100
Isopropylbenzene (Cumene)	24
M,P-Xylenes	380
Methyl Ethyl Ketone (2-Butanone)	11
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	1.3 J
N-Butylbenzene	0.83 J
N-Heptane	49
N-Hexane	30
N-Propylbenzene	19
O-Xylene (1,2-Dimethylbenzene)	150
Tert-Butyl Methyl Ether	0.3 J
Tetrachloroethylene (PCE)	600 D
Toluene	290 D
Trans-1,2-Dichloroethene	3.2
Trichloroethylene (TCE)	78
Trichlorofluoromethane	26

AA-01 20250929: 9/29/2025

COMPOUND	CONC. (ug/m3)
VOCs	
2,2,4-Trimethylpentane	0.8 J
Acetone	14
Benzene	0.49 J
Butane	1.7
Carbon Tetrachloride	0.51
Chlorodifluoromethane	0.98 J
Chloromethane	0.89 J
Cyclohexane	0.23 J
Dichlorodifluoromethane	2.3 J
M,P-Xylenes	0.7 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	0.6 J
Methyl Methacrylate	1.3 J
Toluene	2.1
Trichlorofluoromethane	1.3

SV-01 20250929: 9/29/2025

COMPOUND	CONC. (ug/m3)
VOCs	
1,3-Dichlorobenzene	0.61 J
2-Hexanone	0.75 J
2,2,4-Trimethylpentane	0.47 J
Acetone	49
Benzene	1.6
Carbon Disulfide	0.97 J
Carbon Tetrachloride	0.41
Chlorodifluoromethane	1.2 J
Chloroform	0.64 J
Cyclohexane	0.53 J
Dichlorodifluoromethane	2.1 J
Ethylbenzene	4.8
Isopropylbenzene (Cumene)	0.5 J
M,P-Xylenes	14
Methyl Ethyl Ketone (2-Butanone)	4.9
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	2.6
N-Heptane	0.57 J
N-Hexane	0.46 J
O-Xylene (1,2-Dimethylbenzene)	3.3
Tert-Butyl Alcohol	9 J
Tetrachloroethylene (PCE)	11
Toluene	4.2
Trichlorofluoromethane	2.7

N

LEGEND

- SITE BOUNDARY
- 50 — LOT BOUNDARY AND TAX LOT NUMBER
- 566 — BLOCK NUMBER
- SOIL VAPOR POINT
- AMBIENT AIR SAMPLING LOCATION

SOIL VAPOR

µg/m³- micrograms per cubic meter

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

Sample ID — Sample Date

AA-01 20250929: 9/29/2025

COMPOUND	CONC. (ug/m3)
VOCs	
2,2,4-Trimethylpentane	0.8 J
Acetone	14
Benzene	0.49 J
Butane	1.7
Carbon Tetrachloride	0.51

Analyte/Compound — Concentration

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PHASE II SOIL VAPOR DETECTIONS

DATE
3/24/2026

PROJECT NO.
250852

FIGURE
6

LEGEND

- SITE BOUNDARY
- 50 LOT BOUNDARY AND TAX LOT NUMBER
- 566 BLOCK NUMBER
- BUILDING
- SOIL BORING (PHASE II)
- SOIL BORING/TEMPORARY WELL (PHASE II)
- SOIL VAPOR POINT (PHASE II)
- AMBIENT AIR SAMPLING LOCATION (PHASE II)
- PROPOSED RI SOIL BORING
- PROPOSED RI SOIL BORING/ TEMPORARY WELL
- PROPOSED RI SOIL VAPOR POINT

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

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23-56 Broadway
Queens, New York

SITE PLAN AND PROPOSED RI SAMPLING LOCATIONS

DATE
3/24/2026

PROJECT NO.
250825

FIGURE
7

AKRF O:\Projects\250825 - 23-56 BROADWAY\SAR\250825 BCP RIWP.aprx3/24/2026 10:04 AM250825 Fig 7 Proposed Sampling Locationsjszalus

APPENDIX A
QUALITY ASSURANCE PROJECT PLAN

Broadway Astoria Arts

23-56 BROADWAY, ASTORIA, NEW YORK

Quality Assurance Project Plan

NYSDEC BCP Site No.: TBD
AKRF Project Number: 250825

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:

Broadway Astoria Arts LLC
23-56 Broadway
Astoria, New York 11106

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
212-696-0670

MARCH 2026

TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENTS

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the protocols and procedures that will be followed during implementation of the Remedial Investigation Work Plan (RIWP) at the Broadway Astoria Arts property located at 23-56 Broadway in the Astoria section of Queens, New York (hereafter referred to as the "Site"). The Site is identified by the City of New York as Borough of Queens, Tax Map 4, Block 556, Lot 50. A Site location map is provided as Figure 1, and a Site plan that shows the proposed sample locations is provided as Figure 2.

The objective of this QAPP is to provide for Quality Assurance (QA) and maintain Quality Control (QC) of environmental investigative and sampling activities conducted under New York State Department of Environmental Conservation (NYSDEC) oversight in the Brownfield Cleanup Program (BCP) (BCP Site No. TBD). Adherence to this QAPP will ensure that defensible data will be obtained during environmental work at the Site.

2.0 PROJECT TEAM

The project team will be drawn from AKRF, Inc. (AKRF) professional and technical personnel, and AKRF's subcontractors. All field personnel and subcontractors will have completed a 40-hour training course and updated 8-hour refresher course that meet the Occupational Safety and Health Administration (OSHA) requirements of 29 Code of Federal Regulations (CFR) Part 1910. The following sections describe the key project personnel and their responsibilities.

2.1 Quality Assurance/ Quality Control (QA/QC) Officer

Ms. Deborah Shapiro, QEP will serve as the QA/QC Officer and will be responsible for adherence to the QAPP, including QA/QC. The QA/QC Officer will review the procedures with all personnel prior to commencing any fieldwork and will conduct periodic Site visits to assess implementation of the procedures. The project director will also be responsible for reviewing the Data Usability Summary Reports (DUSRs) prepared by a third-party data validator for soil, groundwater, and soil vapor analytical results. Ms. Shapiro's resume is included in Attachment A.

2.2 Project Manager

Mr. J. Patrick Diggins will serve as the project manager for the RIWP. The project manager will be responsible for directing and coordinating all elements of the RIWP. The project manager will prepare reports and participate in meetings with the Site owner/Volunteer, and/or NYSDEC.

Mr. Diggins' and Mr. Giordano's resumes are included in Attachment A.

2.3 Deputy Project Manager

Mr. Thomas Giordano will serve as the deputy project manager for the RIWP. The deputy project manager will be responsible for assisting the project manager with certain elements of the RIWP. The deputy project manager will assist in preparation reports and participate in meetings with the Site owner/Volunteer, and/or NYSDEC.

Mr. Giordano's resumes are included in Attachment A.

2.4 Remediation Engineer

Ms. Rebecca A. Kinal, P.E. will serve as the Remediation Engineer for the project. Ms. Kinal's resume is included in Attachment A.

2.5 Field Team Leader, Field Technician, Site Safety Officer (SSO), and Alternates

The field team leader will be responsible for supervising the daily sampling and health and safety activities in the field and will ensure adherence to the RIWP and Health and Safety Plan (HASP) (included as Appendix B of the RIWP). The field team leader will also act as the field technician and SSO and will report to the project manager and/or deputy project manager on a regular basis regarding daily progress and any deviations from the RIWP. The field team leader will be a qualified and responsible person able to act professionally and promptly during environmental work at the Site. Ms. Mackenzie Miller will be the field team leader. The field team leader alternate is Giovanni De Marzo. Ms. Miller and Mr. De Marzo's resumes are included in Attachment A.

2.6 Laboratory Quality Assurance/Quality Control (QA/QC) Officer

The laboratory QA/QC officer will be responsible for quality control procedures and checks in the laboratory and ensuring adherence to laboratory protocols. The laboratory QA/QC officer will track the movement of samples from the time they are checked in at the laboratory to the time that

analytical results are issued, and will conduct a final check on the analytical calculations and sign off on the laboratory reports. The laboratory QA/QC officer will be Carl Armbruster of Eurofins Environmental Testing of Edison, NY (Pace), the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory being employed for all environmental sampling at the Site.

2.7 Thirty-Party Data Validator

The third-party data validator will be responsible for reviewing the final data packages for soil, groundwater, and soil vapor and preparing a DUSR that will provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the laboratory analyses for the investigation. The third-party data validator will be Lori Beyer of L.A.B. Validation Corporation of East Northport, New York.

3.0 DATA QUALITY OBJECTIVES

The objectives for the sampling include:

- During the Remedial Investigation (RI), soil, groundwater, and soil vapor samples will be collected from soil borings, permanent groundwater monitoring wells, and temporary soil vapor points, respectively.
- Samples will be collected to further define and characterize the nature and extent of on-site contamination and assist with determining the appropriate remedial action.

Who will use the data?

- The collected data will be used by NYSDEC, NYSDOH, the Volunteer, and AKRF as part of the Site's enrollment in the BCP.

What types of data are needed?

- Soil samples will be collected from soil borings advanced across the Site. Samples will be analyzed for volatile organic compounds (VOCs) by United States Environmental Protection Agency (EPA) Method 8260, semi-volatile organic compounds (SVOCs) by EPA Method 8270, polychlorinated biphenyls (PCBs) by EPA Method 8082, pesticides by EPA Method 8081, target analyte list (TAL) metals by EPA Method 6000/7000 series, hexavalent chromium by EPA Method 7196A, per- and polyfluorinated compounds (PFAS) by Modified EPA Method 1633A, and 1,4-dioxane by EPA Method 8270, using Category B deliverables.
- Groundwater samples will be collected from permanent monitoring wells to be installed as part of the RI. Samples will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, PCBs by EPA Method 8082, pesticides by EPA Method 8081, total and dissolved TAL metals by EPA Method 6000/7000 series, PFAS by EPA Method 1633A, and 1,4-dioxane by EPA Method 8270 selected ion monitoring (SIM), using Category B deliverables.
- Soil vapor samples will be collected from temporary sub-slab soil vapor and soil vapor points. All sub-slab soil vapor and soil vapor samples will be analyzed for VOCs by EPA Method TO-15 using Category B deliverables.

How much data are needed?

- Approximately 16 soil samples will be collected from 8 borings.
- Six groundwater samples will be collected from six permanent monitoring wells.
- Six soil vapor samples will be collected from six temporary vapor points.

Where, when, and how should the data be collected/generated?

- Soil samples will be collected from the eight borings outlined in the RIWP and shown at the approximate locations shown on Figure 2. Borings will be advanced using a Geoprobe® Direct-Push Probe (DPP). Soil samples will be inspected by AKRF field personnel for evidence of contamination (e.g., odors, staining, etc.), screened for the presence of VOCs with a calibrated photoionization detector (PID) equipped with an 11.7 electron Volt (eV) lamp, and logged using the modified Burmister soil classification system. Soil samples will be placed in laboratory-supplied containers by AKRF personnel and shipped to a NYSDOH ELAP-certified laboratory via a courier with chain-of-custody (COC) documentation in accordance with appropriate EPA protocols.
- Groundwater samples will be collected in accordance with EPA low-flow sampling protocols approximately one to two weeks following monitoring well development. Samples will be collected

by AKRF personnel using a submersible bladder pump with high-density polyethylene (HDPE) tubing. Sampling for PFAS will be conducted in accordance with the April 2023 NYSDEC-issued sampling protocol, except that a low-density polyethylene (LDPE) bladder will be used as no industry-approved high-density polyethylene (HDPE) alternative currently exists. During sampling, water quality parameters will be recorded on log sheets until the parameters have stabilized within ±10% and turbidity is below 50 nephelometric turbidity units (NTUs). Groundwater samples will be placed in laboratory-supplied containers and shipped in accordance with appropriate EPA protocols to a NYSDOH ELAP-certified laboratory.

- Soil vapor and sub-slab soil vapor sampling will be performed in accordance with the guidelines provided in the NYSDOH document entitled, "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006, revised 2017 and 2024. The soil vapor and sub-slab soil vapor samples will be collected over a 2-hour time period using a 6-Liter, batch-certified SUMMA® canister equipped with a vacuum gauge and flow regulator set at a maximum rate of 0.2 liter per minute. After two hours, the flow controller valve will be closed, the final vacuum noted, and the canister placed in a shipping carton for delivery to the laboratory.

Who will collect and generate the data?

- AKRF, and any AKRF subcontractor, will be responsible for performing the sampling. All samples will be analyzed by Eurofins (subcontracted by AKRF), a NYSDOH ELAP-certified laboratory. AKRF will be responsible for collecting, reviewing, assessing, and disseminating validated data. Third-party data validation and the preparation of a DUSR will be completed by Ms. Lori Beyer of L.A.B. Validation Corporation.

How will the data be reported?

- The data will be reported in the RI Report (RIR), and as EQuIS-compatible electronic data deliverables (EDDs) submitted to NYSDEC.

How will the data be archived?

- All hard-copy data will be maintained at AKRF offices for a minimum of one year. Field logbooks and forms/sampling logs will be scanned and all electronic data will be archived on the AKRF corporate server.

4.0 STANDARD OPERATING PROCEDURES (SOPS)

The following sections describe the SOPs for the remedial activities included in the RIWP. During these activities, safety monitoring will be performed as described in the HASP, included as Appendix B of the RIWP.

4.1 Decontamination of Sampling Equipment

All sampling equipment (augers, drilling rods, split spoon samplers, probe rods, pumps, etc.) will be either dedicated or decontaminated between sampling locations. Decontamination will be conducted on plastic sheeting (or equivalent) that is bermed to prevent discharge to the ground. The decontamination procedure will be as follows:

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

4.2 Management of Investigation-Derived Waste (IDW)

IDW will be containerized in New York State Department of Transportation (DOT)-approved 55-gallon drums. The drums will be sealed at the end of each workday and labeled with the date, the wells(s) and/or boring numbers, the type of waste (i.e., drill cuttings, decontamination fluids, development water, or purge water), and the name and phone number of an AKRF point-of-contact. All IDW exhibiting field evidence of contamination will be disposed of or treated according to applicable local, state, and federal regulations.

5.0 SAMPLING AND LABORATORY PROCEDURES

5.1 Soil Sampling

Soil sampling will be conducted according to the following procedures:

- Characterize the sample according to the modified Burmister soil classification system.
- Field screen the sample for evidence of contamination (e.g., odors, staining, etc.) using visual and olfactory methods and screen for VOCs using a PID equipped with an 11.7 eV lamp.
- Use the following acceptable equipment (other equipment may be considered appropriate based on sampling conditions):
  - stainless steel spoon;
  - stainless steel bowl; and
  - steel hand auger or shovel without any coatings.
- Collect an aliquot of soil from each proposed sample location, place it in laboratory-supplied glassware, label the sample in accordance with Section 5.6.1, and place it in an ice-filled cooler for shipment to the laboratory. Samples analyzed for PFAS should be contained in a separate cooler and the sample containers should be labeled with ballpoint pen, not permanent marker.
- Complete the proper COC paperwork and seal the cooler.
- Record sample location, sample depth, and sample observations (evidence of contamination, PID readings, soil classification, etc.) in the field logbook and on the boring log data sheet, if applicable.
- Decontaminate any soil sampling equipment between sample locations as described in Section 4.1 of this QAPP. Standard two-step decontamination using detergent (Alconox) and clean, PFAS-free water will be performed for sampling equipment.

5.2 Groundwater Sampling

Groundwater sampling will be conducted according to the following procedures:

- Field screen the sample for evidence of contamination (e.g., odors, staining, etc.) using visual and olfactory methods and screen the well headspace for VOCs using a PID equipped with an 11.7 eV lamp.
- Use the following acceptable equipment (other equipment may be considered appropriate based on sampling conditions):
  - stainless steel inertia pump with HDPE tubing;
  - peristaltic pump equipped with HDPE tubing and silicone tubing;
  - stainless steel bailer with stainless steel ball; and
  - bladder pump (identified as PFAS-free) with HDPE tubing [a low-density polyethylene (LDPE) bladder will be used for PFAS, as no industry-approved HDPE alternative currently exists].
- Collect the groundwater sample from each proposed sample location in laboratory-supplied glassware, label the sample in accordance with Section 5.6.1, and place it in an ice-filled

cooler for shipment to the laboratory. Samples analyzed for PFAS should be contained in a separate cooler and the sample containers should be labeled with ballpoint pen, not permanent marker.

- Complete the proper COC paperwork and seal the cooler.
- Record sample location, sample depth, and sample observations (evidence of contamination, PID readings, free phase liquid, etc.) in the field logbook and on the boring log data sheet, if applicable.
- Decontaminate any groundwater sampling equipment between sample locations as described in Section 4.1 of this QAPP. Standard two-step decontamination using detergent (Alconox) and clean, PFAS-free water will be performed for sampling equipment.

5.3 Soil Vapor and Sub-Slab Soil Vapor Sampling

Soil vapor and sub-slab soil vapor sampling will be conducted according to the following procedures:

- Field screen the sample for evidence of contamination (e.g., odors, etc.) using olfactory methods and screen the purged vapors for VOCs using a PID equipped with an 11.7 eV lamp.
- Collect a soil vapor or sub-slab soil vapor sample from each proposed sample location in a laboratory-supplied SUMMA® canister, label the sample in accordance with Section 5.6.1, and place it in a shipment container for shipment to the laboratory.
- Complete the proper COC paperwork and seal the shipment container.
- Record sample location, sample depth, and sample observations (odors, PID readings, etc.) in the field logbook and on the boring log data sheet, if applicable.

5.4 Laboratory Methods

Table 1 summarizes the laboratory methods that will be used to analyze field samples and the sample container type, preservation, and applicable holding times. Pace, a NYSDOH ELAP-certified laboratory subcontracted to AKRF, will be used for all chemical analyses in accordance with the Division of Environmental Remediation (DER)-10 2.1(b) and 2.1(f) with Category B Deliverables.

