

975 NOSTRAND AVENUE

BROOKLYN, NEW YORK

Draft Interim Remedial Measure Work Plan

BCP Site Number: TBD
AKRF Project Number: 210225

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CERTIFICATIONS

I, Rebecca Kinal, certify that I am currently a NYS registered Professional Engineer and that this Interim Remedial Measure (IRM) 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).

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

Rebecca Kinal	DRAFT	DRAFT
NYS Professional Engineer #	Date	Signature

PE Stamp

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

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1.0 INTRODUCTION

This Interim Remedial Measure (IRM) Work Plan (IRMWP) has been prepared by AKRF, Inc. (AKRF) on behalf of Nostrand Green LLC (the “Volunteer”) for the irregularly-shaped 1.369-acre project site located at 975 Nostrand Avenue in Brooklyn, New York (the “Site”). The Site, also identified as Tax Block 1309, Lot 6, is designated for redevelopment with a new mixed-use residential and commercial building with cellar. The Site location is shown on Figure 1 and a Site Plan is provided as Figure 2.

The purpose of this IRMWP is to conduct tasks necessary to facilitate investigation and remediation of contamination of the Site in the area of the existing structure and asphalt-paved parking lot. The remedial actions to be conducted under this IRMWP include demolition of the existing Site structure in order to complete the testing detailed in AKRF’s August 2021 draft Remedial Investigation Work Plan (RIWP), and installation of Support of Excavation (SOE) and hot-spot removal of contaminated soil prior to site redevelopment. This IRMWP is based upon the findings presented in previous investigations described below (discussed in more detail in Section 3.0), and will be implemented in accordance with the Site Specific Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) provided in Appendix A.

Following demolition of the building but prior to any soil excavation/hot-spot removal outlined in this IRMWP, the proposed Remedial Investigation (RI), including a qualitative exposure assessment, will be conducted upon NYSDEC approval of AKRF’s RIWP. Estimated quantities of soil excavated for hot-spot remediation as part of the IRM would be updated upon receipt of the results of the RI. The findings of the RI will also be used to prepare a Remedial Action Work Plan (RAWP).

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description and Surrounding Land Use

The Site consists of an irregularly-shaped 1.369-acre parcel with a vacant one-story commercial use building (formerly used as a supermarket) on the northern portion of the Site with the remainder being an asphalt-paved surface parking lot. The building was constructed sometime between 1965 and 1970.

The Site is in a mixed-use commercial and residential neighborhood with some institutional uses including a public school and a church. The Site is bounded to the north by a vacant lot; to the east by Clove Road, followed by multi-family residential buildings; to the south by mixed residential and commercial uses; and to the west by Nostrand Avenue followed by mixed residential and commercial uses and Sullivan Place. A Site Location Map is provided as Figure 1.

2.2 Proposed Redevelopment Plan

The proposed remediation and redevelopment project includes demolition of the existing building and construction of a mixed-use residential and commercial building with cellar. Demolition of the existing building would be required to fully characterize subsurface conditions at the Site, and installation of SOE along the entire Site perimeter would be required to achieve either a Track 1 or a Track 2 Cleanup.

2.3 Site Geology, Hydrogeology and Subsurface Characteristics

The surface topography generally slopes towards the south. Based on the U.S. Geological Survey Brooklyn, New York quadrangle map, the Property is approximately 85 feet above the National Geodetic Vertical Datum of 1988 (an approximation of sea level).

Soil encountered during the previous December 2020 Phase II Environmental Site Assessment and August 2021 Limited Subsurface (Phase II) Investigations consisted of historic fill (sand with silt, concrete, asphalt, brick, gravel, ash, and glass) to a depth of approximately 15 feet below grade (maximum boring depth). Groundwater was not encountered during these investigations. Based on USGS mapping, groundwater is estimated to be approximately 70 feet below grade and flow in a southerly to southwesterly direction toward Prospect Park Lake. However, actual groundwater flow can be affected by many factors including underground utilities, underground subway tunnels, bedrock, and other factors beyond the scope of this study. There are no surface water bodies or streams at or adjacent to the Site.

2.4 Nearby Areas of Public Concern

The uses immediately surrounding the Site are predominantly residential and commercial, with some institutional uses. The proposed future use of the Site is residential with below-grade parking and ground floor retail and commercial uses.

On-Site Receptors: As the Site is currently unoccupied, the only current on-site potential receptors are trespassers. During redevelopment (including the IRM activities), potential receptors will include construction workers and inspectors. Once the Site is redeveloped, potential receptors will include residents, maintenance staff, and workers/customers associated with the future commercial uses.

Off-Site Receptors: Potential off-site receptors within a 0.25-mile radius of the Site include: residents, commercial and construction workers, students, pedestrians, and cyclists, based on the following:

1. Commercial Businesses – existing and future
2. Residential Buildings – existing and future
3. Building Construction/Renovation – existing and future
4. Pedestrians, Cyclists – existing and future
5. Schools – existing and future
6. Daycare Facilities – existing and future

2.5 Site History

Based on a review of historical Sanborn maps and City Directories, the Site was developed with a trucking company as early as 1908. At that time, a portion of an unspecified road intersected the eastern portion of the Property in a north-south direction. Prior to the construction of the current supermarket building, the Site was occupied by various uses including stores, a parking garage, a printing facility, upholstery facility, a carpenter, an auto repair shop, a printing press, hand laundry facility, an exterminator, and an auto school.