Table 1
Laboratory Analytical Methods for Analysis Groups

Matrix	Analysis	EPA Method	Bottle Type	Preservative	Hold Time
Soil and Soil QA/QC	VOCs	8260C	EnCore® samplers (3) and 2 oz. plastic jar	≤ 4 ºC	48 hours to extract; 14 days to analyze
	SVOCs	8270D	8 oz. Glass Jar	≤ 4 ºC	14 days to extract; 40 days to analyze
	1,4-Dioxane	8270D; 0.1 mg/kg RL	4 oz. Glass Jar	≤ 4 ºC	14 days to extract; 40 days to analyze
	TAL Metals and Hexavalent Chromium	6000/7000 Series, 6010C, and 7196A	8 oz. Glass Jar	≤ 4 ºC	6 months holding time; Mercury 28 days holding time; Hexavalent chromium 30 days to extract, 7 days to analyze
	Pesticides	8081B	8 oz. Glass Jar	≤ 4 ºC	14 days to extract; 40 days to analyze
	PCBs	8082A	8 oz. Glass Jar	≤ 4 ºC	14 days to extract; 40 days to analyze
	PFAS	1633A	4 oz. HDPE Container	≤ 4 ºC	90 days to extract; 28 days to analyze
Groundwater and Groundwater QA/QC	VOCs	8260C	5 40 mL Glass Vials	HCl to pH < 2 and ≤ 4 ºC	48 hours to extract; 14 days to analyze
	SVOCs	8270D	2,000 mL Amber Jar	≤ 4 ºC	7 days to extract; 40 days to analyze
	1,4-Dioxane	8270D plus SIM; 0.35 µg/L RL	1 L Amber Jar	≤ 4 ºC	7 days to extract; 40 days to analyze
	TAL Metals	6000/7000 Series	2,000 mL Amber Jar	HNO_3 to pH < 2	6 months for metals; 28 days for Mercury; 24 hours for Hexavalent chromium
	Pesticides	8081B	2,000 mL Amber Jar	≤ 4 ºC	7 days to extract; 40 days to analyze
	PCBs	8082A	2,000 mL Amber Jar	≤ 4 ºC	7 days to extract; 40 days to analyze
	PFAS	1633A	3 x 250 mL Polypropylene Bottles	≤ 4 ºC, Trizma	14 days to analyze
Soil Vapor and Sub-Slab Soil Vapor	VOCs	TO-15	6L SUMMA® Canister	None	14 days

Notes:
QA/QC samples will be analyzed for the same parameters as the parent sample, with the exception of the trip blank(s), which will be analyzed for VOCs by EPA Method 8260C only.
mg/kg – milligrams per kilogram (parts per million)
µg/L – parts per billion
ng/L – parts per trillion

5.5 Quality Control (QC) Sampling

In addition to the laboratory analysis of the soil and groundwater samples, additional analysis will be included for QC measures, as required by the Category B sampling techniques. These samples will include field blank, trip blank, matrix spike/matrix spike duplicate (MS/MSD), and blind duplicate samples at a frequency of one sample per 20 field samples collected. QC samples will be analyzed for the same parameters as the accompanying samples, with the exception of any trip blanks, which will be analyzed for the VOC list only. Additionally, one equipment blank will be collected during each day of groundwater sampling and analyzed for PFAS only. The QA/QC samples are summarized in Table 2 below:

Table 2
Field Sample and QA/QC Sample Quantities

Sample Type	Parameters	EPA Method[1]	Field Samples	QA/QC Samples				
				Duplicate[2]	MS/MSD[2]	Field Blank[2]	Trip Blank[2]	Equipment Blank[3]
Soil	VOCs	EPA 8260C	16 (estimated)	1/20 (1)	1/20 (1)	1/20 (1)	1 (Laboratory-Supplied)	NA
	SVOCs (+1,4-Dioxane), TAL Metals, Hexavalent Chromium, PCBs, Pesticides, and PFAS	EPA 8270D, 6010C/7471B, 8082A, 8081B, and 1633A	16 (estimated)	1/20 (1)	1/20 (1)	1/20 (1)	NA	NA
Groundwater	VOCs	EPA 8260C	6	1/20 (1)	1/20 (1)	1/20 (1)	1 (Laboratory-Supplied)	NA
	SVOCs (+1,4-Dioxane), Total/Dissolved, TAL Metals, PCBs, Pesticides, and PFAS	EPA 8270D, 6010C/7471B, 8082A, 8081B, and 1633A	6	1/20 (1)	1/20 (1)	1/20 (1)	NA	1 per day for PFAS analysis only
Soil Vapor and Sub-Slab Soil Vapor	VOCs	TO-15	6	NA	NA	NA	NA	NA

Notes:
NA – Not Applicable
[1] – NYSDEC July 2005 ASP Category B deliverables
[2] – One MS/MSD, blind duplicate, field blank, and trip blank sample per 20 field samples per media
[3] – One equipment blank will be collected per day of groundwater sampling for PFAS analysis only

5.6 Sample Handling

5.6.1 Sample Identification

All samples will be consistently identified in all field documentation, COC documents, and laboratory reports. Soil, groundwater, and soil vapor samples collected during the RI will be identified with "RI-" and "SB-" for soil borings, "MW-" for groundwater monitoring wells, and "SV-" for soil vapor points, followed by the soil boring, groundwater monitoring well, or soil vapor point sample number. All samples will be amended with the collection date at the end of the sample name in a year, month, day (YYYYMMDD) format. Blind duplicate sample nomenclature will consist of the sample type, followed by an "X"; MS/MSD samples nomenclature will consist of the parent sample name only, but triplicate sample volume will be collected and the COC comment section will explain that the additional volume is for running the MS/MSD; and trip and field blanks will consist of "TB-" and "FB-", respectively, followed by "S" for soil and "GW" for groundwater, and a sequential number of the trip/field blanks collected. Special characters, including primes/apostrophes ('), will not be used for sample nomenclature. Table 3 provides examples of the sampling identification scheme for samples collected during the RI.

Table 3
Remedial Investigation Sample Nomenclature

Sample Description	Sample Designation
Groundwater sample collected from groundwater monitoring well RI-MW-03 on October 1, 2026	RI-MW-03_20261001
Blind duplicate sample of groundwater sample collected from groundwater monitoring well RI-MW-03 on October 1, 2026	RI-MW-X_20261001
Field blank collected during the RI on October 1, 2026 with the soil samples	RI-FB-S_20261001
Soil sample collected from soil boring RI-SB-05 between 0 and 2 feet below grade on October 1, 2026	RI-SB-05_0-2_20261001
Second blind duplicate soil sample collected from soil boring RI-SB-05 between 0 and 2 feet below grade on October 1, 2026	RI-SB-X2_0-2_20261001
Soil vapor sample collected from temporary soil vapor point RI-SV-05 on October 1, 2026	RI-SV-05_20261001
Sub-slab soil vapor sample collected from temporary sub-slab soil vapor point RI-SV-02 on October 1, 2026	RI-SSV-02_20261001

Sample Labeling and Shipping

All sample containers will be provided with labels containing the following information:

- Project identification, including Site name and Site address;
- Sample identification;
- Date and time of collection;
- Analysis(es) to be performed; and
- Sampler's initials.

Once the samples are collected and labeled, they will be placed in chilled coolers and stored in a cool area away from direct sunlight to await shipment to the laboratory. All samples will be shipped to the laboratory at least twice per week. At the start and end of each workday, field personnel will add ice to the cooler(s) as needed.

The samples will be prepared for shipment by placing each sample in laboratory-supplied glassware, wrapping each container in bubble wrap to prevent breakage, and adding freezer packs and/or fresh ice in sealable plastic bags. The COC form will be properly completed by the sampler in ink, and all sample shipment transactions will be documented with signatures and the date and time of custody transfer. Samples will be shipped overnight (e.g., Federal Express) or transported by a laboratory courier. All coolers shipped to the laboratory will be sealed with mailing tape and a COC seal to ensure that the samples remain under strict COC protocol.

Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured location until they are picked up and/or sent to the laboratory. The record of possession of samples from the time they are obtained in the field to the time they are delivered to the laboratory or shipped off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; signatures of individuals involved in sample transfer; and the dates and times of transfers. Laboratory personnel will note the condition of the custody seal and sample containers at sample check-in.

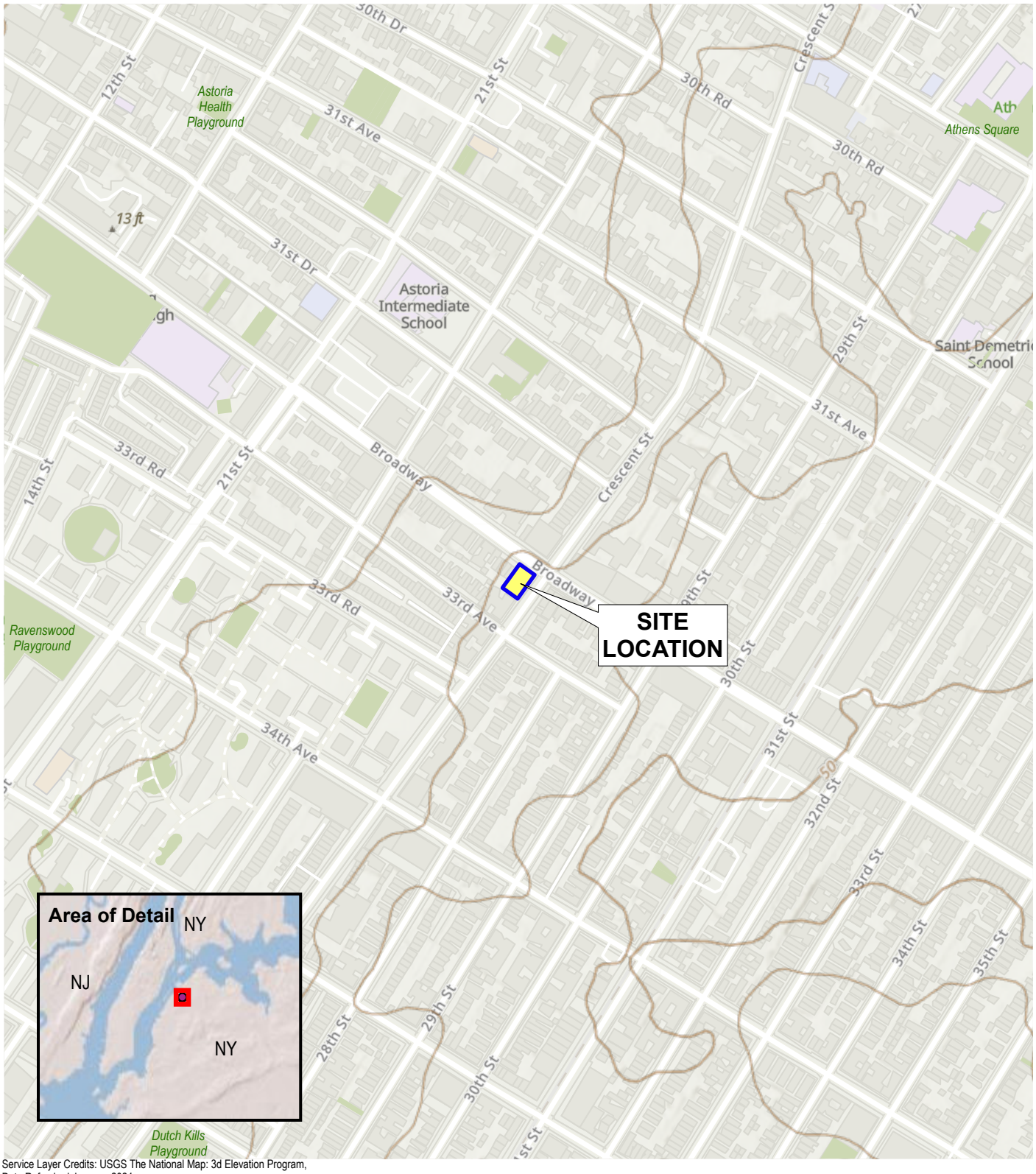
5.7 Field Instrumentation

Field personnel will be trained in the proper operation of all field instruments at the start of the field program. Instruction manuals for the equipment will be on file at the Site for referencing proper operation, maintenance, and calibration procedures. 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 or QA/QC officer will be contacted immediately to obtain a replacement instrument. A calibration log will be maintained to record the date of each calibration, any failure to calibrate, and corrective actions taken. The PID will be equipped with an 11.7 eV lamp and will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas in accordance with the manufacturer's standards.

5.8 Quality Assurance (QA)

All soil, groundwater, soil vapor, and sub-slab soil vapor laboratory analytical data will be reviewed by a third-party validator and a DUSR will be prepared to document the usability and validity of the data. The RIR will include a detailed description of sampling activities, data summary tables, a concentration map showing sample locations and concentrations, DUSRs, and laboratory reports.

FIGURES



Service Layer Credits: USGS The National Map: 3d Elevation Program, Data Refreshed January, 2024

0 500 1,000

SCALE IN FEET

N

akrf

440 Park Avenue South, New York, NY 10016

Broadway Astoria Arts

23-56 Broadway Queens, New York

BCP SITE LOCATION

DATE **12/15/2025**

PROJECT NO. **250825**

FIGURE **1**

AKRF O:\Projects\250825 - 23-56 BROADWAY\SAR\250825 Phase II Figures aprx1/19/2022 5:36 PM250825 Fig 1 site locationjszalus

LEGEND

- SITE BOUNDARY
- 50 LOT BOUNDARY AND TAX LOT NUMBER
- 566 BLOCK NUMBER
- BUILDING
- SOIL BORING (PHASE II)
- SOIL BORING/TEMPORARY WELL (PHASE II)
- SOIL VAPOR POINT (PHASE II)
- AMBIENT AIR SAMPLING LOCATION (PHASE II)
- PROPOSED RI SOIL BORING
- PROPOSED RI SOIL BORING/ TEMPORARY WELL
- PROPOSED RI SOIL VAPOR POINT

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

0 20 40
SCALE IN FEET

akrf
440 Park Avenue South, New York, NY 10016

Broadway Astoria Arts
23-56 Broadway
Queens, New York

SITE PLAN AND PROPOSED RI SAMPLING LOCATIONS

DATE
3/24/2026

PROJECT NO.
250825

FIGURE
2

AKRF O:\Projects\250825 - 23-56 BROADWAY\SAR\250825 BCP RIWP.aprx3/24/2026 10:04 AM250825 Fig 7 Proposed Sampling Locationsjszalus

ATTACHMENT A
RESUMES OF QA/QC OFFICER, PROJECT MANAGER, DEPUTY PROJECT MANAGER, AND FIELD TEAM LEADER/FIELD TECHNICIAN/SITE SAFETY OFFICER/ALTERNATE

DEBORAH SHAPIRO, QEP

SENIOR VICE PRESIDENT

Deborah Shapiro is a Senior Vice President in the Site Assessment and Remediation Department. Ms. Shapiro supervises project teams and manages all aspects of assessment and remediation projects across the New York Metropolitan Area. Ms. Shapiro works with developers, non-profit organizations, architects, local community groups, local businesses, and government agencies. Her projects fall under the regulatory oversight of NYSDEC, NYCDEP, and NYCOER including the New York State Brownfield Cleanup Program (BCP), New York City Voluntary Cleanup Program (VCP), NYSDEC petroleum spills program, RCRA/UIC closures, and NYCOER's E-designation program. Ms. Shapiro has also assisted commercial and industrial property owners with maintaining the integrity of their portfolios by providing compliance related cleanup and chemical storage management services. Ms. Shapiro has also been a moderator and panelist at numerous conferences.

Ms. Shapiro manages all aspects of redevelopment projects from the initial Phase I ESA, Phase II, and remediation through post-remedial site management. In addition, her experience includes groundwater investigations, monitoring, and sampling programs; Brownfield and hazardous waste site investigations; In-Situ Chemical Oxidation; underground storage tank studies, including soil contamination delineation, classification, removal and disposal; waste characterization sampling; exposure assessments; on-going remedial action (especially AS/SVE), and permitting.

BACKGROUND

Education

M.S., Environmental Science, American University, 2001
B.A., Environmental Studies, American University, 1998

Professional Licenses/Certifications

Qualified Environmental Professional
Health and Safety Operations at Hazardous Materials Sites 29 CFR 1910.120

OSHA 8 Hour HAZWOPER Supervisor

OSHA 10 Hour Occupational Construction Safety and Health

CPR

Professional Memberships

Past President, New York City Brownfield Partnership
Board Member, Residents for a More Beautiful Port Washington
Member, Institute of Professional Environmental Practitioners (IPEP)

Awards

Big Apple Brownfield Award recipient as part of the Elton Crossing redevelopment team 2017
Big Apple Brownfield Award recipient as part of the Courtlandt Crescent redevelopment team 2013
Big Apple Brownfield Award recipient as part of the Via Verde redevelopment team 2012
Big Apple Brownfield Award recipient as part of the Cornerstone B1 (LaTerraza) redevelopment team 2011

Years of Experience

Year started in company: 2013
Year started in industry: 1998

RELEVANT EXPERIENCE

Elton Crossing, Bronx, NY

AKRF provided environmental consulting services in connection with the purchase and redevelopment of the Elton Crossing site at 899 Elton Avenue in the Bronx, NY. The work initially involved the preparation of a Phase II subsurface investigation including soil and soil vapor testing to determine if the site would be eligible for the New York State Brownfield Cleanup Program (NYSBCP). Upon completion of the investigation, AKRF prepared a NYCBCP Application and the site was accepted into the NYSBCP. AKRF managed all aspects of the brownfield cleanup including; development of Investigation Work Plans, performing Remedial Investigations and Reports, preparation of Phase I ESAs, preparation of a Citizen Participation Plan, distribution of public notices, preparation and implementation of a Remedial Action Work Plan (RAWP), design of a sub-slab depressurization system, preparation of the Final Engineering Report and Site Management Plan, and sampling and management of soil disposal. AKRF is in the midst of implementing the Site Management Plan. As project manager, Ms. Shapiro was responsible for managing all technical components of the project, communication with NYSDEC and the Client, and managing the budget.