3.0 PREVIOUS INVESTIGATIONS

Various environmental studies have been completed for the Site to date. A Site plan showing previous sampling/testing locations is provided as Figure 2. Previous investigations are summarized below:

Phase I Environmental Site Assessment – 975 Nostrand Avenue, Brooklyn, NY, EBI Consulting, November 2020

EBI Consulting performed a Phase I ESA for the Site in November 2020 and the following Recognized Environmental Conditions (RECs) were identified:

- Based upon a review of historical resources, prior to construction of the existing commercial structure in the early 1970s, the Site was developed with a single-story structure situated on the western half of the Site. This building was constructed in 1925, and was originally configured with small stores/commercial units fronting Nostrand Avenue, and a parking garage for 150 cars at the rear of the building. Fire insurance maps, dated 1932 and 1951, depicted two buried gasoline tanks located within a small courtyard area at the west central portion of the building. It is presumed that the gasoline tanks were utilized for fueling operations associated with the parking garage. By the 1960s, the parking garage was occupied by a wholesale textiles warehouse, and the gasoline tanks were no longer depicted on the fire insurance maps. No documentation regarding closure of the former underground storage tank (UST) system, or documentation regarding previous soil and/or groundwater investigation at this location, was identified during this assessment. This portion of the Site currently consists of paved surface parking. Based upon the absence of closure documentation, the potential exists that the USTs remain in the ground and have impacted subsurface conditions.
- Review of historical resources also indicated that the area to the east of the former retail/garage building consisted of a paved parking area until around the 1960s, at which time a single-story auto repair facility was constructed. This auto repair facility was located on the central portion of the Site.
- Based upon review of historical fire insurance maps and New York City Department of Buildings records, the Site includes a range of municipal addresses, specifically 969 to 983 Nostrand Avenue. Review of historical street directories for the full address range identified the following potentially environmentally concerning tenants:
 - 1934 - Windsor Printers (977 Nostrand Avenue), Schmidt WM & Melham Printers (981 Nostrand Avenue), Cut Rate Hand Laundry (983 Nostrand Avenue)
 - 1940 - Garfinkel I Cleaner and Dyer (979 Nostrand Avenue)
 - 1945 - Liberty Hand Laundry (975 Nostrand Avenue), Windsor Printers (977 Nostrand Avenue), Garfinkel I Cleaner and Dyer (979 Nostrand Avenue)
 - 1949 - Liberty Hand Laundry (975 Nostrand Avenue), Garfinkel I Cleaner and Dyer (979 Nostrand Avenue)
 - 1960 and 1965 - Liberty Hand Laundry (975 Nostrand Avenue).

Based upon the time periods, it is likely that these former tenants occupied retail units within the western portion of the former retail/garage structure. The exact operations of these former tenants are unknown. Based on the nature of these businesses (i.e., auto repair facility, printers, cleaners and dyers, and laundry facilities), these former tenants may have handled, generated, stored, and/or disposed of hazardous substances and/or petroleum products as a part of daily operations. The portions of the Site where the former retail units and auto repair

facility were located currently consist of paved surface parking. Although these historical uses predate construction of the existing commercial building in the early 1970s, the potential for the operations of these former tenants to have impacted subsurface conditions at the Site cannot be ruled out.

In addition, the following consideration outside the scope of ASTM Practice E 1527-13 was identified in connection with the Site:

- A limited visual screening survey for the presence of asbestos-containing materials (ACM) at the Site was conducted. Friable suspect ACM in the form of sheetrock/joint compound composite material and 2'x4' white perforated acoustical ceiling tile and non-friable suspect ACM in the form of vinyl floor tile and associated mastic, various construction mastics and caulking and roofing materials was identified. These materials were observed to be undamaged and in good condition at the time of assessment. Please note that this survey was limited to visual observations of accessible areas and that the scope of work for this assessment did not include the collection and laboratory analysis of bulk samples of suspect ACM. Additional suspect ACM may be present in inaccessible areas, including, but not limited to, roofs, pipe chases behind solid walls and ceilings, concealed floor coverings, the interior of machinery or equipment, or water and sewer systems. Suspect ACM do not present a problem when maintained in good condition. However, additional sampling, removal, and disposal arrangements may be necessary should building construction or renovation activities be conducted.

The Phase I report made the following recommendations:

- A limited subsurface investigation should be conducted at the Site to evaluate potential environmental impacts from the USTs depicted on historical fire insurance maps on the west-central portion of the Property, and the historical occupants (i.e., auto repair facility, printers, cleaners and dyers, and laundry facilities) formerly located on the Site; and
- The development and implementation of an Asbestos Operations and Maintenance (O&M) Plan for the Site. This O&M Plan provides the procedures and guidelines that, when used during facility cleaning, maintenance, and general operations, will minimize human exposure to asbestos fibers and minimize release of asbestos fibers to the environment. This O&M Plan is a long-term management approach; and
- A comprehensive asbestos inspection be conducted prior to significant renovation or demolition of the building.