Second Farms, Bronx, NY

AKRF, Inc. was initially contracted by the New York City Office of Environmental Remediation (NYCOER) to conduct a subsurface investigation of a 1.12-acre parcel in the Bronx, New York under the United States Environmental Protection Agency (USEPA) Brownfield Assessment Grant program. The investigation included a geophysical survey and utility mark-outs, and the collection and analysis of soil, groundwater, soil vapor, indoor air and ambient air samples. AKRF continued working on the project for the developer by preparing a Remedial Action Plan and Environmental Assessment Statement. AKRF is in the midst of implementing the remedy.As project manager, Ms. Shapiro was responsible for managing all technical components of the project, communication with OER, NYCDEP, and the Client, and managing the budget.

Bradhurst Cornerstone II Residences, Manhattan, NY

AKRF, Inc. prepared a Part 58 Environmental Assessment and a City Environmental Quality Review Environmental Assessment Statement for the Bradhurst Cornerstone II Apartments project. Issues of concern for the environmental review included the identification of project commitments for certain of the four sites related to historic resources, hazardous materials, air quality, and building attenuation. As part of the mitigation of hazardous materials, AKRF conducted a Phase II investigation, and prepared a Remedial Action Plan and Construction Health and Safety Plan. As project manager, Ms. Shapiro was responsible for managing all technical components of the hazardous materials portion of the project, communication with the regulatory agency and the Client, and managing the budget.

Lambert Houses, Bronx, NY

AKRF performed an EIS of the Lambert Houses affordable housing complex located in the West Farms section of the Bronx, NY. Lambert Houses consisted of multi-story apartment buildings, parking garage, and a multi-tenant retail/commercial building alongside the elevated NYC subway. AKRF also conducted a Phase I ESA with a vapor intrusion screen of the Property to satisfy HUD's vapor intrusion requirements. The Phase I and vapor intrusion screens were prepared in accordance with ASTM E1527-05, ASTM E2600, and EPA's All Appropriate Inquiry (AAI) rule. After completion of the EIS, an E designation for hazardous materials was placed on the Site. A Subsurface Investigation was conducted and a Remedial Action Work Plan was prepared under OER oversight. The Site was subsequently entered in the NYC Voluntary Cleanup Program. AKRF is in the midst of implementing the RAWP, which included remediation of a hydraulic oil spill. As project manager, Ms. Shapiro was responsible for managing all technical components of the hazardous materials portion of the project, communication with the regulatory agency and the Client, and managing the budget.

Brook 156, Bronx, NY

AKRF was retained to provide environmental consulting services in connection with the purchase and development of the Site. AKRF prepared a Phase I Environmental Site Assessment (ESA) of the NYC-owned former gasoline service station and a former railroad. A Tier 1 Vapor Encroachment Screening was also conducted to satisfy HUD's vapor intrusion requirements. AKRF prepared a Remedial Investigation Work Plan (RIWP) and conducted a Remedial Investigation (RI) at the site, which included the collection and analysis of soil, soil vapor, and groundwater. The results of the RI, which were documented in a Remedial Investigation Report (RIR), were used to prepare a New York City Brownfield Cleanup Program (NYCBCP) application. The site was accepted into the New York State Brownfield Cleanup Program (NYSBCP). AKRF prepared a Citizen Participation Plan (CPP), distributed public notices, and conducted multiple Remedial Investigations to further investigate soil, soil vapor, and groundwater at the site prior to redevelopment. The results of the investigations were used to prepare a Remedial Action Work Plan (RAWP), which is undergoing review and approval by NYSDEC. The proposed remedy includes excavation of soil, design and installation of a soil vapor extraction system and sub-slab depressurization system, contingent groundwater treatment program, and installation of a vapor barrier and composite cover system. As project manager, Ms. Shapiro is responsible for managing all technical components of the project, communication with NYSDEC and the Client, and managing the budget.

On-Call Environmental Consulting Services (Various Locations), New York City Mayor's Office of Environmental Remediation (OER) (administered by NYCEDC)

Ms. Shapiro is managing an on-call contract with the OER for brownfields environmental assessment and remediation. The work has included conducting Phase I environmental site assessments (ESAs) and multi-media sampling of soil, groundwater, and soil vapor for various sites funded by EPA grants. The work plans and investigation reports were completed in accordance with OER and EPA requirements. AKRF also implemented a remedial plan for capping a park site in Staten Island. In addition, AKRF provided support to OER and an affordable housing developer to expedite an application for entry into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), as well as preparation and implementation of the remedial investigation and remedial plan.

Atlantic Chestnut, Brooklyn, NY

AKRF was retained to provide environmental consulting services in connection with the purchase and redevelopment of former burned manufacturing buildings encompassing an entire city block in Brooklyn, New York. As part of due diligence, AKRF prepared a Phase I Environmental Site Assessment (ESA) Report for the property. After acquisition, the property was divided into three separate sites (3264 Fulton Street, 235 Chestnut Street, and 3301 Atlantic Avenue). AKRF prepared a Subsurface (Phase II) Investigation Work Plans and conducted Phase IIs at each of the sites, which included the collection and analysis of soil, soil vapor, and groundwater samples. Based on the results of the Phase IIs, which were documented in Subsurface (Phase II) Reports, New York State Brownfield Cleanup Program (NYSBCP) applications were prepared for each of the sites. After acceptance into the NYSBCP, AKRF prepared Citizen Participation Plans (CPPs) and distributed public notices. AKRF prepared Remedial Investigation (RI) Work Plans (RIWPs) and implemented numerous Remediation Investigations for each of the sites to further investigate contaminated media at the site prior to redevelopment, and prepared the RI Reports (RIRs). AKRF is in the midst of preparing Interim Remedial Work Plans for each Site, which include installation of a Soil Vapor Extraction to prevent the off-site migration of contaminants. As project manager, Ms. Shapiro was responsible for managing all technical components of the project, communication with NYSDEC and the Client, and managing the budget.

MARC S. GODICK, LEP

SR. VICE PRESIDENT

Marc S. Godick, a Senior Vice President of the firm, has over 30 years of experience in the environmental consulting industry. Mr. Godick has broad-based environmental experience includes expertise in brownfield redevelopment, site assessment, remedial investigation, design and implementation of remedial measures, compliance assessment, and litigation support.

Education

M.E., Engineering Science/Environmental Engineering, Pennsylvania State University, 1998

B.S., Chemical Engineering, Carnegie Mellon University, 1989

Licenses/Certifications

Licensed Environmental Professional (License # 396) – State of Connecticut – 2003 - Present

40 Hour HAZWOPER and Annual Refresher Training, 1990 - Present

Supervisors of Hazardous Waste Operations (8 Hour), 1990

Professional Memberships

Chairman, Village of Larchmont/Town of Mamaroneck Coastal Zone Management Commission, 1997 – Present

Member, Westchester County Stormwater Advisory Board, 2011 – Present

Chairman/Member, Westchester County Soil and Water Conservation District, 2005 - 2010

Board of Directors, Sheldrake Environmental Center, Larchmont, New York, 2006 - 2008

Member, NYSDEC Risk-Based Corrective Action (RBCA) Advisory Group for Petroleum-Impacted Sites, 1997

Community Leadership Alliance, Pace University School of Law, 2001

Years of Experience

Year started in company: 2002

Year started in industry: 1990

RELEVANT EXPERIENCE

New York City Department of Design and Construction, East Side Coastal Resiliency, Manhattan, NY

Mr. Godick leads the environmental investigation and related support for a multidisciplinary design team selected by the New York City agency partnership of DDC, DPR, and ORR for the Feasibility Study and Pre-Scoping Services for East Side Coastal Resiliency (ESCR) project. The AKRF Team is providing design services, for 100+ year storm protection with anticipated sea level rise along the east side of Lower Manhattan. The ESCR subsurface exploration program involved a review of available utility plans and environmental reports involving manufactured gas plant (MGP) and potential petroleum-related contamination along a 2.5 mile study area from Montgomery Street to East 25th Street to develop a Subsurface Investigation Work Plan, which was approved by the NYCDEP.

The program included both public and private utility mark-out services across vast areas of the project site containing critical infrastructure to enable the installation of numerous shallow and deep borings and groundwater wells. Mr. Godick supervised the implementation of the investigation, which was completed in two phases. He was also responsible for the interpreting the wide-range of chemical parameters to evaluate critical cost and environmental impacts for the City and design team, and to prepare technical reports for submission and approval by the NYCDEP to satisfy for City Environmental Quality Review (CEQR) requirements. In addition, he continues to support the design and environmental review team, including preparation of the Hazardous Materials chapter for the Environmental Impact Statement, estimating cost impacts to the project for design and cost

recovery purposes, and developing a Soil Management Plan. Mr. Godick also managed a hydrogeologic modeling study to evaluate potential hydraulic and contaminant migration impacts associated with construction of the proposed flood control structure. Mr. Godick continues to coordinate with the NYC team, NYSDEC, and Con Edison to ensure that the design incorporates appropriate remedial measures to be implemented prior to and/or in conjunction with construction.

Remedial Design, Gowanus Canal First Street Turning Basin, New York City Department of Design and Construction (DDC)

Mr. Godick is managing the remedial design for restoration of the filled-in former First Street Turning Basin in Brooklyn, New York. The remediation is being conducted as part of an Order of Consent between the City of New York and EPA for the Gowanus Canal Superfund Site. The remedial design will include removal of fill and sediment within the fill-in basing in an approximately 475-foot by 50-foot area. The restored basin will provide enhanced waterfront access to the community and a boat launch for canoes and kayaks. Design considerations include geotechnical concerns related to adjacent buildings and new and existing bulkheads; soil and water management; landscape design; and access/construction logistics. The design in anticipated to be completed in late 2017.

Remediation & Litigation Support, 3200 Jerome Avenue, Bronx, NY (Former PS 151)

Mr. Godick managed the investigation and remediation of a former public school in the Bronx under the New York State Department of Environmental Conservation (NYSDEC) Brownfields Cleanup Program (BCP). The site was contaminated with trichloroethylene (TCE) from historic operations at the property prior to use as a school. The remedial investigation included soil, groundwater, and vapor intrusion assessment both on-site and off-site. The remedial design included excavation of the source area, in-situ chemical oxidation of groundwater, and installation of a sub-slab depressurization system (SSDS) to address to potential vapor intrusion. Implementation of the remedy was complete in late 2014. The completed remediation allows for future multi-family residential, educational, childcare, and/or medical uses. Mr. Godick also provided litigation support in connection with a cost recovery claim against the former operator of the site.

Remediation & Litigation Support, Queens West Project, Avalon Bay Communities, Queens, NY

For over 20 years, AKRF has played a key role in advancing the Queens West development, which promises to transform an underused industrial waterfront property into one of largest and most vibrant mixed-use communities just across the East River from the United Nations. AKRF prepared an Environmental Impact Statement (EIS) that examines issues pertaining to air quality, land use and community character, economic impacts, historic and archaeological resources, and infrastructure. As part of this project, Mr. Godick managed one of the largest remediation projects completed under the NYSDEC BCP at the time that was contaminated by coal tar and petroleum. The remedy included the installation of a hydraulic barrier (sheet pile cut off wall), excavation of contaminated soil under a temporary structure to control odors during remediation, a vapor mitigation system below the buildings, and implementation of institution controls. The investigation, remediation design, and remedy implementation, and final sign-off (issuance of Certificate of Completion) were completed in two years. Total remediation costs were in excess of $13 million. Following completion of the remediation, Mr. Godick developed a cost allocation model and provided litigation support for a cost recovery action against a former operator of the site, including participation in a deposition as a fact witness prior to settlement between the parties.

On-Call Environmental Consulting Services (Various Locations), New York City Mayor's Office of Environmental Remediation (OER) (administered by NYCEDC)

Mr. Godick is managing an on-call contract with the OER for brownfields environmental assessment and remediation. The work has included conducting Phase I environmental site assessments (ESAs) and multi-media sampling of soil, groundwater, and soil vapor for various sites funded by EPA grants. The work plans and investigation reports were completed in accordance with OER and EPA requirements. AKRF also developed a remedial plan for a former gas station site in the Bronx and implemented a remedial plan for capping a park site in Staten Island. In addition, Mr. Godick is providing support to OER and an affordable housing developer to expedite an application for entry into the New York State Department of Environmental Conservation

(NYSDEC) Brownfield Cleanup Program (BCP), as well as preparation and implementation of the remedial investigation and remedial plan.

On-Call Environmental Consulting (Various Locations), New York City School Construction Authority

Mr. Godick is managing an on-call contract with the SCA for environmental assessment, remedial design, and plumbing disinfection. For new school sites, initial due diligence involves conducting Phase I environmental site assessments (ESAs) and multi-media sampling of soil, groundwater, and soil vapor to determine the suitability of a site for development as a school and remediation requirements and associated costs. Once design for a school is underway, AKRF would prepare remediation plans and construction specifications and oversee the construction activities. For existing school sites, the work can involve conducting Phase I ESAs and indoor air quality testing, preparation of specifications, supervision of storage tank removals, investigation and remediation of spills, and development of remediation cost estimates. AKRF also oversees plumbing disinfection work, which is required prior to new plumbing being placed into service. The assignments involve reviewing and commenting on disinfection plans, supervision of the disinfection and confirmation testing, and preparation of a report documenting the work was conducted in accordance with the specifications and applicable requirements. Due to the sensitivity of school sites, work under this contract is often conducted on short notice and during non-school hours. Mr. Godick also manages AKRF's potable water sampling (for lead) work for SCA, including providing recommendations for mitigating exceedances.

Remediation, Former Industrial Laundry/Dry Cleaning Plant, 2350 Fifth Avenue. New York, NY

Mr. Godick managed the assessment, cleanup and post-remedial operations, maintenance and monitoring of the only NYSDEC listed inactive hazardous waste (State Superfund) site in Manhattan, a former laundry/dry cleaning plant in Harlem. Remedial investigation included evaluation of soil, groundwater, soil vapor, indoor air, and building materials. Interim remediation included the removal of contaminated building materials and operation of a sub-slab vapor extraction system retrofitted into the existing building. Mr. Godick coordinated with the regulatory agencies, site owner and occupants; and managed the investigation, remedial design, and remedial implementation activities. Phase 1 of the Remedial Action Work Plan consisted of further removal of contaminated building materials. Phase 2 of the remediation included a sub-slab depressurization system (SSDS) retrofitted into the existing building, soil vapor extraction (SVE) system, and chemical oxidation injection. Remedial action work was completed in 2014 and documented in a Final Engineering Report. NYSDEC issued Certificate of Completion in January 2015 and the site has been reclassified to a "Class 4" site (site properly closed – requires continued management). Mr. Godick continues to manage the project, including operations, maintenance and monitoring of the SSDS and SVE system under the NYSDEC-approved Site Management Plan.

606 West 57th Street, New York, NY, TF Cornerstone

AKRF has been retained by TF Cornerstone to provide environmental services for the proposed redevelopment of a portion of the block bounded by Eleventh and Twelfth Avenues and West 56th and 57th Streets. The proposed actions included a zoning map amendment, zoning text amendments, a special permit, and an authorization to facilitate development of approximately 1.2 million square feet of residential and retail space. AKRF prepared an Environmental Impact Statement (EIS) for the New York City Department of City Planning (DCP) to analyze the effects of the proposed actions and development of the proposed building. The EIS addressed the full range of environmental impacts associated with the proposed development.

Mr. Godick was responsible for the elements of the EIS pertaining to hazardous materials, including coordination of a Phase I ESA and summarizing pertinent site information for the hazardous materials and construction chapters. Mr. Godick provided pre-acquisition support to TF Cornerstone, which included development of a remedial cost estimate report to outline remediation cost during site development. Mr. Godick also managed work related to the subsurface investigation, localized remediation (chemical injection and limited excavation beneath the building basement) and regulatory closure of a petroleum spill on a portion of the project site to satisfy NYSDEC requirements. After EIS certification, Mr. Godick coordinated approvals with NYCOER, the regulatory agency overseeing remedial measures related to the redevelopment of the site. The Site has an (E) Designation and is participating in the New York City Voluntary Cleanup Program. Mr. Godick managed the preparation of a Phase II Investigation Work Plan, Remedial Investigation Report, Remedial Action Work Plan (RAWP), and contractor

specifications for soil management and tank and hydraulic lift removal. Mr. Godick managed implementation of the remediation in accordance with the RAWP.

164 Kent Avenue, Brooklyn, NY (AKA Northside Piers and 1 North 4th Place), RD Management, L&M Development, Toll Brothers, and Douglaston Development

The project was a multi-phase development consisting of a large waterfront block in the Williamsburg Rezoning Area. The project site has been developed with a mixed-use residential-commercial high rise towers with an esplanade and a pier along the East River. AKRF provided acquisition and development support, including performing Phase I and II environmental site assessments and development of remedial cost estimates for development, and preparation of Remedial Action Plans (RAPs) and Construction Health and Safety Plan (CHASPs) for approval by DEP and OER. AKRF provided assistance with construction oversight during soil handling activities and managing the Community Air Monitoring Plan (CAMP) activities. Closure reports were prepared and the project is fully built-out and occupied.

Site Investigation–Over 20 Facilities, Con Edison, New York, NY

Mr. Godick managed site investigations associated with petroleum, dielectric fluid, and PCB releases at over 20 Con Edison facilities including service centers, substations, generating stations, and underground transmission and distribution systems. Site investigations have included due diligence site reviews, soil boring installation, monitoring well installation, hydrogeologic testing, and water quality sampling. Risk-based closures were proposed for several sites.

Underground Storage Tank Closure and Site Remediation–Program Management, Con Edison, New York, NY

Mr. Godick provided technical assistance to Con Edison in developing technical submittals and budgets associated with tank closures at over 50 facilities. Technical summaries were prepared for submittal of contractor-prepared closure reports to the NYSDEC. The summaries included a review of historic pre-closure assessments, tank closure data, and provided recommendations for additional assessment, remediation or closure. Subsequently, a three-year program budget was developed for implementation of the UST investigation/remedial program, which Con Edison utilized for internal budgeting purposes.

Site Investigation–7 World Trade Center Substation, Con Edison, New York, NY

Mr. Godick managed the site investigation at the former 7 World Trade Center Substation in an effort to delineate and recover approximately 140,000 gallons of transformer and feeder oil following the collapse of the building. The project involved coordination with several crews, Con Edison, and other site personnel.

Site Investigation–Former Manufactured Gas Plant (MGP) Facilities, Con Edison, New York, NY

Mr. Godick managed site investigations at four former manufactured gas plant (MGP) facilities. The investigations were completed at Con Edison substations, a flush pit facility, and a service center to support remedial design and expansion at select locations. The findings from these characterizations were used by Con Edison to make appropriate changes to the design specifications and to plan for appropriate handling of impacted materials and health and safety protocols during future construction activities.

National Grid – Halesite Manufactured Gas Plant Site Remediation, Town of Huntington, NY

Mr. Godick managed the remedial design and engineering work associated with remediation of National Grid's former MGP located in the Town of Huntington. The site is situated in a sensitive location along the waterfront, surrounded by commercial and residential properties, and half the property where the remediation was conducted was a steep slope. The remedy consisted of soil removal, oxygen injection, and non-aqueous phase liquid recovery. Mr. Godick was responsible for the development of the remedial work plans, design/construction documents, landscape architecture, confirmatory sampling, air monitoring, supervision, and preparation of close-out documentation in accordance with NYSDEC requirements.

Verizon, Investigation & Remediation, Various Locations, NY, PA and DE

Mr. Godick managed over 50 environmental investigations and remediation projects related to petroleum releases at various facilities. Responsibilities included annual budgeting, day-to-day project management, development and

implementation of soil and ground water investigation workplans, ground water modeling, risk evaluation, remedial action work plans, remedial design, system installation, waste disposal, well abandonment, and operation and maintenance. Many of the assessment and remedial projects followed a risk-based approach. Remedial technologies implemented included air sparging, soil vapor extraction, bioremediation, pump and treat, soil excavation, and natural attenuation.

Storage Tank Management, Verizon, Various Locations, NY, PA, DE, and MA

Mr. Godick managed the removal and replacement of underground and aboveground storage tank systems for Verizon in New York, Pennsylvania, Delaware, and Massachusetts. Responsibilities included the management of design, preparation of specifications, contractor bidding, construction oversight, project budget, and documentation. For selected AST sites, managed the development of Spill Control, Contingency and Countermeasures (SPCC) plans.

Litigation Support, Cost Recovery Action, Gowanus Superfund Site, New York

Mr. Godick provided technical support to one of the 40+ potential responsible parties (PRPs) associated with a Federal Superfund site in New York State, which included conducting a liability assessment for the various parties and development of a cost allocation model.

Litigation Support, Cost Recovery Action, New York State Superfund Site

Mr. Godick provided technical support for the former owner of a New York State Superfund site in upstate New York. The owner of the property brought a cost recovery action against our client as a PRP. Mr. Godick completed a technical review of the draft Remedial Investigation/Feasibility Study prepared by the opposing party's consultant to develop a more cost effective remedial strategy and to better position the client for liability allocation as part of future settlement negotiations. Mr. Godick also developed a cost allocation report that included a model for settlement negotiations, as well as participated in mediation.

Litigation Support & Remediation, Former Service Station, Brooklyn, New York

Mr. Godick took over management of remediation of an inactive service station (formerly conducted by another firm). His approach outlined additional characterization and remediation efforts which resulted in successful closure of the spill by NYSDEC within two years. Mr. Godick testified as an expert witness at a hearing in the New York State Supreme Court of Kings County to determine the adequacy of the remediation efforts.

Litigation Support, Cost Recovery Action, Town of Carmel, New York

Mr. Godick served as an expert witness representing the owner of a property in a landlord-tenant dispute, which was used as a gasoline station and oil change facility. Mr. Godick prepared exhibits, testified, and participated in meetings with NYSDEC to support the landlord's claim that the oil change tenant's practices were poor and were adversely affecting the environment and the overall facility systems at the site.

Litigation Support, Cost Recovery Action, New York State Petroleum Spill Site, New York, NY

Mr. Godick provided technical support for the former owner of a New York City multi-unit residential apartment building. The State of New York brought a cost recovery action against our client as a result of a previous spill from a former underground storage tank. Mr. Godick reviewed invoices and project documentation to dispute work performed by the NYSDEC, which provided the basis for settlement at a fraction of the initial claim.

Litigation Support, Class Action Lawsuit, Confidential Client, NJ

Mr. Godick provided technical support for a class action suit involving a petroleum-impacted community water supply in southern New Jersey. The technical assistance included analysis of expert testimony and coordination with legal counsel in preparing for cross-examination of the opposing party's lead expert witness.

Cost Analysis, Environmental Insurance Claims, Various Locations

Mr. Godick provided technical support for cost analyses completed for a large national insurance company related to several former MGP and other industrial sites. Responsibilities included evaluation and development of cost-effective remedial strategies, as well as compilation of detailed costs for remedial action implementation and closure.

REBECCA KINAL, P.E.

VICE PRESIDENT

Rebecca Kinal has over 20 years of experience in the assessment and remediation of soil and groundwater contamination and other hazardous/non-hazardous waste problems. Ms. Kinal's experience includes environmental due diligence, soil and groundwater investigations, leaking underground storage tank studies, soil gas/vapor intrusion surveys, and oversight of small- and large-scale remediation programs, including design of groundwater remediation systems and vapor mitigation systems. She has directed numerous Phase I and Phase II investigations and remediation programs, many of them in conjunction with commercial/residential developers, law firms, lending institutions, and public agencies. She is experienced in the cleanup of contaminated properties under New York State Brownfield Cleanup Program (BCP) regulations and the New York City "E-designation" program. As a part of this work, her duties have included technical and report review, proposal writing, scheduling, budgeting, and acting as liaison between clients and regulatory agencies, and project coordination with federal, state, and local authorities.

BACKGROUND

Education

M.S., Hydrogeology, Rensselaer Polytechnic Institute, 1995

B.S., Civil Engineering, Lafayette College, 1992

Licenses/Certifications

State of New York, P.E. Registration No. 082046, 2004

Years of Experience

Year started in company: 2000

Year started in industry: 1996

RELEVANT EXPERIENCE

White Plains Mall/Hamilton Green

Ms. Kinal managed environmental due diligence and remediation planning for the project, which included Phase I and II environmental assessments, a petroleum Spill investigation, preparation of remediation cost estimates, and application to the NYSDEC BCP.

New York City School Construction Authority On-Call Contracts for Environmental Consulting Services, Various Sites, NY

Ms. Kinal serves as the project manager for AKRF's on-call hazardous materials consulting contract with the New York City School Construction Authority for over 8 years. For potential new school sites, assignments include initial due diligence, Phase I environmental site assessments, (ESAs) and subsurface investigation of soil, groundwater, and soil vapor to determine the suitability of a site for development as a school, likely remediation requirements, and associated costs. For sites undergoing design and development, assignments include preparation of remediation plan, contract specifications, and design drawings. The work has also included conducting indoor air quality testing, vapor intrusion assessments, preparation of specifications, supervision of storage tank removals, and investigation and remediation of spills for existing schools. Due to the sensitivity of school sites, work under this contract is often conducted on short notice and during non-school hours.

USTA National Tennis Center, Queens, NY

AKRF prepared an EIS for the New York City Departments of City Planning (DCP) and Environmental Protection (DEP) as co-lead agencies to analyze the expansion of the National Tennis Center, which includes multiple improvements and construction projects at the USTA campus over several years. As part of the EIS requirements, AKRF prepared a Remedial Action Plan for implementation during the proposed project's construction. In accordance with the RAP, vapor mitigation systems were incorporated into the design for several of the proposed structures at the facility, including two new stadiums, a new transportation center, and several practice court facilities. Ms. Kinal prepared the specifications and design drawings for the vapor mitigation and is providing on-going construction support to review contractor submittals and inspect the vapor barrier and sub-slab depressurization system installations.

Montefiore Medical Center, Various Locations, NY

Ms. Kinal provides due diligence assistance to Montefiore Medical Center (MMC) for the ongoing expansion of their facilities, primarily in the Bronx and Westchester County. She conducts and manages environmental due diligence tasks related to their property transactions, including Phase I Environmental Site Assessments (ESAs), Phase II investigations, and geophysical surveys. She also assists MMC in making decisions with respect to environmental risk issues.

Queens West Development Project, Long Island City, NY

For over 20 years, AKRF has played a key role in advancing the Queens West development, which promises to transform an underused industrial waterfront property into one of largest and most vibrant mixed-use communities just across the East River from the United Nations. AKRF has prepared an Environmental Impact Statement that examines issues pertaining to air quality, land use and community character, economic impacts, historic and archaeological resources, and infrastructure. As part of the project, AKRF also undertook the largest remediation ventures completed to date under the NYSDEC Brownfields Cleanup Program (BCP). Ms. Kinal helped prepare the Remedial Work Plan (RWP) and oversaw the remediation of Parcel 9, a 1.8-acre former industrial site. Remediation includes installation of a sheet pile containment wall, excavation of coal tar- and petroleum-contaminated soil under a temporary structure to control odors during remediation, vapor mitigation for the future buildings, and institutional controls. Upon completion of the remediation activities, Ms. Kinal managed the preparation of a Final Engineering Report (FER) to document the clean-up activities. The NYSDEC issued a Certificate of Completion (COC) for the Parcel 9 site in December 2006. Ms. Kinal continues to oversee post-remediation monitoring and site management activities to ensure that the remedy remains in-place and effective.

Roosevelt Union Free School District, Roosevelt, NY

Ms. Kinal managed environmental investigation and remediation activities for the sites of three new elementary schools and a new middle school in Roosevelt, New York. Remediation activities include removal/closure of contaminated dry wells and underground petroleum storage tanks, and excavation and off-site disposal of petroleum- and pesticide-contaminated soil. Remediation of the new middle school site, which also included a sub-slab depressurization system, was conducted through coordination with the NYSDEC, NYSDOH, New York State Education Department (NYSED), and the local school district. Upon completion of the remediation and school construction, Ms. Kinal managed confirmatory indoor air testing and preparation of a Final Engineering Report to document the site clean-up. The NYSDEC issued a Certificate of Completion and the school was open for the Fall 2008 semester as planned.

Proposed NYC Public School Campus, Bronx, NY

Ms. Kinal provided environmental consulting services to the selected environmental remediation contractor for this former manufactured gas plant in the Mott Haven neighborhood of the Bronx, which was remediated under the NYSDEC BCP. These services included: preparation of an in situ sampling plan and excavation plan for waste

characterization and disposal; supervision of waste characterization sampling activities; development and implementation of a community air monitoring program during all remediation activities; and daily reporting to the NYC School Construction Authority.

National Grid – Halesite Manufactured Gas Plant Site, Town of Huntington, NY

Ms. Kinal served as the project manager for the remedial design and engineering work associated with remediation of National Grid's former manufactured gas plant (MGP) located in the Town of Huntington. The site is situated in a sensitive location along the waterfront, surround by commercial and residential properties, and half the property where the remediation was conducted is a steep slope. The remedy consisted of soil removal, oxygen injection, and non-aqueous phase liquid recovery. Ms. Kinal developed the remedial work plans, design/construction documents, and managed environmental oversight of the remedial work, including waste characterization and tracking, confirmatory endpoint sampling, air monitoring, and reporting to the NYSDEC. After the remediation work was completed, Ms. Kinal prepared appropriate close-out documentation in accordance with NYSDEC requirements.

Shell Service Station, Millwood, NY

Ms. Kinal planned and oversaw a Phase I Environmental Site Assessment and Phase II Subsurface Investigation of this active gasoline station in northern Westchester County. The Phase I/Phase II investigations were performed for the potential buyer of the property who wished to redevelop it with a more modern service station and convenience store. Ms. Kinal also prepared a conceptual remediation plan to address several areas of petroleum contamination identified during the Phase II. The plan, which was approved by NYSDEC, will be implemented in conjunction with the site redevelopment activities to achieve closure for several spills reported at the site.

Pelham Plaza Shopping Center Site Investigation & Remediation, Pelham Manor, NY

Ms. Kinal managed a Site Investigation at Pelham Plaza, an approximately ten-acre site that formerly contained a manufactured gas plant. The site was investigated under a voluntary clean-up agreement entered into with the NYSDEC by the site owner. The site investigation included advancing over 100 soil borings with continuous soil sampling to bedrock, installing monitoring and recovery wells, and conducting test pitting both indoor and outdoor locations to collect soil and groundwater samples and determine the extent of Non-Aqueous Phase Liquid (NAPL). The investigation also included: soil gas sampling to determine contaminant concentrations in the vapors beneath the foundation of an on-site retail store; sediment sampling in an adjacent creek to identify off-site impacts; and a tidal survey to determine tidal influence on groundwater levels at the site. Ms. Kinal also oversaw interim remedial measures, which include biweekly pumping of recovery wells to remove dense NAPL (DNAPL) from the site subsurface.

Shaws Supermarket Redevelopment Project, New Fairfield, CT

Ms. Kinal managed the Remedial Investigation (RI) for an approximately nine-acre shopping center site that was contaminated by releases from former dry cleaning operations. The site was being redeveloped with a new supermarket and separate retail stores. The investigation included the installation of monitoring wells in the intermediate overburden aquifer and bedrock aquifer, sampling of existing and newly installed wells, geophysical logging in bedrock wells, and pump testing in intermediate and bedrock wells. Ms. Kinal prepared a Remedial Action Work Plan (RAWP) based on results from the RI, which included a groundwater pump and treat system to contain a plume of perchlorethylene (PCE)-contaminated groundwater, and excavation and disposal of contaminated soil in the presumed source area. Following CTDEP approval of the RAWP, Ms. Kinal prepared bid specifications for soil excavation and remediation system installation, and oversaw their implementation. Ms. Kinal also prepared NPDES permit applications for discharges from construction dewatering and the groundwater remediation system, and conducted associated discharge monitoring.

Yankee Stadium, Bronx, NY

Ms. Kinal performed the hazardous materials analysis for the Draft Environmental Impact Statement for the proposed new Yankee Stadium. The analysis included a Phase I Environmental Site Assessment of the entire project area and Subsurface (Phase II) Investigation in areas where environmental conditions were identified. The Phase II investigation included geophysical surveys to search for potential underground storage tanks; and soil, soil gas, and groundwater sampling at over 40 locations to determine potential environmental impacts during and after the proposed construction. Ms. Kinal also developed an extensive community air monitoring plan and oversaw its implementation during deconstruction of the old Yankee Stadium.

Avalon on the Sound, New Rochelle, NY

Ms. Kinal oversaw environmental investigation and soil remediation during the construction of two luxury high-rise apartment buildings and an associated parking garage. Investigation activities included an electromagnetic survey to search for possible underground storage tanks, and subsurface sampling to characterize soil and groundwater. Remediation activities included removing underground storage tanks, excavating and disposing of soil contaminated with volatile and semi-volatile organic compounds, and collecting end-of-excavation confirmation samples.

Davids Island Environmental Audit, New Rochelle, NY

Ms. Kinal managed the hazardous materials portion of the audit of this undeveloped island site, including a Phase I Environmental Site Assessment (ESA) and Subsurface (Phase II) Investigation in areas where environmental conditions were identified. The Phase II investigation included collecting soil samples from more than 100 locations and analyzing them for targeted compounds, including volatile organic compounds, semi-volatile compounds, metals, pesticides, and polychlorinated biphenyls (PCBs). Ms. Kinal also oversaw an electromagnetic (EM) survey conducted to identify the location of suspected underground storage tanks on the island. Based on soil sample results, Ms. Kinal estimated the volume of contaminated soil requiring remediation and prepared cost estimates for soil excavation and for transportation and disposal of contaminated soil and hazardous materials.

Outlet City Site Investigation, Queens, NY

Ms. Kinal prepared a work plan for remedial investigation of the Outlet City site, a property in Long Island City that was formerly occupied by a manufacturer of industrial cleaners and pharmaceuticals. The site is being investigated and remediated under the NYSDEC voluntary clean-up program. In preparing the work plan, Ms. Kinal evaluated results from several previous investigations and conducted a limited groundwater sampling program to determine future data needs for designing remediation of creosote-contaminated soil and groundwater. The work plan included additional soil and groundwater sampling, a tidal survey to determine tidal influence on groundwater levels, and pilot free product recovery testing. Ms. Kinal also helped design a venting system for an on-site basement and performed exposure calculations for the vented vapors.

Yonkers Waterfront Redevelopment Project, Yonkers, NY

For this redevelopment along Yonkers' Hudson River waterfront, Ms. Kinal supervised the remediation of Parcels H and I that were contaminated with hazardous soil. During the remediation process, she reviewed the subcontractor health and safety plans, delineated the areas of excavation, and oversaw field activities to ensure compliance with the specifications and appropriate regulations. This property was remediated under the NYSDEC Environmental Restoration Program (ERP).

MACKENZIE MILLER

ENVIRONMENTAL SCIENTIST

Mackenzie Miller is an Environmental Scientist at AKRF. She has experience in a laboratory setting, as well as participating in scientific field work and analysis. Mackenzie's experience also includes data entry and data manipulation. She is proficient providing statistical analyses with Rstudio and SPSS. Her environmental consulting experience includes implementing Phase I Environmental Site Assessments and Phase II Environmental Site Investigations; and overseeing remedial action programs under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) and NYC Office of Environmental Remediation (OER) E-Designation program, including soil excavation, community air monitoring, remedial system installation, and collection of environmental samples.