Phase II Environmental Site Assessment – 975 Nostrand Avenue, Brooklyn, NY, EBI Consulting, December 2020

Based on the results of the November 2020 Phase I ESA, EBI Consulting conducted a Phase II ESA at the Site in December 2020. The Phase II included the advancement of 9 soil borings with the collection of 15 soil samples and the installation of 6 soil vapor sampling points with the collection of 6 soil vapor samples. Soil samples were slated for laboratory analysis of volatile organic compounds (VOCs) by EPA Method 8260, polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270, and lead by EPA Method 6010. Soil vapor samples were analyzed for VOCs by EPA Method TO-15. The results of the investigations indicated the following:

- The soil analytical results detected concentrations of VOCs, PAHs and lead above laboratory detection limits in the soil samples, with some concentrations above the NYSDEC Restricted Residential Soil Cleanup Objectives (RRSCOs).

- The soil vapor analytical results detected low level concentrations of VOCs above the laboratory detection limits in the soil vapor samples.

EBI Consulting concluded that the soil at the Site was impacted with low concentrations of VOCs, PAHs and lead above laboratory method detection limits that appear characteristic of the presence of historic and urban fill material.

Phase I Environmental Site Assessment, 975 Nostrand Avenue, Brooklyn, New York, AKRF, Inc., July 2021

A Phase I ESA was completed for the Site by AKRF in July 2021 in general accordance with the ASTM Standard E1527-13, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Practice. The following evidence of on-site RECs were identified:

- Historical Sanborn maps indicated that the Site contained two gasoline tanks in the western portion of the Site, along Nostrand Avenue, between 1932 and 1951. The Site was not registered in the New York State Department of Environmental Conservation (NYSDEC) Petroleum Bulk Storage (PBS) database and no evidence of vent pipes or fill ports were observed during the reconnaissance. The tanks may not have been removed during demolition of the former buildings and may still be present beneath the Site.
- Historic Sanborn maps and City Directories indicated that the Site was occupied by a printing facility between 1932 and 1951, and an auto repair shop between 1963 and 1965. Such uses may have affected the subsurface conditions beneath the Site.
- The Site building contained one hydraulic freight elevator and two hydraulic trash and cardboard compactors. Suspect historic staining was observed in the elevator machine room and around the compactors. It is unknown whether the hydraulic fluid contains polychlorinated biphenyls (PCBs). The sump within the elevator machine room is reportedly connected to the municipal sewer system.
- Sanborn maps and City Directories identified proximal automotive, industrial, and dry cleaning uses between 1908 and 2007, including: a brass foundry, a sheet metal works, an auto greasing facility, a machine shop, filling stations, a furniture manufacturer, a printing facility, auto repair shops, and a car wash. Some of these uses were also identified in the EDR Historic Auto Station, NY SPILLS, Resource Conservation and Recovery Act (RCRA), Petroleum Bulk Storage (PBS), and Registered/Historic Dry Cleaner databases, with documented impacts to subsurface soil.

The following considerations outside the scope of ASTM Practice E 1527-13 were also identified.

- Based on the age of the Site building, ACM, PCBs and/or lead-based paint (LBP) could be present within building components.
- Given the ages of former structures on the Site, potential fill material and/or demolition debris beneath the Property could contain suspect ACM, polychlorinated biphenyls (PCBs) and/or LBP. Fill material is of unknown origin.

Limited Subsurface Investigation Letter Report, 975 Nostrand Avenue, Brooklyn, New York, AKRF, Inc., August 2021

AKRF conducted a Limited Subsurface Investigation (SI) which included the advancement of eight soil borings on a portion (parking lot) of the Site with the collection and laboratory analysis of 24 soil samples to evaluate soil quality. Soil beneath the Site consisted of fill material (sand,

gravel, silt, concrete, brick, ash, glass, asphalt) to 15 feet below grade (boring termination). Groundwater was not encountered during the investigation.

The laboratory results identified concentrations of VOCs, SVOCs, pesticides, and metals above Unrestricted Use Soil Cleanup Objectives (UUSCOs) and/or Restricted Residential Soil Cleanup Objectives (RRSCOs).

4.0 INTERIM REMEDIAL MEASURES

The proposed IRM includes 1) demolition of the existing Site structure to facilitate the RI and ultimately remediate the Site in the areas of the existing structure and asphalt-paved parking lot, and 2) installation of SOE and hot-spot removal of contaminated soil prior to redevelopment. Removal of the building will be required to complete the proposed RI and to achieve a Track 1 or a Track 2 cleanup standard. Excavation will also include the removal of any petroleum storage tanks, fill ports, vent lines, etc. should they be encountered. Prior to any excavation and off-site disposal activities, soil will be characterized as described in Section 4.6 and a comprehensive RI will be conducted in accordance with a NYSDEC-approved RIWP.

This section outlines the scope of work and procedures for monitoring, Site controls, and handling and disposal of contaminated materials during the implementation of the IRM.

4.1 Site Preparation

The Site construction fence will be installed and all necessary permits pertaining to excavation will be procured prior to starting work. Site mobilization involving utility markouts will be performed prior to undertaking any excavation. The Volunteer and its contractors will be solely responsible for the identification of utilities that might be affected by excavation work and implementation of all required, appropriate, or necessary health and safety measures.

4.2 Demolition of Existing Buildings

Demolition of the existing building is required to conduct the RI and make contaminated soil accessible for removal. Construction and demolition (C&D) debris generated during demolition will be transported as an NYSDEC Part 360 solid waste to a municipal, state, or federal permitted processing, disposal, or recycling facility.

A department of building (DOB) demolition permit will be obtained prior to commencement of the demolition work. ACM inspection and abatement will be conducted (as applicable) in accordance with applicable regulations and guidelines. Demolition operations will be conducted in compliance with the NYC Building Code, the NYC Fire Code, and applicable Occupational Safety and Health (OSHA) regulations.

4.3 Soil Removal

A Site plan depicting the proposed hot-spot excavation areas is provided as Figure 3. In order to achieve the remedial action goal of either a Track 1 or a Track 2 Cleanup, approximately 4,800 tons of soil/fill is anticipated to be removed from these hot-spot areas and disposed of at facilities licensed to accept such material. Upon completion of the RI, any additional identified hot-spot areas and the approximate extent of remedial soil excavation (and associated soil volume/quantities) will be reflected in an IRMWP Addendum or the Remedial Action Work Plan (RAWP). Based on the history of the Site and the fact that historic fill was observed to at least 15 feet below grade during subsurface soil investigations, it is likely that contamination above the cleanup standards will be identified Site-wide.

The removal of materials from the Site will include: (1) excavation and off-site disposal of soil; (2) removal of any storage tanks, fill ports, and vent lines encountered; and (3) removal of any subsurface construction and demolition (C&D) debris. The final volume of soil excavated as part of the interim remedial action will be provided in a IRM Construction Completion Report (CCR) or in the Final Engineering Report (FER). An RI will be completed at the Site in accordance with the NYSDEC-approved RIWP prior to start of any Site excavation and implementation of this work plan.

During the removal process, excavated material will be inspected by AKRF field personnel for any evidence of contamination (e.g., staining or odors) and field-screened using a PID, which screens for VOCs. A particulate meter will be used to measure levels of airborne dust and a CAMP will be implemented during all soil excavation activities.

4.4 Support of Excavation (SOE)

Support of excavation (SOE) will be installed as necessary to enable excavation of contaminated soil and to prevent compromising adjacent properties, structures, subway structures, and roadways. Additionally, underpinning of the existing south-adjacent building may be required prior to excavation and removal of contaminated soil. These activities will comply with applicable vibration monitoring requirements, and any local and state controlled inspections.

4.5 Fluids Management

Dewatering is not contemplated during the interim remedial action. However, and if required, all liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed of in accordance with applicable local, State, and Federal regulations. The dewatered fluids will be pumped to frac tanks for temporary storage, as needed, and disposed of at an approved facility off-site. As an alternate to the off-site transport of dewatered fluids, adequately treated fluids may be discharged to a sanitary sewer upon approval from New York City Department of Environmental Protection (NYCDEP). Dewatered fluids will not be recharged back to the land surface or subsurface of the Site without prior approval by NYCDEP. Dewatering and treatment (if required) will be conducted in accordance with applicable local, state and federal regulation, as necessary, to enable the remedial excavation activities.

4.6 Post-Excavation Endpoint Sampling

To confirm that remaining soil does not exceed the proposed cleanup standard, post-excavation endpoint samples will be collected following the removal of the hot-spots and any additional remedial excavation required based on the results of the forthcoming RI and associated RAWP. The sampling frequency would be in accordance with NYSDEC DER-10 Section 5.4 with endpoint samples collected at a rate of one per 900-square feet of excavation in the areas where the excavation does not extend to bedrock. The samples would be containerized in accordance with EPA analytical protocols and submitted to a NYSDOH ELAP-certified laboratory for analysis of VOCs by EPA Method 8260, SVOCs by EPA Method 8270, pesticides by EPA Method 8081, PCBs by EPA Method 8082, TAL Metals using EPA Method 6000/7000 series, 1,4-dioxane by EPA Method 8270, and the standard list of 21 per- and polyfluoroalkyl substances (PFAS) compounds by modified EPA Method 537. The laboratory will follow the NYSDEC Analytical Services Protocol dated 1995. The laboratory will compile and submit the data package using NYSDEC ASP Category B deliverables. Further details regarding the specific sampling methodology and analytical procedures are presented in the Quality Assurance Project Plan (QAPP), included as Appendix B.

In the event that a UST is encountered and removed, typically five endpoint samples consisting of four sidewalls and one bottom sample will be obtained following removal of the tank and any

associated petroleum-contaminated soil. The exact depths, locations and analytical parameters of any petroleum-related sampling will be coordinated with NYSDEC prior to initiating sampling, in accordance with NYSDEC DER-10.