BACKGROUND

Education

BA, University of Colorado at Boulder, Environmental Studies, 2020
BA, University of Colorado at Boulder, Ecology & Evolutionary Biology, 2020

Licenses/Certifications

OSHA Safety Training Institute – 30-Hour Construction Safety and Health Certification
OSHA Safety Training Institute – 40-Hour Hazardous Waste and Emergency Response Certification
NYC SST – 8-Hour Fall Prevention for Construction Certification
New York State Conservation District – Certificate of Erosion and Sediment Control Training (exp. July 2023)

Years of Experience

4 years in the industry
1.5 years with AKRF

RELEVANT EXPERIENCE

210300, New York City Department of Design & Construction, BBJS Queens Dismantle & Swing Space, Queens, NY

AKRF is leading acoustics, noise, and vibration services as part of the design-build team dismantling the Queens Detention Center as part of the New York City Borough-Based Jail Program. Mackenzie is providing air monitoring in accordance with the site-specific Community Air Monitoring Plan (CAMP) during remedial excavation and demolition activities, providing construction oversight, and documenting daily construction, demolition, and remedial activities performed under the NYSDEC -approved BCP Remedial Action Work Plan (RAWP).

80614.04, New York City Economic Development Corporation, New York City Public Health Laboratory, New York, NY

AKRF is providing site assessment/remediation services on behalf of the New York City Economic Development Corporation and the Department of Health and Mental Hygiene for a new 10-story, 240,000-square-foot Public Health Laboratory on the Harlem Hospital campus in Manhattan. The $454 million building will allow for testing and services for a wide range of clinical and environmental health-related concerns related to microbiology, virology, immunology, and biosafety. The topping-out ceremony was held in September 2023. Mackenzie is providing air monitoring in accordance with the site-specific Community Air Monitoring Plan (CAMP) during remedial excavation activities, on-site field inspections for construction oversight, overseeing soil export manifests, and documenting construction and remedial activities performed under the NYSDEC -approved BCP Remedial Action Work Plan (RAWP).

MACKENZIE MILLER

ENVIRONMENTAL SCIENTIST

80619, New York City School Construction Authority, On-Call Environmental Consulting (Multiple) Contracts, Various Locations, New York, NY

For new school sites, initial due diligence involves conducting Phase I environmental site assessments (ESAs) and multi-media sampling of soil, groundwater, and soil vapor to determine the suitability of a site for development as a school and remediation requirements and associated costs. Once design for a school is underway, AKRF would prepare remediation plans and construction specifications and oversee the construction activities. For existing school sites, the work can involve conducting Phase I ESAs and indoor air quality testing, preparation of specifications, supervision of storage tank removals, investigation and remediation of spills, and development of remediation cost estimates. Mackenzie is providing on-site field inspections, overseeing drinking water disinfection and sampling protocol associated with installation of new plumbing fixtures, and documenting daily activities performed for task orders at various SCA sites.

210379, NYCHA PACT Williamsburg Houses, Brooklyn, NY

AKRF is providing professional environmental services in connection with the Williamsburg Houses site, which consists of 20 four-story residential buildings situated on four city blocks in Williamsburg, Brooklyn. The site is being rehabilitated under NYCHA's Permanent Affordability Commitment Together (PACT) program. AKRF is providing remedial engineering services, assisting the Client with soil management services including testing, import and export), and vapor mitigation work required under a NYCDEP-approved Remedial Action Work Plan (RAWP). As the RAWP was prepared by a prior consulting firm, AKRF successfully amended the RAWP to reduce certain monitoring and vapor mitigation requirements on behalf of tour Client. At the conclusion of AKRF's work, we will document all activities in a Remedial Closure Report (RCR) for approval by NYCDEP. Mackenzie is providing air monitoring in accordance with the site-specific Community Air Monitoring Plan (CAMP) during remedial excavation activities, on-site field inspections for construction oversight, overseeing soil export manifests, and documenting construction and remedial activities performed under the NYSDEC -approved BCP Remedial Action Work Plan (RAWP).

Phipps Houses, Lambert Houses Redevelopment, Bronx, NY

AKRF is providing a range of services to Phipps Houses for the phased redevelopment of their Lambert Houses complex in the West Farms neighborhood of the Bronx. The current Lambert Houses will be demolished and replaced with new buildings on nearly 12 acres of the Bronx Park South Large-Scale Residential Development area, increasing by 1,000 the number of permanently affordable housing units along with tenant amenities, retail space, and community facilities. AKRF prepared the Environmental Impact Statement pursuant to CEQR, SEQRA, and NEPA guidelines for the entire redevelopment, and has since provided site assessment/remediation services along with civil engineering and permitting for buildings on Parcels 3 and 5. We have also provided civil engineering and resident engineering inspection services for NYCDEP utility improvements and supported a city map change application pursuant to ULURP. AKRF has also been responsible for noise and air quality consulting related to the property's E-Designation. Mackenzie is providing air monitoring in accordance with the site-specific Community Air Monitoring Plan (CAMP) during remedial excavation activities, on-site field inspections for construction oversight, overseeing soil export manifests, and documenting construction and remedial activities performed under the NYSDEC -approved BCP Remedial Action Work Plan (RAWP), including engineering controls such as the Sub-Slab Depressurization System (SSDS) and collection of environmental documentation and waste characterization samples.

190021, 272 4th Avenue, Brooklyn, NY

AKRF is providing site assessment/remediation services for a proposed residential apartment building at 272-274 Fourth Avenue in Gowanus, Brooklyn. Mackenzie is providing air monitoring in accordance with the site-specific Community Air Monitoring Plan (CAMP) during remedial excavation activities, on-site field inspections for construction

oversight, overseeing soil export manifests, and documenting construction and remedial activities performed under the NYSDEC -approved BCP Remedial Action Work Plan (RAWP), including engineering controls such as the Sub-Slab Depressurization System (SSDS) and collection of environmental documentation and waste characterization samples.

James C. Todaro

Quality Assurance Officer

Qualifications Summary

- Over 30 years of experience in the environmental field and over 40 years in analytical laboratories
- Extensive experience involving management of environmental laboratory operations.
- Involvement with NELAC since its inception and member of "Accreditation Committee"
- ASTM committee member on D-34 "Waste Characterization and Disposal"
- Co-founder of Matrix Analytical, Inc.
- Diverse experience in laboratory from medical, industrial and environmental
- Lab Design for wastewater, water treatment, analytical & environmental facilities for existing & new labs, including equipment selection, casework, hood selection.
  Linear process flow for expansion considerations

Professional Affiliations

National Environmental Laboratory Accreditation Conference (NELAC)
American Chemical Society (ACS)
American Society for the Testing of Materials (ASTM)
Independent Testing Laboratory Association (ITLA)
Society of American Military Engineers (SAME)

Fields of Expertise

Laboratory Management – Environmental, Analytical, Medical
Marketing and Sales
Laboratory Design

Higher Education

B.A., Biology – Ricker College (1970)
M.T. A.S.C.P. – Norwood Hospital (1971)

Employment History

2007-Present	Alpha Analytical Labs – Quality Assurance Officer,
2005-2007	Alpha Analytical Labs – Laboratory Director - Mansfield
2000-2005	Alpha Analytical Labs – Laboratory Director - Westboro
1983-2000	Matrix Analytical Laboratory – Owner/Laboratory Director
1979-1983	NE Medical Laboratory – Laboratory Director
1976-1979	Corning Medical Diagnostics – Quality Assurance Officer
1974-1976	NE Deaconess Hospital – Emergency Lab Technologist
1971-1974	NE Medical Laboratory – Automated Chem Supervisor

Professional Training/Committees

NELAC/TNI Expert PT Committee

DoD Technical Advisory Group

MassDEP Laboratory Advisory Committee

NJDEP Environmental Laboratory Advisory Committee

ASTM D-34 Waste Management Committee

Certified Instructor 4 hr LEP and LSP CEU courses for: "Interpretation of Analytical Data", "Selection of Organic Methods".

James C. Todaro

Quality Assurance Officer

Qualifications Summary

- Over 30 years of experience in the environmental field and over 40 years in analytical laboratories
- Extensive experience involving management of environmental laboratory operations.
- Involvement with NELAC since its inception and member of "Accreditation Committee"
- ASTM committee member on D-34 "Waste Characterization and Disposal"
- Co-founder of Matrix Analytical, Inc.
- Diverse experience in laboratory from medical, industrial and environmental
- Lab Design for wastewater, water treatment, analytical & environmental facilities for existing & new labs, including equipment selection, casework, hood selection.
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Fields of Expertise

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2000-2005	Alpha Analytical Labs – Laboratory Director - Westboro
1983-2000	Matrix Analytical Laboratory – Owner/Laboratory Director
1979-1983	NE Medical Laboratory – Laboratory Director
1976-1979	Corning Medical Diagnostics – Quality Assurance Officer
1974-1976	NE Deaconess Hospital – Emergency Lab Technologist
1971-1974	NE Medical Laboratory – Automated Chem Supervisor

Professional Training/Committees

NELAC/TNI Expert PT Committee

DoD Technical Advisory Group

MassDEP Laboratory Advisory Committee

NJDEP Environmental Laboratory Advisory Committee

ASTM D-34 Waste Management Committee

Certified Instructor 4 hr LEP and LSP CEU courses for: "Interpretation of Analytical Data", "Selection of Organic Methods".

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Personnel Resume

Carl Armbruster
QA Manager

Qualifications Summary

Mr. Armbruster has over 30 years of experience in the environmental laboratory and engineering industry that includes extensive technical, management/leadership experience in all aspects of the laboratory business. He is an action-oriented manager dedicated to ensuring the laboratory maintains a quality program that holds the highest credentials in PT scores, accreditations and customer satisfaction. His unique experience lends itself to working successfully with employees, managers and clients at all levels.

Professional Experience

Quality Assurance Manager – TestAmerica Edison - 2005 to Present

Mr. Armbruster is responsible for establishing and implementing the quality assurance program at the Edison facility; and for interfacing with the corporate Quality Assurance Director to ensure adherence with the overall Quality Management Plan. He is also responsible for monitoring implementation and compliance with NELAC and TestAmerica's QMP, conducting annual management system audits and data audits, as well as providing regulatory updates and technical support to the Laboratory Director, Operations Manager, Client Services and Sales department.

Project Manager/Assistant Technical Director – STL Edison --2000 to 2005

Laboratory Director − STL Whippany − 1998 to 2000

Account Manager − Clean Harbors Environmental Services − 1997 to 1998

Laboratory Manager − Waste Management Inc., and Chemical Waste Management Inc − 1988 to 1997

Environmental Scientist − ICF Technology − 1987 to 1988

Analytical Chemist − IT Corporation – 1985 to 1987

Analytical Chemist − Hess Environmental Laboratories – 1983 to 1985

Education

- MS in Biology – East Stroudsburg University, 1984
- BS in Environmental Studies - East Stroudsburg University, 1980

L.A.B. Validation Corp., 14 West Point Drive, East Northport, New York 11731

Lori A. Beyer

SUMMARY: General Manager/Laboratory Director with a solid technical background combined with Management experience in environmental testing industry. Outstanding organizational, leadership, communication and technical skills. Customer focused, quality oriented professional with consistently high marks in customer/employee satisfaction.

EXPERIENCE:

1998-Present L.A.B. Validation Corporation, 14 West Point Drive, East Northport, NY
President

- Perform Data Validation activities relating to laboratory generated Organic and Inorganic Environmental Data.

1998-Present American Analytical Laboratories, LLC. 56 Toledo Street, Farmingdale, NY
Laboratory Director/Technical Director

- Plan, direct and control the operation, development and implementation of programs for the entire laboratory in order to meet AAL's financial and operational performance standards.
- Ensures that all operations are in compliance with AAL's QA manual and other appropriate regulatory requirements.
- Actively maintains a safe and healthy working environmental that is demanded by local laws/regulations.
- Monitors and manages group's performance with respect to data quality, on time delivery, safety, analyst development/goal achievement and any other key performance indices.
- Reviews work for accuracy and completeness prior to release of results to customers.

1996-1998 Nytest Environmental, Inc. (NEI) Port Washington, New York
General Manager

- Responsible for controlling the operation of an 18,000 square foot facility to meet NEI's financial and operational performance standards.
- Management of 65 FTEs including Sales and Operations
- Ensure that all operations are in compliance with NEI's QA procedures
- Ensures that productivity indicators, staffing levels and other cost factors are held within established guidelines
- Maintains a quantified model of laboratory's capacity and uses this model as the basis for controlling the flow of work into and through the lab so as to ensure that customer requirements and lab's revenue and contribution targets are achieved.

1994-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York
Technical Project Manager

- Responsible for the coordination and implementation of environmental testing programs requirements between NEI and their customers
- Supervise Customer Service Department
- Assist in the development of major proposals
- Complete management of all Federal and State Contracts and assigned commercial contracts
- Provide technical assistance to the customer, including data validation and interpretation
- Review and implement Project specific QAPP's.

1995-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York
Corporate QA/QC Officer

- Responsible for the implementation of QA practices as required in the NJDEP and EPA Contracts
- Primary contact for NJDEP QA/QC issues including SOP preparation, review and approval
- Responsible for review, verification and adherence to the Contract requirements and NEI QA Plan

1992-1994 Nytest Environmental, Inc. (NEI) Port Washington, New York
Data Review Manager

- Responsible for the accurate compilation, review and delivery of analytical data to the company's customers. Directly and effectively supervised a department of 22 personnel.
- Managed activities of the data processing software including method development, form creation, and production
- Implement new protocol requirements for report and data management formats
- Maintained control of data storage/archival areas as EPA/CLP document control officer

1987-1991 Nytest Environmental, Inc. (NEI) Port Washington, New York
Data Review Specialist

- Responsible for the review of GC, GC/MS, Metals and Wet Chemistry data in accordance with regulatory requirements
- Proficient with USEPA, NYSDEC, NJDEP and NEESA requirements
- Review data generated in accordance with SW846, NYSDEC ASP, EPA/CLP and 40 CFR Methodologies

1986-1987 Nytest Environmental, Inc (NEI) Port Washington, New York
GC/MS VOA Analyst

EDUCATION:

1982-1985 State University of New York at Stony Brook, New York; BS Biology/Biochemistry
1981-1982 University of Delaware; Biology/Chemistry
5/91 Rutgers University; Mass Spectral Data Interpretation Course, GC/MS Training
8/92 Westchester Community College; Organic Data Validation Course
9/93 Westchester Community College; Inorganic Data Validation Course

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

ORGANIC DATA VALIDATION COURSE (35 HOURS)

Dr. John Samuelian

Date AUGUST 1992

Assistant Dean
Professional Development Center

President

The Professional
Development Center

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

INORGANIC DATA VALIDATION

Instructor: Dale Boshart

Date MARCH 1993

Assistant Dean
Professional Development Center

President

The Professional
Development Center

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

July 8, 1992

Ms. Elaine Sall
Program Coordinator
Westchester Community College
Valhalla, NY 10595-1698

Dear Elaine,

Thank you for your letter of June 29, 1992. I have reviewed the course outline for organic data validation, qualifications for teachers and qualifications for students. The course that you propose to offer would be deemed equivalent to that which is offered by EPA. The individuals who successfully complete the course and pass the final written exam would be acceptable to perform the task of organic data validation for the Department of Environmental Conservation, Division of Hazardous Waste Remediation.

As we have discussed in our conversation of July 7, 1992, you will forward to me prior to the August course deadline, the differences between the EPA SOW/90 and the NYSDEC ASP 12/91. You stated these differences will be compiled by Mr. John Samulian.

I strongly encourage you to offer an inorganic data validation course. I anticipate the same list of candidates would be interested in an inorganic validation course as well, since most of the data to be validated consists of both organic and inorganic data.

Thank you for you efforts and please contact me if I can be of any further assistance.

Sincerely,

Maureen P. Serafini

Maureen P. Serafini
Environmental Chemist II
Division of Hazardous Waste
Remediation

The Professional
Development Center
AT
WESTCHESTER COMMUNITY COLLEGE

914 285-6619

October 2, 1992

Ms. Lori Beyer
3 sparkill Drive
East Northport, NY 11731

Dear Ms. Beyer:

Congratulations upon successful completion of the Organic Data Validation course held August 17 - 21, 1992, through Westchester Community College, Professional Development Center. This course has been deemed by New York State Department of Environmental Conservation as equivalent to EPA's Organic Data Validation Course.

Enclosed is your Certificate. Holders of this Certificate are deemed competent to perform organic data validation for the New York State DEC Division of Hazardous Waste Remediation.

The Professional Development Center at Westchester Community College plans to continue to offer courses and seminars which will be valuable to environmental engineers, chemists and related personnel. Current plans include a TCLP seminar on November 17th and a conference on Environmental Monitoring Regulations on November 18th.

We look forward to seeing you again soon at another environmental program or event. Again, congratulations.

Very truly yours,

Passing Grade is 70%
Your Grade is 99%

Elaine Sall
Program Coordinator

ES/bf

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

The Professional
Development Center
AT
WESTCHESTER COMMUNITY COLLEGE

914 285-6619

June 21, 1993

Dear Ms. Beyer:

Enclosed is your graded final examination in the Inorganic Data Validation course you completed this past March. A score of 70% was required in order to receive a certificate of satisfactory completion. Persons holding this certificate are deemed acceptable to perform Inorganic Data Validation for the New York State Department of Environmental Conservation, Division of Hazardous Waste Remediation.

I am also enclosing a course evaluation for you to complete if you have not already done so. The information you provide will greatly aid us in structuring further courses. We wish to make these course offerings as relevant, targeted and comprehensive as possible. Your evaluation is vital to that end.

Congratulations on your achievement. I look forward to seeing you again at another professional conference or course. We will be co-sponsoring an environmental monitoring conference on October 21, 1993 with the New York Water Pollution Control Association, Lower Hudson Chapter, at IBM's Yorktown Heights, NY site. Information regarding this event will be going out in August.

Very truly yours,

Elaine Sall

Elaine Sall
Program Coordinator

ES/bf

Enclosures

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

APPENDIX B
HEALTH AND SAFETY PLAN

Broadway Astoria Arts

23-56 BROADWAY, ASTORIA, NEW YORK

Health and Safety Plan

NYSDEC BCP Site No.: TBD
AKRF Project Number: 250825

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:

Broadway Astoria Arts LLC
23-56 Broadway
Astoria, New York 11106

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
212-696-0670

MARCH 2026

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FIGURES

ATTACHMENTS

1.0 INTRODUCTION

This environmental Health and Safety Plan (HASP) has been developed for the implementation of a Remedial Investigation (RI) Work Plan (RIWP) by AKRF, Inc. (AKRF) personnel and subcontractors at the Broadway Astoria Arts site located at 23-56 Broadway in the Astoria section of Queens, New York (hereafter referred to as the "Site"). The Site is identified by the City of New York as Borough of Queens, Tax Map 4, Block 556, Lot 50.

Currently, the Site comprises a rectangular-shaped, 6,385-square-foot (sf) lot located at the intersection of Broadway and Cresent Street. The Site contains a vacant one-story, 8,670-gross-square-foot (gsf) commercial building with two partial cellars, which occupies a majority of the lot footprint. A small concrete-paved exterior loading dock area is located in the southeastern corner of the Site along Cresent Street. The Site is bounded by single and multi-family residential buildings to the west, followed by 23rd Street; by Broadway to the north, followed by a supermarket; by Cresent Street to the east, followed by commercial and residential buildings; and by a multi-family residential building to the south, followed by 33rd Avenue. The surrounding neighborhood uses are primarily residential and commercial.

A subsurface (Phase II) investigation was conducted by AKRF at the Site in September 2025, as documented in a Phase II ESA Report dated December 2025. The subsurface investigation identified elevated levels of chlorinated volatile organic compounds (CVOCs), including cis-1,2-dichloroethylene, tetrachloroethylene (PCE), trans-1,2-dichloroethene, and trichloroethylene (TCE), in groundwater; elevated CVOCs and petroleum volatile organic compounds (VOCs) in soil vapor; and elevated levels of metals (copper, lead, mercury, and zinc) in soil.

This HASP does not discuss 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 AKRF'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

Hazards of concern include: organic and inorganic chemicals, and heat and/or cold stress.

2.1.2 Physical Characteristics

Physical characteristics of the hazards of concern include solid, aqueous, and vapor states.

2.1.3 Hazardous Materials

The Site-specific hazardous materials that may be encountered during RI implementation include: fill material, solvent-related VOCs, PAHs, petroleum, and/or metals.

2.1.4 Chemicals of Concern

Chemical	REL/PEL/STEL	Health Hazards
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.
Benzene	REL: 0.319 mg/m^3 PEL: 3.19 mg/m^3	Inhalation causes immediate irritation of the nose, throat, and eyes, as well as dizziness, vomiting, and headaches. High concentrations may lead to convulsions, unconsciousness, or death.
Ethylbenzene	REL: 435 mg/m^3 PEL: 435 mg/m^3	Inhalation causes immediate irritation of the nose, throat, and eyes, as well as dizziness, vertigo, and headaches. High concentrations may lead to chest constriction.
Toluene	REL: 375 mg/m^3 PEL: 37 mg/m^3	Inhalation causes headaches, dizziness, euphoria, and fatigue. Short-term, high-level exposure leads to narcosis, intoxication, and potential unconsciousness. Chronic, long-term exposure can cause permanent neurological damage, hearing loss, and damage to the liver and kidneys.
Xylenes	REL: 435 mg/m^3 PEL: 435 mg/m^3	Inhalation of xylene vapors causes CNS depression, resulting in headaches, dizziness, nausea, vomiting, confusion, and loss of coordination (ataxia). Higher exposures can lead to giddiness, slurred speech, ringing in the ears, loss of consciousness, and in rare, extreme cases, death.
Fuel Oils	REL: 100 mg/m^3	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.

Chemical	REL/PEL/STEL	Health Hazards
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.
Tetrachloroethylene	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].
Trichloroethylene	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].
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: Permissable 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 Attachment A.

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 is 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 Code of Federal Regulations (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 work begins. A Site safety meeting will be conducted at the start of the project work. 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 any contamination, ensure that proper PPE 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 Zone is the zone area where support facilities such as vehicles, a 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. 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. The Exclusion Zone and CRZ will be 10 and 25 feet from the drill rig during the RI, respectively. Control measures such as caution tape and/or traffic cones will be placed around the perimeter of the work area when needed.

2.6 Personal Protection Equipment (PPE)

The PPE required for various kinds of investigation tasks is 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 PPE. The protection will be based on the air monitoring described in the Community Air Monitoring Plan (CAMP, Appendix C of the RIWP).

Level D PPE includes donning of the following during drilling and sampling:

- Steel Toed Boots
- Hard Hat
- Work Gloves

- Safety Glasses
- Ear Plugs
- Nitrile Gloves
- Tyvek Suit [if non-aqueous phase liquid (NAPL) is present]

If photoionization detector (PID) readings exceed 5 parts per million (ppm) in the breathing zone, personnel will don Level C PPE, which includes Level D PPE and a half- or full-face respirator with a dual organic and particulate cartridge.

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 Location Map showing the most direct route to the hospital is included as Figure 1.

3.1 Hospital Information

Hospital Name:	Mount Sinai Queens
Phone Number:	(718) 932-1000
Address:	3019 Crescent Street at 30th Road, Astoria, NY 11102
Directions:	1. Turn RIGHT out of the Site onto Broadway. 2. Turn RIGHT onto 23rd Street 2. Turn RIGHT onto 30th Avenue The emergency room will be on the RIGHT at the intersection of Crescent Street and 30th Road.

3.2 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF	Deborah Shapiro	QA/QC Officer	(646) 388-9544
	J. Patrick Diggins	Project Manager	Office: (914) 922-2784 Cell: (603) 494-7090
	Thomas Giordano	Deputy Project Manager	Office: (646) 388-9836 Cell: (609) 575-0796
	Mackenzie Miller	Field Team Leader/Site Safety Officer (SSO)	(631) 357-9404
	Giovanni De Marzo	Alternate Field Team Leader/SSO	(516) 983-0917
Coast Group Inc.	Gerald Sammarco	Client Representative	(646) 418-0820
Broadway Astoria Arts LLC	Katrina Costello	Volunteer	(917) 279-6880
Ambulance, Fire Department & Police Department	-	-	911
NYSDEC Spill Hotline	-	-	800-457-7362

4.0 APPROVAL & ACKNOWLEDGMENTS OF HASP

4.1 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.

4.2 Affidavit

I have read the Health and Safety Plan (HASP) for the project located at the Broadway Astoria Arts site located at 23-56 Broadway, Astoria, 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: _____
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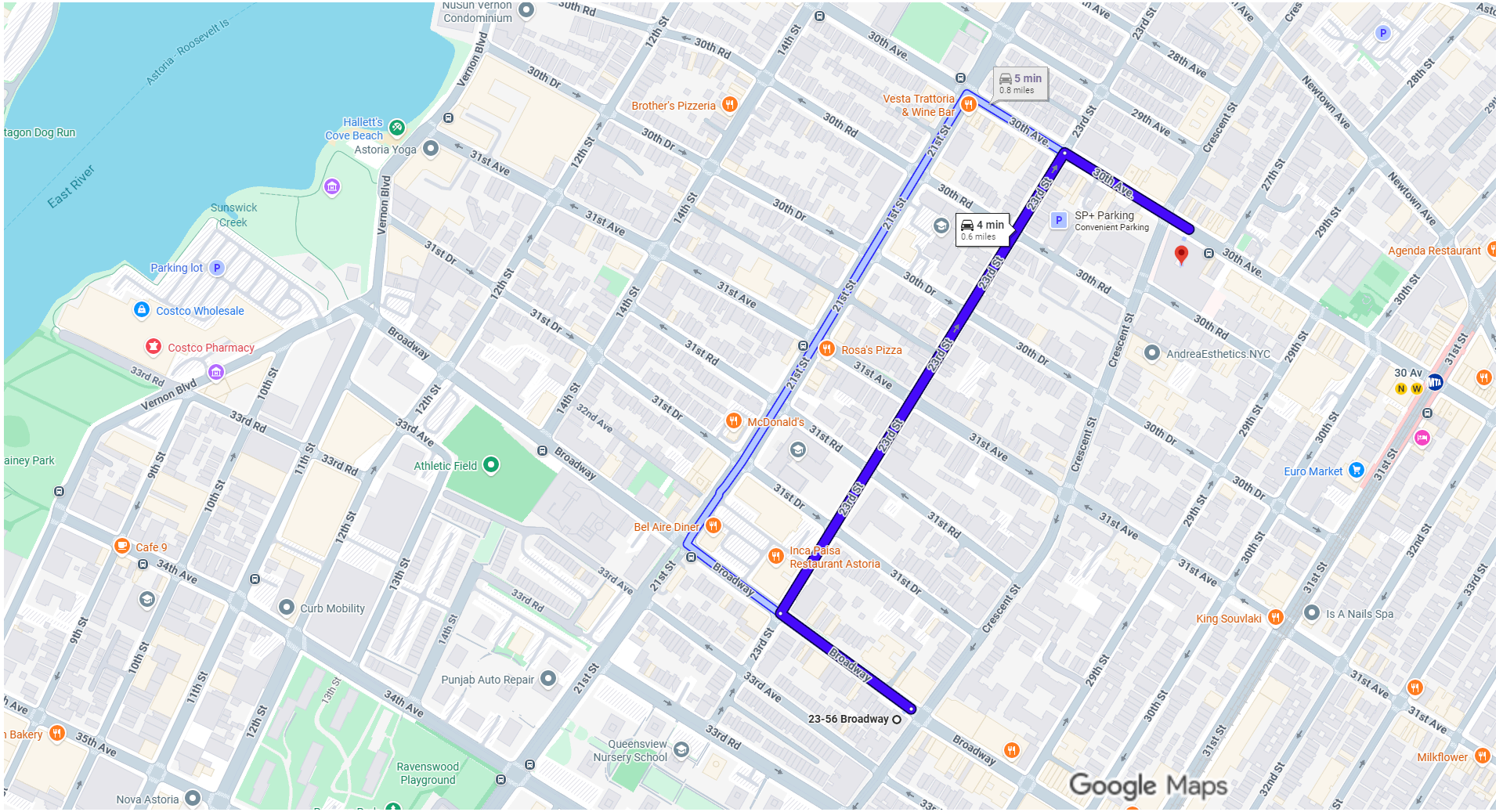
FIGURE

Figure 1
Hospital Directions



23-56 Broadway, Long Island City, NY 11106 to Mount Sinai Queens

Imagery ©2026 , Map data ©2026 Google 200 ft

Drive 0.6 mile, 4 min

ATTACHMENT A
POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

Benzene - ToxFAQs™

What is benzene?

Benzene is a colorless liquid with a petroleum-like odor. It evaporates into the air very quickly and dissolves in water. It is highly flammable. Benzene is made naturally in the environment from burning wood and volcanic activity. It is also found in human-made sources like cigarette smoke and motor vehicle exhaust.

Benzene is used in industry as a solvent and to make other products such as plastics, nylon resins, detergents, paint removers, and rubber goods. Benzene is especially important for unleaded gasoline because of its anti-knock characteristics.

What happens to benzene in the environment?

Benzene can enter the environment naturally from forest fires, volcanic activity, or oil coming to the earth's surface. Benzene also gets into the environment from motor vehicle exhaust, tobacco smoke, gas station operations, and industries that use or make benzene.

In the air, benzene breaks down within a few days. It may also be removed from the air by rain or snow and go back to the ground. Benzene quickly evaporates from surface water and soil into the air. Benzene is able to travel through the soil and can get into groundwater. It is not expected to accumulate in plants or animals.

How can I be exposed to benzene?

The most common ways to be exposed to benzene are by smoking cigarettes or breathing in cigarette smoke from other people (second-hand smoke). Motor vehicle exhaust and gasoline contain benzene, so if you breathe in contaminated air, particularly in areas with heavy motor vehicle traffic or around gas stations, you may be exposed to benzene. Inside your home, benzene can be released from gas stoves and ovens, and from fuel or wood-based heat sources such as fireplaces.

If you live around manufacturing plants that produce or use benzene, or around landfills and hazardous waste sites that contain benzene, you may be exposed. Underground fuel tanks can leak and release benzene vapors that can move into homes. Firefighters, gasoline station workers, and dry cleaners maybe be exposed to higher levels of benzene.

Exposure to benzene can decrease the number of red and white blood cells. Long-term exposure may also cause leukemia.

How can benzene affect my health?

Breathing in benzene for a long period of time can affect your blood cells and bone marrow. Reduced numbers of red blood cells and white blood cells have been seen in workers exposed to benzene. This can lead to anemia and reduce your ability to fight off diseases and infections. These changes were also seen in animals after breathing in benzene and after eating benzene for a long period of time.

Benzene

Can benzene cause cancer?

In people, exposure to benzene for a long period of time can result in bone marrow cancers, including acute myelogenous leukemia.

Studies in animals show that rats and mice exposed to benzene develop tumors at many sites in their body, and like humans, can develop leukemia.

The U.S. Department of Health and Human Services (DHHS) considers benzene as a known human carcinogen (able to cause cancer).

The U.S. Environmental Protection Agency (EPA) has classified benzene as a known human carcinogen.

The International Agency for Research on Cancer (IARC) has classified benzene as carcinogenic to humans.

Can I get a medical test to check for benzene?

There is a test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene and its breakdown products can also be detected in the urine. These tests cannot predict whether you will have health problems from the exposure. Doctor's offices do not routinely offer these tests. If you think you have been exposed to benzene, or any other chemical, talk to your doctor or nurse or call poison control.

How can I protect myself and my family from benzene?

Avoid smoking and keep away from areas where your or your children may be exposed to secondhand smoke. If you have an attached garage to your house, do not store gasoline cans in the garage. Avoid breathing in smoke from fires. Try to limit your time in heavily traffic areas to minimize exposure to automobile exhaust. Do not allow your children to play near a facility that uses benzene or around landfills.

For more information:

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for Benzene: https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=40&tid=14

Go to ATSDR's Toxic Substances Portal: https://wwwn.cdc.gov/TSP/index.aspx

Find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

Lead - ToxFAQs™

What is lead?

Lead is a metal found naturally in the earth's crust. It can be found in all parts of our environment, including air, water, and soil. Lead can combine with other chemicals to make different compounds.

Lead is used in the production of batteries, ammunition, and metal products (solder and pipes). Because of health concerns, the use of lead in paints, ceramic products, caulking, and pipe solder has been dramatically reduced. The use of lead as an additive to automobile gasoline was banned in 1996 in the United States.

What happens to lead in the environment?

- Lead is an element, so it does not break down.
- When lead is released into the air, it may be transported long distances before it lands and stays on the ground.
- Once on the ground, lead can often stick to soil particles.
- Lead in soil can get into groundwater, but the amount of lead that moves into groundwater will depend on the lead compound and soil type.

How can I be exposed to lead?

Lead can cause health problems in almost every organ and system in your body.

- Eating food or drinking water that contains lead.
- Drinking water from pipes that were soldered with lead can cause exposure.
- Spending time or living in homes with lead-based paints can result in exposure when the paint breaks down and forms dust, which can get on your hands, or into your mouth and nose and be swallowed.
- Spending time in areas where the soil is contaminated with lead.
- Working in a job where lead is used or participating in certain hobbies where lead is used, such as making stained glass.
- Using healthcare products from other countries, alternative treatments, or folk remedies.

How can lead affect my health?

The effects of lead are the same whether it enters the body by breathing it in or eating it. Lead can affect almost every organ and system in your body. The nervous system is the main target for lead poisoning in children and adults. Long-term exposure can result in decreased learning, memory, and attention, and weakness in fingers, wrists, or ankles. Lead exposure can cause anemia (low iron in the blood) and damage to the kidneys. It can also cause increases in blood pressure, particularly in middle-aged and older individuals. Exposure to high lead levels can severely damage the brain and kidneys and can cause death. In pregnant women, exposure to high levels of lead may cause a miscarriage. In men, it can cause damage to reproductive organs.

Lead

How can lead affect children?

Children are more vulnerable to lead poisoning than adults because their nervous system is still developing. Children can be exposed to lead in their environment and before birth from lead in their mother's body. At lower levels of exposure, lead can decrease mental development, especially learning, intelligence, and behavior. Physical growth may also be decreased. A child who swallows large amounts of lead may develop anemia, severe stomachache, muscle weakness, and brain damage. Exposure to lead during pregnancy can also result in premature births. Some effects of lead poisoning in a child may continue into adulthood.

Can lead cause cancer?

Several agencies and organizations both in the United States and internationally have reviewed studies and made an assessment about whether lead can cause cancer.

- The Department of Health and Human Services (HHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens (causing cancer in people).
- The U.S. Environmental Protection Agency (EPA) has classified lead as 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.

Can I get a medical test to check for lead?

A blood test is available to measure the amount of lead in your blood. Blood tests are commonly used to screen children for lead poisoning. Your doctor can draw blood samples and send them to appropriate laboratories for analysis. If you think you or anyone in your family has been exposed to lead, contact your doctor, nurse, or poison control center.

How can I protect my family from lead exposure?

- 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 your home contains lead-based paint (built before 1978), or if 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 to remove lead dust and lead tracked in soil.
- Certain water pipes may contain lead, so if you know that pipes have lead solder, you should avoid drinking from that source.
- Check for lead in some products such as toys and jewelry and avoid such products.
- Lead is sometimes in candies imported from other countries or traditional home remedies; find out if yours has any lead and avoid using these products or giving them to children.
- You can learn more about preventing lead poisoning here: https://www.cdc.gov/nceh/lead/faqs/lead-faqs.htm

Want more information?

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for Lead

CDC Lead Poisoning Prevention Program https://www.cdc.gov/nceh/lead/default.htm

Environmental Protection Agency https://www.epa.gov/lead/protect-your-family-exposures-lead

Go to ATSDR's Toxic Substances Portal: https://wwwn.cdc.gov/TSP/index.aspx

If you have any more questions or concerns, you can also find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

Tetrachloroethylene - ToxFAQs™

CAS # 127-18-4

This fact sheet answers the most frequently asked health questions (FAQs) about tetrachloroethylene. 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: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing and in the aerospace industry. Exposure to very high concentrations of tetrachloroethylene can cause dizziness headaches, sleepiness, incoordination confusion, nausea, unconsciousness, and even death. Tetrachloroethylene has been found in at least 949 of the 1,854 National Priorities List sites identified by U.S. Environmental Protection Agency (EPA).