4.7 Pre-Excavation Soil Characterization

Waste characterization samples will be collected prior to initiating excavation. Based on these sampling results, one or more appropriately permitted waste disposal facilities will be selected for off-site disposal. The disposal facility information, including locations, will be submitted to the NYSDEC Project Manager for approval and prior to commencing the disposal activities.

All soil/fill excavated and removed from the Site will be disposed of in accordance with all local, State (including 6NYCRR Part 360), and Federal regulations. If any native soil from this Site is proposed for unregulated disposal (not anticipated during IRM activities), a formal request with an associated plan will be submitted to the NYSDEC PM for approval. Material that does not meet Track 1 Unrestricted Use Soil Cleanup Objectives (UUSCOs) is prohibited from being taken to a New York State recycling facility.

The following documentation will be obtained and reported by the Qualified Environmental professional (QEP) [under supervision of the Remedial Engineer (RE)] for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws: (1) a letter from the QEP or his/her designee or BCP Volunteer to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter will state that material to be disposed of is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the QEP or his/her designee. The letter will include an attachment summarizing all chemical data for the material being transported (including Site Characterization data); and (2) a letter from each receiving facility stating that it is in receipt of the correspondence (noted above) and is approved to accept the material. These documents will be included in the Final Engineering Report (FER).

Non-hazardous historical fill and other non-native soil taken off-site will be handled, at minimum, as a Municipal Solid Waste.

Soil that exceeds UUSCOs and is non-native, but non-hazardous and is being removed from the Site is considered by the NYSDEC Division of Materials Management (DMM) to be Construction and Demolition (C&D) debris with contamination not typical of virgin soil. These types of soil may be sent to a permitted Part 360 landfill. Such material may be sent to a permitted C&D processing facility without permit modifications only upon prior notification of NYSDEC Region 3 DMM. This material is prohibited from being sent or redirected to a Part 360-16 Registration Facility. In this case, as dictated by the DMM, special procedures will include, at a minimum, a letter to the C&D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to on-site or off-site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the RE. The letter will include a summary of all chemical data for the material being transported as an attachment.

The IRM CCR (if applicable) and FER will include an accounting of the destination of all material removed from the Site during this IRM, including excavated soil, contaminated soil, historic fill, solid waste, and hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. This information will be presented in tabulated form in the IRM CCR/FER.

Bill of Lading system or equivalent will be used for off-site movement of non-hazardous wastes and contaminated soils. This information will be reported in the IRM CCR/FER. Hazardous wastes derived from on-site will be stored, transported, and disposed of in full compliance with applicable local, State, and Federal regulations.

Appropriately licensed haulers will be used for material removed from this Site and will be in full compliance with all applicable local, State, and Federal regulations.

Waste characterization will be performed for off-site disposal in a manner suitable to the receiving facility and in conformance with applicable permits. Sampling and analytical methods, sampling frequency, analytical results, and QA/QC will be reported in the IRM CCR/FER. All data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt.

4.8 Backfill from Off-Site Sources

Backfill import is not expected during the IRM. However, in the event clean backfill is required for Site grading, all materials proposed for import onto the Site will be approved by the RE and the NYSDEC Project Manager and will be in compliance with provisions in this IRMWP prior to receipt at the Site. Material proposed for import shall either be from a NYSDEC registered certified clean fill facility or other permitted facility. Any facility proposed for import shall undergo a facility history review and background check by the RE.

Material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

Prior to import, soil will be segregated and tested at the source facility for analysis of VOCs, SVOCs, PCBs, pesticides, TAL Metals, 1,4-dioxane, and the standard list of 21 per- and polyfluoroalkyl substances (PFAS) compounds at the frequency outlined in Table 5.4(e)10 in DER-10 on page 161 of the DER-10 Technical Guidance for Investigation and Remediation. The analytical results will be submitted to NYSDEC for review and approval prior to importation and placement on-site.

All imported soils will meet NYSDEC approved backfill or cover soil quality objectives for this Site. Non-compliant soils will not be imported onto the Site without prior approval by NYSDEC. Nothing in this approved IRMWP or its approval by NYSDEC should be construed as an approval for this purpose.

The IRM CCR and/or FER will include the following certification by the RE: "I certify that all import of soils from off-site, including source evaluation, approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan."

Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Nothing in this IRMWP should be construed as an approval for this purpose. Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers.

4.9 Temporary Staging Procedures

The pre-excavation characterization results will be used to attain acceptance by a soil disposal facility prior to initiating soil removal. Direct loading of soil onto haul trucks will be performed to the extent feasible. If Site conditions require temporarily staging of soil prior to removal from the Site, stockpiled soil will be managed in accordance with appropriate guidelines. Stockpiled

soil will be placed on and covered with polyethylene sheeting and secured with large rocks or other appropriate weights to protect against leaching or runoff of contaminants into groundwater or stormwater. Stockpiles will be managed to minimize dust generation, run-off and erosion, using water, plastic covers, silt fences, and/or hay bales, as necessary. A dedicated water hose connected to a fire hydrant will be available on-site for dust control.