What is tetrachloroethylene?

Tetrachloroethylene is a nonflammable colorless liquid. Other names for tetrachloroethylene include perchloroethylene, PCE, perc, tetrachloroethene, and perchlor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part in 1 million parts of air (1 ppm) or more.

Tetrachloroethylene is used as a dry cleaning agent and metal degreasing solvent. It is also used as a starting material (building block) for making other chemicals and is used in some consumer products.

What happens to tetrachloroethylene when it enters the environment?

- Tetrachloroethylene can be released into air, water, and soil at places where it is produced or used.
- Tetrachloroethylene breaks down very slowly in the air and so it can be transported long distances in the air. Half of the amount in the air will degrade in approximately 100 days.
- Tetrachloroethylene evaporates quickly from water into air. It is generally slow to break down in water.
- Tetrachloroethylene may evaporate quickly from shallow soils or may filter through the soil and into the groundwater below. It is generally slow to break down in soil.

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. You might also be exposed to tetrachloroethylene that is released into the air during showering and bathing.
- People residing near contaminated sites or dry cleaning locations may be exposed to higher levels than the general population.
- People working in the dry cleaning industries or using metal degreasing products may be exposed to elevated levels of tetrachloroethylene.

How can tetrachloroethylene affect my health?

Breathing high levels of tetrachloroethylene for a brief period may cause dizziness or drowsiness, headache, and incoordination; higher levels may cause unconsciousness and even death.

Exposure for longer periods to low levels of tetrachloroethylene may cause changes in mood, memory, attention, reaction time, and vision.

Studies in animals exposed to tetrachloroethylene have shown liver and kidney effects, and changes in brain chemistry, but we do not know what these findings mean for humans.

Tetrachloroethylene

CAS # 127-18-4

How likely is tetrachloroethylene to cause cancer?

Studies in humans suggest that exposure to tetrachloroethylene might lead to a higher risk of getting bladder cancer, multiple myeloma, or non-Hodgkin's lymphoma.

In animals, tetrachloroethylene has been shown to cause cancers of the liver, kidney, and blood system.

The Department of Health and Human Services (DHHS) considers tetrachloroethylene to be reasonably anticipated to be a human carcinogen. EPA considers tetrachloroethylene likely to be carcinogenic to humans by all routes of exposure. The International Agency for Research on Cancer (IARC) considers tetrachloroethylene probably carcinogenic to humans.

How can tetrachloroethylene affect children?

It is not known whether children are more susceptible than adults to the effects of tetrachloroethylene.

A few studies in humans have suggested that exposure to tetrachloroethylene increased the numbers of babies with birth defects, but these studies were not large enough to clearly answer the question. Studies in animals exposed by inhalation or stomach tube have not shown clear evidence of specific birth defects.

How can families reduce the risk of exposure to tetrachloroethylene?

- Tetrachloroethylene has been found in low levels in some food. You can minimize the risk of your family's exposure by peeling and thoroughly washing fruits and vegetables before cooking.
- Use bottled water if you have concerns about the presence of tetrachloroethylene in your tap water. You may also contact local drinking water authorities and follow their advice.
- Prevent children from playing in dirt or eating dirt if you live near a waste site that has tetrachloroethylene.
- Tetrachloroethylene is widely used as a scouring solvent that removes oils from fabrics, as a carrier solvent, as a fabric finish or water repellant, and as a metal degreaser/cleaner. Follow instructions on product labels to minimize exposure to tetrachloroethylene.

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

Tetrachloroethylene and its breakdown products (metabolites) can be measured in blood and urine. However, the detection of tetrachloroethylene or its metabolites cannot predict the kind of health effects that might develop from that exposure. Because tetrachloroethylene and its metabolites leave the body fairly rapidly, the tests need to be conducted within days after exposure.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set an 8-hour time weighted average permissible exposure limit of 100 ppm, an acceptable ceiling exposure limit of 200 ppm, and a maximum peak of 300 ppm (not to be exceeded for more than 5 minutes of any 3-hour period).

The National Institute for Occupational Safety and Health (NIOSH) recommends that workplace exposure to tetrachloroethylene be minimized due to concerns about its carcinogenicity.

Reference

This ToxFAQs™ information is taken from the 2019 Toxicological Profile for Tetrachloroethylene 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 and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ on the web: www.atsdr.cdc.gov/ToxFAQs

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.

Trichloroethylene - ToxFAQs™

CAS # 79-01-6

This fact sheet answers the most frequently asked health questions (FAQs) about trichloroethylene. 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: Trichloroethylene is used as a solvent for cleaning metal parts. Exposure to very high concentrations of trichloroethylene can cause dizziness headaches, sleepiness, incoordination, confusion, nausea, unconsciousness, and even death. Trichloroethylene has been found in at least 1,051 of the 1,854 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is trichloroethylene?

Trichloroethylene is a colorless, volatile liquid. Liquid trichloroethylene evaporates quickly into the air. It is nonflammable and has a sweet odor.

The two major uses of trichloroethylene are as a solvent to remove grease from metal parts and as a chemical that is used to make other chemicals, especially the refrigerant, HFC-134a.

What happens to trichloroethylene when it enters the environment?

- Trichloroethylene can be released to air, water, and soil at places where it is produced or used.
- Trichloroethylene is broken down quickly in air.
- Trichloroethylene breaks down very slowly in soil and water and is removed mostly through evaporation to air.
- It is expected to remain in groundwater for long time since it is not able to evaporate.
- Trichloroethylene does not build up significantly in plants or animals.

How might I be exposed to trichloroethylene?

- Breathing trichloroethylene in contaminated air.
- Drinking contaminated water.
- Workers at facilities using this substance for metal degreasing are exposed to higher levels of trichloroethylene.
- If you live near such a facility or near a hazardous waste site containing trichloroethylene, you may also have higher exposure to this substance.

How can trichloroethylene affect my health?

Trichloroethylene was once used as an anesthetic for surgery. Exposure to moderate amounts of trichloroethylene may cause headaches, dizziness, and sleepiness; large amounts may cause coma and even death. Eating or breathing high levels of trichloroethylene may damage some of the nerves in the face. Exposure to high levels can also result in changes in the rhythm of the heartbeat, liver damage, and evidence of kidney damage. Skin contact with concentrated solutions of trichloroethylene can cause skin rashes. There is some evidence exposure to trichloroethylene in the work place may cause scleroderma (a systemic autoimmune disease) in some people. Some men occupationally-exposed to trichloroethylene and other chemicals showed decreases in sex drive, sperm quality, and reproductive hormone levels.

How likely is trichloroethylene to cause cancer?

There is strong evidence that trichloroethylene can cause kidney cancer in people and some evidence for trichloroethylene-induced liver cancer and malignant lymphoma. Lifetime exposure to trichloroethylene resulted in increased liver cancer in mice and increased kidney cancer and testicular cancer in rats.

The Department of Health and Human Services (DHHS) considers trichloroethylene to be a known human carcinogen. The International Agency for Research on Cancer (IARC) classified trichloroethylene as carcinogenic to humans. The EPA has characterized trichloroethylene as carcinogenic to humans by all routes of exposure.

Trichloroethylene

CAS # 79-01-6

How can trichloroethylene affect children?

It is not known whether children are more susceptible than adults to the effects of trichloroethylene.

Some human studies indicate that trichloroethylene may cause developmental effects such as spontaneous abortion, congenital heart defects, central nervous system defects, and small birth weight. However, these people were exposed to other chemicals as well.

In some animal studies, exposure to trichloroethylene during development caused decreases in body weight, increases in heart defects, changes to the developing nervous system, and effects on the immune system.

How can families reduce the risk of exposure to trichloroethylene?

- Avoid drinking water from sources that are known to be contaminated with trichloroethylene. Use bottled water if you have concerns about the presence of chemicals in your tap water. You may also contact local drinking water authorities and follow their advice.
- Prevent children from playing in dirt or eating dirt if you live near a waste site that has trichloroethylene.
- Trichloroethylene is used in many industrial products. Follow instructions on product labels to minimize exposure to trichloroethylene.

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

Trichloroethylene and its breakdown products (metabolites) can be measured in blood and urine. However, the detection of trichloroethylene or its metabolites cannot predict the kind of health effects that might develop from that exposure. Because trichloroethylene and its metabolites leave the body fairly rapidly, the tests need to be conducted within days after exposure.

Has the federal government made recommendations to protect human health?

The EPA set a maximum contaminant goal (MCL) of 0.005 milligrams per liter (mg/L; 5 ppb) as a national primary drinking standard for trichloroethylene.

The Occupational Safety and Health Administration (OSHA) set a permissible exposure limit (PEL) of 100 ppm for trichloroethylene in air averaged over an 8-hour work day, an acceptable ceiling concentration of 200 ppm provided the 8 hour PEL is not exceeded, and an acceptable maximum peak of 300 ppm for a maximum duration of 5 minutes in any 2 hours.

The National Institute for Occupational Safety and Health (NIOSH) considers trichloroethylene to be a potential occupational carcinogen and established a recommended exposure limit (REL) of 2 ppm (as a 60-minute ceiling) during its use as an anesthetic agent and 25 ppm (as a 10-hour TWA) during all other exposures.

Reference

This ToxFAQs™ information is taken from the 2019 Toxicological Profile for Trichloroethylene 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 and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ on the web: www.atsdr.cdc.gov/ToxFAQs

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.

Mercury - ToxFAQs™

What is mercury?

Mercury is a naturally occurring element with a chemical symbol of Hg. Elemental mercury is a silver liquid at room temperature that can also evaporate into the air as a gas or become a solid at very low temperatures. It can combine with other substances to form solid compounds that are categorized into two groups: inorganic mercury salts and organic mercury compounds. Mercury and mercury compounds are odorless.

Mercury is used in a number of industries and products. It is primarily used in the manufacture of electronics, fluorescent-lighting, and production of chlorine-caustic soda. It is also used in dental products (fillings), although uses in dentistry are being phased-out. Other historical uses of mercury (batteries; thermometers and other scientific and medical devices; electronic switches and lighting applications; paints and pigments; fungicides and pesticides) have been eliminated or drastically reduced.

What happens to mercury in the environment?

Because mercury is a naturally occurring element, it can be found in the air, water, or soil. It can also be found in the environment due to industrial releases to air and water. Industrial releases to air have steadily decreased over the past few decades.

Mercury does not break down in the environment. In air, mercury may spread far from where it was released. Mercury seldom appears as a silver liquid in the environment. In water, mercury can evaporate into the air. In soil, it can adhere (stick) to soil and sediments (dirt deposits at the bottom of bodies of water). One type of organic mercury compound called methylmercury can build up in plants and fish.

How can I be exposed to mercury?

Most people are exposed to organic mercury compounds (typically methylmercury) in food (such as fish, seafood, rice) or to elemental mercury from dental fillings. Food is the most common form of exposure. Most people are not exposed to inorganic mercury salts. Industrial and dental workers who use mercury are primarily exposed to elemental mercury. Some cultures use mercury in traditional medicines or religious practices, although this is not recommended or approved for use in the United States.

How can mercury affect my health?

Mercury can affect the nervous system and kidneys. The health effects from exposure to mercury depend on a number of factors including the amount and form of mercury, route and length of exposure, and age.

All forms of mercury can affect the nervous system and the kidneys. Workers exposed to elemental mercury vapor and people who eat foods with high levels of methylmercury experienced tremors, incoordination, impaired vision, impaired learning and memory, and mood changes. Some children born in communities that ate food with high levels of organic mercury had learning, sensory, and movement problems. In people exposed to high levels of methylmercury in their diets, birth defects have occurred. Some humans and animals that ate mercury compounds had high blood pressure and alterations in their immune systems. Animals that breathed elemental mercury vapor or ate organic or inorganic mercury compounds in their diets showed nervous system effects and/or kidney damage. Animals that ate high levels of mercury compounds showed decreased fertility and/or birth defects.

Mercury

Can mercury cause cancer?

Rats that ate an inorganic mercury compound for a long period of time developed stomach or thyroid cancer. Rats and mice that ate organic mercury compounds for a long period of time developed kidney cancer.

The U.S. Department of Health and Human Services (DHHS) has not evaluated the potential of mercury or mercury compounds to cause cancer in people.

The U.S. Environmental Protection Agency (EPA) has determined that mercuric chloride (inorganic mercury salt) and methylmercury (organic mercury compound) are possible human carcinogens (cause cancer). The EPA did not classify the potential of elemental mercury to cause cancer in humans.

The International Agency for Research on Cancer (IARC) classified methylmercury compounds as possibly carcinogenic to humans. IARC designated inorganic mercury and elemental mercury as not classifiable for causing cancer in humans.

Can I get a medical test to check for mercury?

Mercury can be measured in your blood, urine, hair, or toenails. However, tests cannot determine which form of mercury you were exposed to. Tests also cannot predict whether you will have health problems. If you think you have been exposed to mercury, call your doctor, nurse, or poison control center.

How can I protect myself and my family from mercury?

People should avoid eating fish that contain high levels of methylmercury. This is particularly important for pregnant women and children. Follow your state's health advisories that tell you about whether it is okay to eat fish or wildlife caught in contaminated areas. Avoid all contact with spills of the liquid form of elemental mercury (the type of mercury found in old thermometers). If a spill occurs, refer to https://www.atsdr.cdc.gov/dontmesswithmercury for safe clean-up practices. Most people don't need to take any special steps to avoid exposure to inorganic mercury salts in their daily lives. Keep children from playing in areas near hazardous waste sites to avoid coming in contact with mercury.

For more information:

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for Mercury: https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=115&tid=24

Go to ATSDR's Toxic Substances Portal: https://wwwn.cdc.gov/TSP/index.aspx

Find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

Toluene - ToxFAQs™

What is toluene?

Toluene is a clear, colorless liquid with a distinctive smell. It occurs naturally in crude oil and in the tolú tree. Toluene is produced in the process of making gasoline and other fuels from crude oil and in making coke from coal.

Toluene is a good solvent (a substance that can dissolve other substances). It is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes. Toluene is also used in the manufacture of other chemicals, nylon, and plastics. It is also added to gasoline along with benzene and xylene to improve octane ratings.

What happens to toluene in the environment?

Toluene can enter the air from car exhaust or when materials that contain it (such as paints or fingernail polish) are used. It can get into surface waters (like lakes and streams), groundwater, or soil if solvents or petroleum products are accidently spilled, or from leaking underground storage tanks at gasoline stations and other facilities. When toluene-containing products are placed in landfills or waste disposal sites, toluene can enter the soil or water near the waste site.

Toluene does not usually stay in the environment long. In surface water or soil, it will readily evaporate into the air or be degraded by bacteria. In the air, toluene rapidly breaks down by reacting with other chemicals or oxygen in the air. Below the surface, microorganisms will break down toluene.

How can I be exposed to toluene?

You may be exposed to toluene by breathing contaminated air or touching products that contain this chemical. Car exhaust contains toluene; therefore, if you spend time in or near vehicles or traffic, you may be exposed to this chemical. People who work with gasoline, paint, or dyes may be exposed to higher levels of toluene than most people.

Toluene is not frequently detected in drinking water or food. People that abuse (inhale) certain products such as glue or paint thinner can be exposed to toluene.

How can toluene affect my health?

Toluene may affect the nervous system. Low to moderate levels can cause headaches, dizziness, tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, and loss of appetite. These symptoms usually disappear when exposure stops.

Toluene can be found in gasoline products, paints, stain removers, and fingernail polish. Breathing toluene can cause headaches, dizziness, and nausea.

Long-term daily exposure to toluene in the workplace may cause some hearing and color vision loss. Repeatedly breathing toluene from glue or paint thinners may permanently damage the brain.

Exposure to high levels of toluene during pregnancy, such as those associated with solvent abuse, may lead to developmental effects, such as reduced mental abilities and growth in children.

In animal studies, the effects of toluene were similar to those seen in humans. In addition, it was found that animals that drank toluene also had decreased immune responses.

Toluene

Can toluene cause cancer?

Studies in workers and animals exposed to toluene generally show that toluene does not cause cancer.

The U.S. Department of Health and Human Services (DHHS) has not evaluated the carcinogenicity (ability to cause cancer) of toluene.

The U.S. Environmental Protection Agency (EPA) has determined that there is inadequate information to assess the carcinogenicity of toluene.

The International Agency for Research on Cancer (IARC) has determined that toluene is not classifiable as to its carcinogenicity in humans.

Can I get a medical test to check for toluene?

Toluene and its breakdown products can be measured in blood and urine. These tests are only useful if done within several days after exposure. These tests cannot predict whether you will have health problem from exposure to toluene.

How can I protect myself and my family from toluene?

To reduce exposure to toluene, you should use products that contain it (such as paints, nail polish, glues, inks, and stain removers) in well-ventilated areas. When not in use, these products should be tightly covered to prevent evaporation into the air and, if possible, stored in a shed or an outside location. Always store household chemicals in their original labeled containers.

Have your tap water tested if you are concerned it may have toluene and, if necessary, take steps to protect yourself. Keep children from eating or playing in the dirt if you live near a waste site.

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

For more information:

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for Toluene: https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=161&tid=29

Go to ATSDR's Toxic Substances Portal: https://wwwn.cdc.gov/TSP/index.aspx

Find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

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.

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.

Polycyclic Aromatic Hydrocarbons (PAHs) - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). 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. 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: 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 (NPL) 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.

Polycyclic Aromatic Hydrocarbons

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 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.

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

Division of Toxicology and Environmental Medicine ToxFAQs™ **August 2007**

This fact sheet answers the most frequently asked health questions (FAQs) about xylene. 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 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. Xylene has been found in at least 840 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is xylene?

There are three forms of xylene in which the methyl groups vary on the benzene ring: *meta*-xylene, *ortho*-xylene, and *para*-xylene (*m*-, *o*-, and *p*-xylene). These different forms are referred to as isomers.

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar. Chemical industries produce xylene from petroleum. It is 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 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 in a couple of days.
❑ It is broken down by microorganisms in soil and water.
❑ Only a small amount of it builds up in fish, shellfish, plants, and other animals living in xylene-contaminated water.

How might I be exposed to xylene?

❑ Using a variety of consumer products including gasoline, paint varnish, shellac, rust preventatives, and cigarette smoke. Xylene can be absorbed through the respiratory tract and through the skin.
❑ Ingesting xylene-contaminated food or water, although these levels are likely to be very low.
❑ Working in a job that involves the use of xylene such as painters, paint industry workers, biomedical laboratory workers, automobile garage workers, metal workers, and furniture refinishers.

How can xylene affect my health?

No health effects have been noted at the background levels that people are exposed to on a daily basis.

High levels of exposure for short or long periods 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.

How likely is xylene to cause cancer?

Both the International Agency for Research on Cancer (IARC) and the EPA have found that there is insufficient information to determine whether or not xylene is carcinogenic.

How can xylene affect children?

The effects of xylene have not been studied in children, but it is likely that they would be similar to those seen in exposed adults. Although there is no direct evidence, children may be more sensitive to acute inhalation exposure than adults because their narrower airways would be more sensitive to swelling effects.

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 can families reduce the risks of exposure to xylene?

❑ Exposure to xylene as solvents (in paints or gasoline) can be reduced if the products are used with adequate ventilation and if they are stored in tightly closed containers out of the reach of small children.
❑ Sometimes older children sniff household chemicals in attempt to get high. Talk with your children about the dangers of sniffing xylene.
❑ If products containing xylene are spilled on the skin, then the excess should be wiped off and the area cleaned with soap and water.

Is there a medical test to determine 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 because they require special equipment.

Has the federal government made recommendations to protect human health?

The EPA set a limit of 10 parts xylene per million parts drinking water (10 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 100 parts xylene per million parts of workplace air (100 ppm) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Xylene (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.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

FUEL OILS

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

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 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.

Ethylbenzene- ToxFAQs™

CAS # 100-41-4

This fact sheet answers the most frequently asked health questions (FAQs) about ethylbenzene. 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: 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. Breathing lower levels has resulted in hearing effects and kidney damage in animals. Ethylbenzene has been found in at least 829 of 1,699 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is ethylbenzene?

Ethylbenzene is a colorless, flammable liquid that smells like gasoline.

It is naturally found in coal tar and petroleum and is also found in manufactured products such as inks, pesticides, 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.
- In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.
- Ethylbenzene can move through soil into groundwater.
- In soil, it is broken down by bacteria.

How might I be exposed to ethylbenzene?

- If you live in a city or near many factories or heavily traveled highways, you may be exposed to ethylbenzene in air.
- Releases of ethylbenzene into the air occur from burning oil, gas, and coal and from industries using ethylbenzene.
- Ethylbenzene is not often found in drinking water. Higher levels may be found in residential drinking water wells near landfills, waste sites, or leaking underground fuel storage tanks.
- Exposure can occur if you work in an industry where ethylbenzene is used or made.
- Exposure can occur if you use products containing it, such as gasoline, carpet glues, varnishes, and paints.

How can ethylbenzene affect my health?

Exposure to high levels of ethylbenzene in air for short periods can cause eye and throat irritation. Exposure to higher levels can result in dizziness.

Irreversible damage to the inner ear and hearing has been observed in animals exposed to relatively low concentrations of ethylbenzene for several days to weeks.

Exposure to relatively low concentrations of ethylbenzene in air for several months to years causes kidney damage in animals.

How likely is ethylbenzene to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that ethylbenzene is a possible human carcinogen.

Ethylbenzene

CAS # 100-41-4

How does ethylbenzene affect children?

There are no studies evaluating the effects of ethylbenzene exposure on children or immature animals. It is likely that children would have the same health effects as adults. We do not know whether children would be more sensitive than adults to the effects of ethylbenzene.

We do not know if ethylbenzene will cause birth defects in humans. Minor birth defects and low birth weight have occurred in newborn animals whose mothers were exposed to ethylbenzene in air during pregnancy.

How can families reduce the risk of exposure to ethylbenzene?

- Use adequate ventilation to reduce exposure to ethylbenzene vapors from consumer products such as gasoline, pesticides, varnishes and paints, and newly installed carpeting.
- Sometimes older children sniff household chemicals, including ethylbenzene, in an attempt to get high. Talk with your children about the dangers of sniffing chemicals.
- 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 that 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.

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. Because these substances leave the body very quickly, this test needs to be done within a few hours after exposure occurs.

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 determined that exposure to ethylbenzene in drinking water at concentrations of 30 mg/L for 1 day or 3 mg/L for 10 days is not expected to cause any adverse effects in a child.

The EPA has determined that lifetime exposure to 0.7 mg/L ethylbenzene is not expected to cause any adverse effects.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 100 ppm for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2010. 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 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.

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.

Copper - ToxFAQs™

What is copper?

Copper (Cu) is an element and metal. It is found in rocks, soils, water, and air. Copper is an essential nutrient for humans and is in many foods. It is also essential to animals and plants. Copper and substances containing copper are used in many industries in the United States. Copper can be found in materials and products such as wiring, plumbing, pesticides, cookware, and dietary supplements, among others. Copper scrap can be combined with other metals to make brass and bronze pipes. In the United States, copper is mined and recovered from metal through smelting.

What happens to copper in the environment?

- Copper is released from natural sources, such as windblown dusts and decaying vegetation, and from human activities like municipal solid waste management and fossil fuel burning.
- In air, copper usually attaches to particles (particulate matter) and can travel far from its source.
- In water, copper will usually attach to soils if possible, or dissolve.
- Copper attaches to soils, where it can be taken up by plants.
- Mollusks, such as clams and oysters, can build up copper in their bodies.
- Copper does not break down in the environment.

Ingesting copper in food is necessary for human health. Too much copper can be harmful.

How can I be exposed to copper?

- People ingest copper from drinking water and food, inhale copper from air, and may touch copper or products that contain copper.
- Drinking water can contain high levels of copper if your home has copper pipes and acidic water. This is more likely to occur in new or recently renovated buildings/homes using copper plumbing.
- Blue copper sulfate crystals can be used to control algae in ponds and have been accidentally ingested by people who confused them for candy or toys.
- You may be exposed to copper particles in air if you work or live near a site that uses copper in mining or agriculture or in a facilitity that processes copper.
- Soils near mines, processing facilities, or waste dump sites may have a lot of copper.

How can copper affect my health?

It is essential for people to ingest small amounts of copper every day in food and water. Ingesting too much or too little copper can lead to illness and/or disease. Ingesting a high amount of copper, usually in drinking water, can cause vomiting, nausea, abdominal pain, and/or diarrhea. Ingesting higher than recommended amounts of copper every day over time, such as in water or in copper supplements, can lead to severe illness, such as kidney and liver damage.

Breathing in copper dusts, sprays, or crystals can irritate your nose and throat and cause dizziness and headaches. People who have ingested these substances have gotten very sick and/or died.

Copper is essential to the development of babies and children and is found in breast milk. Babies and children are expected to have symptoms similar to adults when exposed to high levels of copper in air, water, or food. If you have a disorder that causes copper to build up in your body, like Wilson's disease, you may be especially vulnerable to high copper levels in air, food, or water.

Copper

Can copper cause cancer?

The U.S. Department of Health and Human Services (DHHS) has not evaluated the carcinogenicity (whether it causes cancer) of copper.

The U.S. Environmental Protection Agency (EPA) has not evaluated the carcinogenicity of copper.

The International Agency for Research on Cancer (IARC) has not evaluated the carcinogenicity of copper. IARC lists copper 8-hydroxyquinoline as a group 3 agent, indicating that the carcinogenicity in humans cannot be classified due to lack of cancer studies in humans and animals.

Can I get a medical test to check for copper?

There are tests to measure the amount of copper in your blood, urine, nails, and hair. Your medical provider can help decide if a test is needed and which is the most appropriate for you. High levels of copper in these tests can show if you have been exposed to a lot of copper or if there is a problem with copper regulation in the body. These tests will not predict if you will have health problems. These tests are not part of standard health tests that are done at your doctor's office and are done through a special lab. If you think you may have been exposed to high levels of copper, talk to your doctor, nurse, or clinic, or call poison control.

How can I protect my family from copper exposure?

If your water is metallic or bitter in taste or smell and/or is green-blue in color, this may be a sign that there is too much copper in your drinking water. If you have copper piping, it can leach into water if your home is new or recently renovated or if your water is corrosive (acidic). Regularly cleaning or flushing out your system can help avoid this. There are tests available to check if your water is acidic or if copper levels in your water are high.

Safely store copper powders, crystals, or dusts away from children, pets, or other adults.

Monitor your copper intake if you are adding more copper to your diet, such as by taking dietary supplements with copper, to make sure you are not eating too much. Talk to your doctor, nurse, or clinic to figure out if you are taking the proper amount of copper.

If you work with copper, wear the necessary protective clothing and equipment, and always follow safety procedures. Shower and change your clothes before going home each day.

For more information:

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for Copper: https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=206&tid=37

Go to ATSDR's Toxic Substances Portal: http://www.atsdr.cdc.gov/substances/index.asp

Find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

ATTACHMENT 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	___ Illness	___ Near Miss
__ Property Damage	___ Fire	___ Chemical Exposure
__ On-site Equipment	___ Motor Vehicle	___ Electrical
__ Mechanical	___ Spill	___ 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 _____ Dislocations ____ Punctures

__ Bites _____ Faint/Dizziness ____ Radiation Burns

__ Blisters _____ Fractures ____ Respiratory Allergy

__ Bruises _____ Frostbite ____ Sprains

__ Chemical Burns _____ Heat Burns ____ Toxic Resp. Exposure

__ Cold Exposure _____ Heat Exhaustion ____ Toxic Ingestion

__ Concussion _____ Heat Stroke ____ Dermal Allergy

__ Lacerations

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

ATTACHMENT 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 C
COMMUNITY AIR MONITORING PLAN

Broadway Astoria Arts

23-56 BROADWAY, ASTORIA, NEW YORK

Community Air Monitoring Plan

NYSDEC BCP Site No.: TBD
AKRF Project Number: 250825

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:

Broadway Astoria Arts LLC
23-56 Broadway
Astoria, New York 11106

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
212-696-0670

MARCH 2026

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TABLES

1.0 INTRODUCTION

This Community Air Monitoring Plan (CAMP) has been developed for use during the implementation of a Remedial Investigation (RI) Work Plan (RIWP) by AKRF, Inc. (AKRF) personnel and subcontractors at the Broadway Astoria Arts site located at 23-56 Broadway in the Astoria section of Queens, New York (hereafter referred to as the "Site"). The Site is identified by the City of New York as Borough of Queens, Tax Map 4, Block 556, Lot 50.

Currently, the Site comprises a rectangular-shaped, 6,385-square-foot (sf) lot located at the intersection of Broadway and Cresent Street. The Site contains a vacant one-story, 8,670-gross-square-foot (gsf) commercial building with two partial cellars, which occupies a majority of the lot footprint. A small concrete-paved exterior loading dock area is located in the southeastern corner of the Site along Cresent Street. The Site is bounded by single and multi-family residential buildings to the west, followed by 23rd Street; by Broadway to the north, followed by a supermarket; by Cresent Street to the east, following by commercial and residential buildings; and by a multi-family residential building to the south, followed by 33rd Avenue. The surrounding neighborhood uses are primarily residential and commercial.

A subsurface (Phase II) investigation was conducted by AKRF at the Site in September 2025, as documented in a Phase II ESA Report dated December 2025. The subsurface investigation identified elevated levels of chlorinated volatile organic compounds (CVOCs), including cis-1,2-dichloroethylene, tetrachloroethylene (PCE), trans-1,2-dichloroethene, and trichloroethylene (TCE), in groundwater; elevated CVOCs and petroleum volatile organic compounds (VOCs) in soil vapor; and elevated levels of metals (copper, lead, mercury, and zinc) in soil.

2.0 AIR MONITORING PROGRAM

The purpose of the air monitoring program is to identify any exposure of the field personnel and the community to potential environmental hazards in the soil and groundwater. Air Monitoring will be conducted in accordance with the New York State Department of Health (NYSDOH) and New York State Department of Environmental Conservation (NYSDEC) guidance. 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 field 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.

2.1 Work Zone Air Monitoring

2.1.1 Volatile Organic Compound (VOC) Monitoring

Continuous monitoring for VOCs will be conducted using roving hand-held equipment during all ground-intrusive activities, including soil boring advancement and groundwater monitoring well installation. 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 an 11.7 electron Volt (eV) lamp capable of calculating 15-minute running average concentrations. More frequent intervals of monitoring will be conducted if required as determined by the Site Safety Officer (SSO). All PID readings will be recorded and available for NYSDEC and NYSDOH personnel to review. Instantaneous readings will also be recorded.

2.1.2 Airborne Particulate Monitoring

A DustTrak® or equivalent would be used to measure real-time concentrations of total particulates 10 micrometers or less (PM10). Measurements for particulates will be taken prior to commencement of the work and during the work in areas where contaminated soil would be disturbed. The action levels listed in Table 1, below, are based on 15-minute averages of the monitoring data. The measurements will be made at the breathing height of the workers and as close to their location as practicable. The SSO will set up the equipment and confirm that it is working properly. His/her qualified designee may oversee the air measurements during the day. The initial measurement for the day will be performed before the start of work and will establish background levels. The final measurement for the day will be performed after the end of work. The action levels for particulates and VOCs, and required responses, are listed in Table 1.

Table 1
Work Zone Action Levels and Required Responses

Monitoring	Action Level[1]	Response Action
Particulate	Less than 0.125 mg/m^3 above background	**Level D or D-Modified** (Requires coveralls and steel toe boots) (As applicable: chemical resistant gloves, chemical resistant boot covers, hard hat, safety glasses, face shield, or escape mask)
	Between 0.125 mg/m^3 and 0.150 mg/m^3 above background	**Level C** (Requires full face or half face respirator, hooded chemical resistant two-piece Tyvek suit or overalls, chemical resistant inner and outer gloves, chemical resistant boot covers, steel toe and shank boots) (As applicable: hard hat, face shield, or escape mask) Apply dust suppression measures. Resume work or upgrade.
	Greater than 0.150 mg/m^3 above background	Stop work. Apply additional dust suppression measures. Resume work when less than 0.150 mg/m^3 and maintain Level C.
Volatile Organic Compound (VOC)	Less than 5 ppm in breathing zone	**Level D or D-Modified**
	Between 5 and 50 ppm	**Level C**
	More than 50 ppm	Stop work. Resume work when source of vapors is abated and readings are less than 50 ppm above background.

Notes:
[1] - 15-minute time-weighted average
ppm = parts per million
mg/m^3 = milligrams per cubic meter

2.2 Perimeter Community Air Monitoring

Fixed air monitoring stations will be set up at the upwind and downwind perimeters of the exclusion zone during all ground intrusive activities and will continuously log VOC and particulate levels. Each fixed monitoring station will be fully enclosed and equipped with the following:

- A PID equipped with an 11.7 eV lamp capable of calculating 15-minute running average VOC concentrations;
- A TSI 8530 DustTrak II or equivalent dust monitor capable of measuring the concentration of airborne respirable particulates less than 10 micrometers in size (PM10) and calculating 15-minute running average particulate concentrations; and
- A Netronix™ Thiamus™ ICU-820 or equivalent Global System for Mobile Communication (GSM)/Global Positioning System (GPS) device capable of recording air monitoring and location data.

Each monitoring station will be capable of sending e-mail alerts to the SSO to indicate an exceedance of action levels. Additionally, the SSO will conduct an inspection of the monitoring stations on at least an hourly basis. Upon completion of Site activities, all air monitoring data will be available to download via the iEnvironet® website. All air monitoring data recorded at the fixed monitoring stations will be available for NYSDOH and NYSDEC review and will be included in the RIR.

2.2.1 Perimeter Community Air Monitoring Action Levels

VOC Action Levels

The following actions will be taken based on organic vapor levels measured:

- If total organic vapor levels exceed 5 parts per million (ppm) above background for the 15-minute average at the exclusion zone perimeter, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the exclusion zone persist at levels in excess of 5 ppm above background, but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less (but in no case less than 20 feet), is below 5 ppm above background for the 15-minute average.

If the total organic vapor level is above 25 ppm at the perimeter of the exclusion zone, activities will be shutdown.

Particulate Action Levels

The following actions will be taken based on particulate levels measured:

- If the downwind particulate concentrations are greater than 0.1 milligrams per cubic meter (mg/m^3) above background (upwind concentrations), and no other obvious source is apparent, then it will be assumed that the elevated particulate concentrations are a result of Site activities. In such instances, dust suppression measures will be implemented and monitoring will be continued. Work will be allowed to continue with dust suppression if downwind particulate levels do not exceed 0.15 mg/m^3 above the background (upwind concentration) and provided that no visible dust is migrating from the work area.
- If particulate levels persist at 0.15 mg/m^3 above the background, work must be stopped until dust suppression measures bring particulate levels to below 0.15 mg/m^3 above background.

2.3 Major Vapor Emission Response Plan

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work site, or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted or vapor controls must be implemented.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the exclusion zone, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If either of the following criteria is exceeded in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be implemented:

- Sustained organic vapor levels approaching 1 ppm above background for a period of more than 30 minutes; or
- Organic vapor levels greater than 5 ppm above background for any time period.

Upon activation, the following activities shall be undertaken as part of the Major Vapor Emission Response Plan:

- NYSDEC, NYSDOH, and the local police authorities will be immediately contacted by the SSO and advised of the situation;
- Frequent air monitoring will be conducted at 30-minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Site Safety Officer (SSO); and
- All Emergency Contacts will go into effect, as appropriate.

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

2.4 Reporting

CAMP summary reports will be prepared and submitted to NYSDEC and NYSDOH for review as part of the daily reports. In the event that 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 RIR.

APPENDIX D
PREVIOUS ENVIRONMENTAL REPORTS