If separate piles are needed to address different disposal requirements (hazardous or non-hazardous), each pile will be separated by a sufficient distance to ensure that mixing of dissimilar or potentially dissimilar materials does not occur. The location and classification of each staging area will be tracked on Site drawings and updated, as necessary, at the end of each workday. Copies of Site drawings will be kept in the field logbook.

As applicable, manifest forms and shipment manifest records will be completed as required by the appropriate regulatory agencies for verifying the material and quantity of each load in unit of volume and weight.

4.10 Transportation

Transportation of material leaving the Site for off-site disposal will be in accordance with Federal, State, and local requirements (including 6 NYCRR Part 364 and U.S. DOT regulations) covering licensing of haulers and trucks, placarding, truck routes, manifesting, etc. The schedule for truck arrival will be coordinated to meet the approved project schedule. The schedule will be compatible with the availability of equipment and personnel for material handling operations at the job site.

All vehicles leaving the project Site will be inspected to ensure that contaminated soil adhering to the wheels or under carriage are removed prior to the vehicle leaving the Site. Any situations involving material spilled in transit or mud and dust tracked off-site will be remedied. The access routes will be inspected for road conditions, overhead clearance, and weight restrictions.

Contaminated materials from other projects will not be combined with material from the construction area. The transporter will not deliver waste to any facility other than the disposal facility(s) listed on the shipping manifest.

4.11 Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit using trap rock. A filter fabric will be placed prior to the installation of the trap rock. Before exiting the Site, trucks will be required to stop at the truck inspection station to be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed from vehicles and equipment using brooms, shovels and clean water, as necessary, and the material will be shipped off-site with the Site soil during the remedial work.

4.12 Site Control Measures

The potential off-site transport of sediment, dust and organic vapors potentially generated during soil excavation activities will be controlled by: covering soil stockpiles and/or open excavations with 6-mil polyethylene sheeting; backfilling open excavations with uncontaminated fill material; decontaminating equipment used for soil excavation/sampling; providing drainage inlet protection for catch basins; and/or the use of odor-controlling spray foam, as warranted. These measures will be installed according to the requirements of all applicable or relevant and appropriate Federal, State and local laws.

4.13 Air Monitoring

Work zone and community air monitoring and will be conducted during all work identified in this IRM Work Plan. The protocol for implementing the work zone and community air monitoring will be completed in accordance with the site-specific HASP and CAMP, provided in Appendix A.

4.14 Quality Assurance/Quality Control

Measures will be taken to provide for Quality Assurance (QA) and maintain Quality Control (QC) of environmental sampling and remedial activities conducted under the IRM Work Plan. A QAPP that describes the QA/QC protocols and procedures that will be followed during implementation of the IRM is included in Appendix B. Adherence to the QAPP will ensure that defensible data will be obtained during the implementation of the IRM.

4.15 Surveying

The limits of the remedial excavation will be surveyed by a New York State-licensed surveyor and incorporated into the Site plan.

5.0 POST REMEDIATION REPORTING

Upon completion of the interim remedial measures, either an IRM Construction Completion Report will be prepared for inclusion in the FER or the information will be included in the FER, and submitted to NYSDEC and NYSDOH. The IRM Report and/or FER will include:

- Photographs of Site excavation and SOE installation;
- Air monitoring results and corrective actions taken (if required);
- Post-excavation endpoint sampling results collected during implementation of the interim remedial measures;
- Tabulated quantities of all material removed from the Site and associated manifests/bills of lading and certificates of disposal from the receiving facilities;
- Any tank removal or spill remediation (if appropriate) documentation; and
- Documentation of source approval and sampling for any imported backfill material.

6.0 SCHEDULE OF WORK

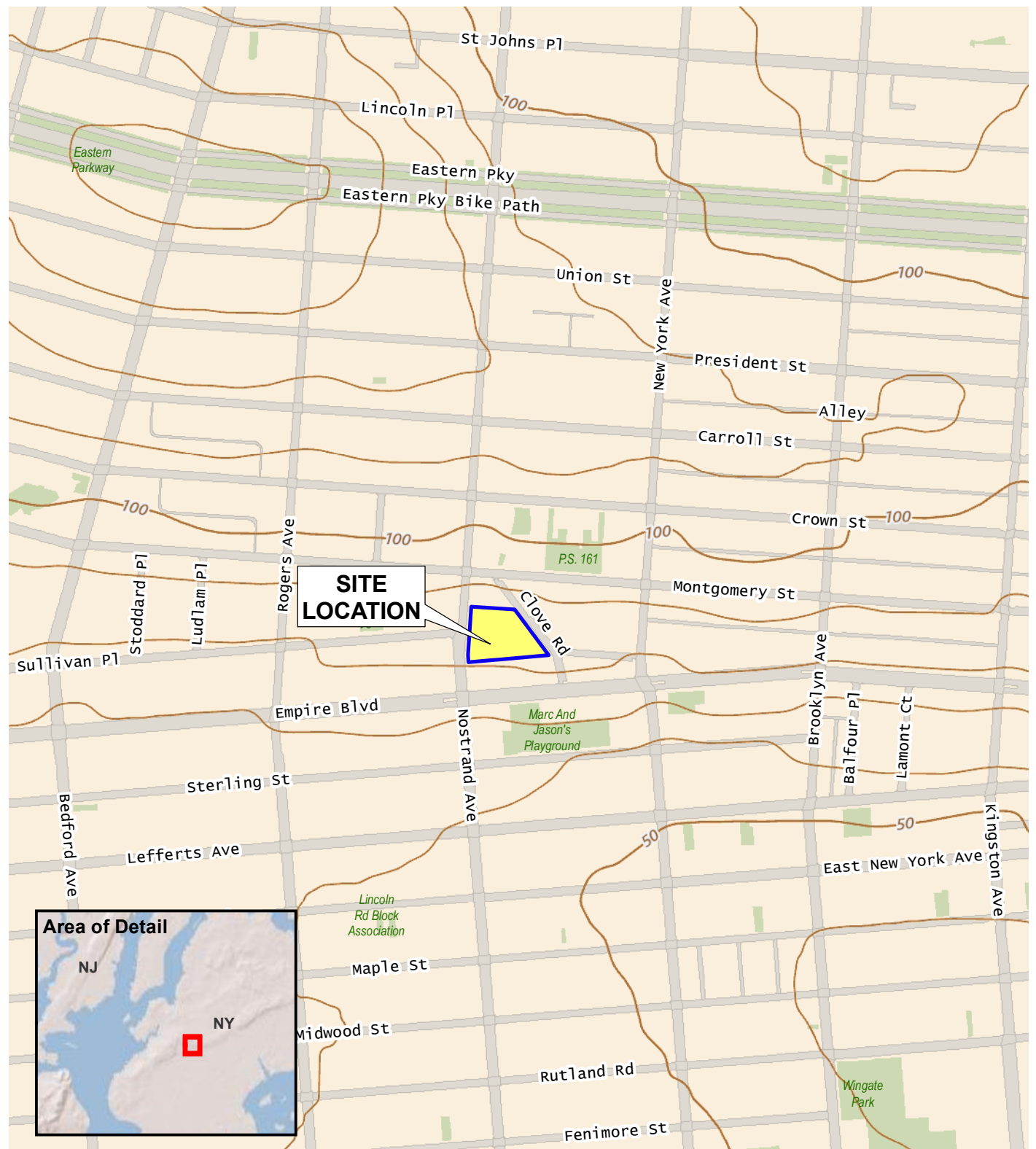
The following tentative schedule has been developed for the project. The schedule would be subject to change to ensure that the data needs of the IRMWP, RAWP, etc. are met to the satisfaction of the NYSDEC.

Remedial Schedule

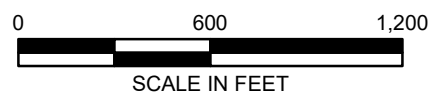
Activity	Time To Complete
BCP application, draft RIWP, and draft IRMWP submitted to NYSDEC.	September 2021
NYSDEC completeness check of BCP application and determination that application is complete/incomplete.	September/October 2021
NYSDEC Issues BCP Application Letter of Completeness	October 2021
30-day Public Comment Period Initiated (Environmental News Bulletin, Newspaper)	October 2021
Execute BCP Agreement (BCA)	November 2021
Citizen Participation Plan (CPP) Submitted to NYSDEC	November 2021
Receive NYSDEC comments to draft RIWP and draft IRMWP.	December 2021/January 2022
Submit revised RIWP and IRMWP, and NYSDEC approves both documents.	January/February 2022
Conduct Remedial Investigation (RI) in the exterior areas	February 2022
Building demolition	February-March 2022
Conduct Remedial Investigation (RI) within the former building footprint area	April 2022
Prepare and submit draft Remedial Investigation Report and the draft Remedial Action Work Plan (RAWP)	April 2022
45-day Public Comment Period (Environmental News Bulletin, Newspaper)	May 2022
Receive comments on Draft RAWP and RIR.	May 2022
Start installation of Support of Excavation (SOE) and removal of contaminated hot-spots under the NYSDEC-approved IRMWP, and collect soil waste characterization samples	May/June 2022
Submit revised RIR and RAWP, and NYSDEC approves both documents, and issues Decision Document (DD)	July 2022
Issue Remedial/Construction Notice Fact Sheet	July 2022
Begin Redevelopment (Construction) with Implementation of RAWP	July 2022
Submittal of Environmental Easement Package	By July 1, 2023
Draft Site Management Plan (SMP) Submitted to NYSDEC	By September 1, 2023
Draft Final Engineering Report (FER) and Fact Sheet	By October 1, 2023
NYSDEC and NYSDOH Approval of FER and SMP	By November 30, 2023
Issue Certificate of Completion (COC)	December 2023

FIGURES

© 2021 AKRF W:\Projects\210225 - 975 Nostrand Avenue\Technical\GIS and Graphics\210225 Figure 1 Site Location map.mxd 8/18/2021 9:53:05 AM jszalus



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



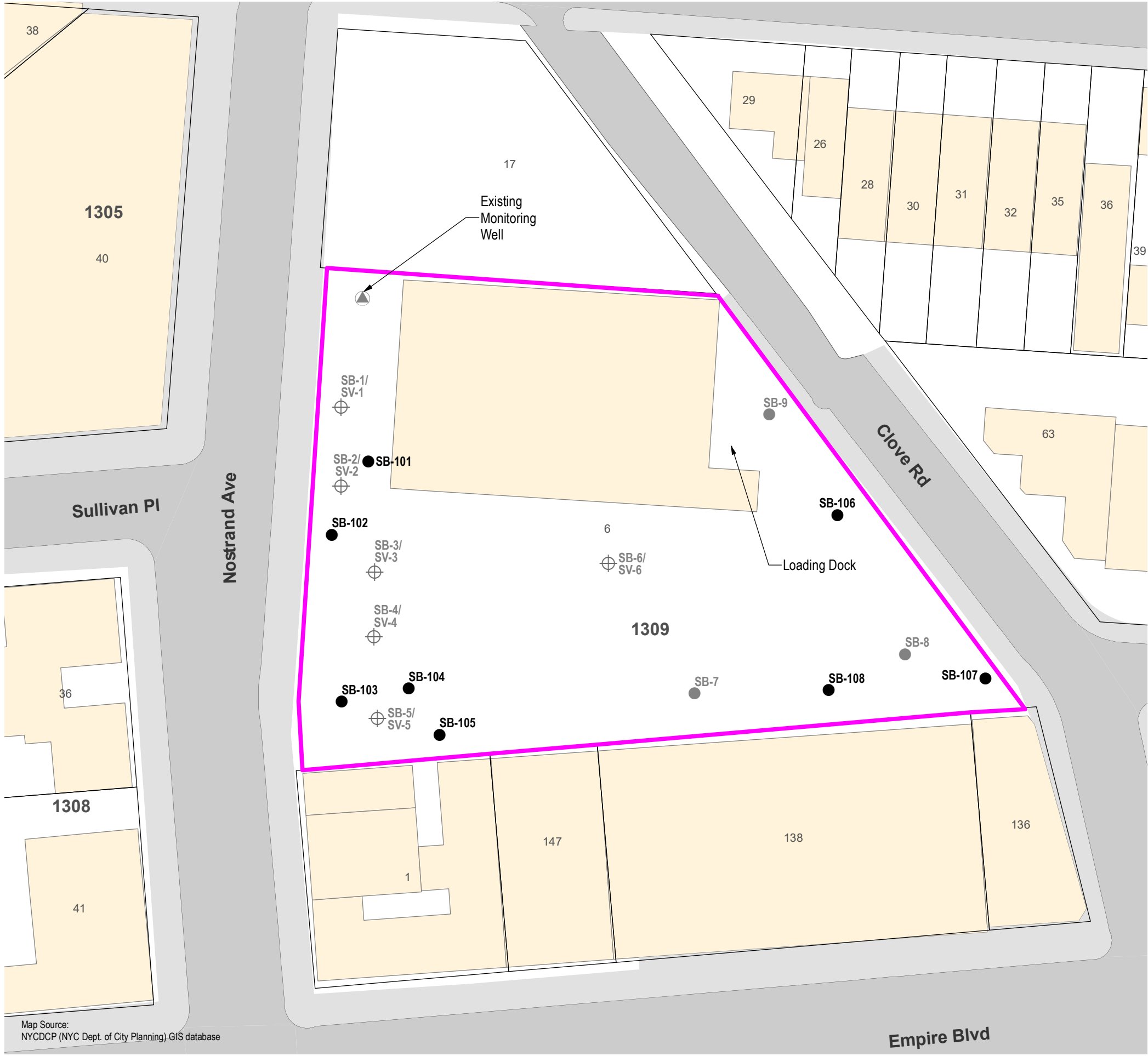
440 Park Avenue South, New York, NY 10016

975 Nostrand Avenue
Brooklyn, New York

SITE LOCATION

DATE	8/18/2021
PROJECT NO.	210225
FIGURE	1

© 2021 AKRF W:\Projects\210225 - 975 NOSTRAND AVENUE\Technical\GIS and Graphics\SAR\limited ph 11210225 Figure 2 Site Plan and Sample locations.mxd8/18/2021 10:01:28 AM iszalus



LEGEND

- PROJECT SITE BOUNDARY
- LOT BOUNDARY AND TAX LOT NUMBER
- 1309 BLOCK NUMBER
- BUILDING
- PREVIOUS SOIL BORING (EBI CONSULTING, 2020)
- PREVIOUS SOIL BORING/SOIL VAPOR POINT (EBI CONSULTING, 2020)
- EXISTING MONITORING WELL
- SOIL BORING LOCATION (AKRF, 2021)

0 25 50 100



SCALE IN FEET



975 Nostrand Avenue
Brooklyn, New York



440 Park Avenue South, New York, NY 10016

SITE PLAN AND SAMPLING LOCATIONS

DATE

8/18/2021

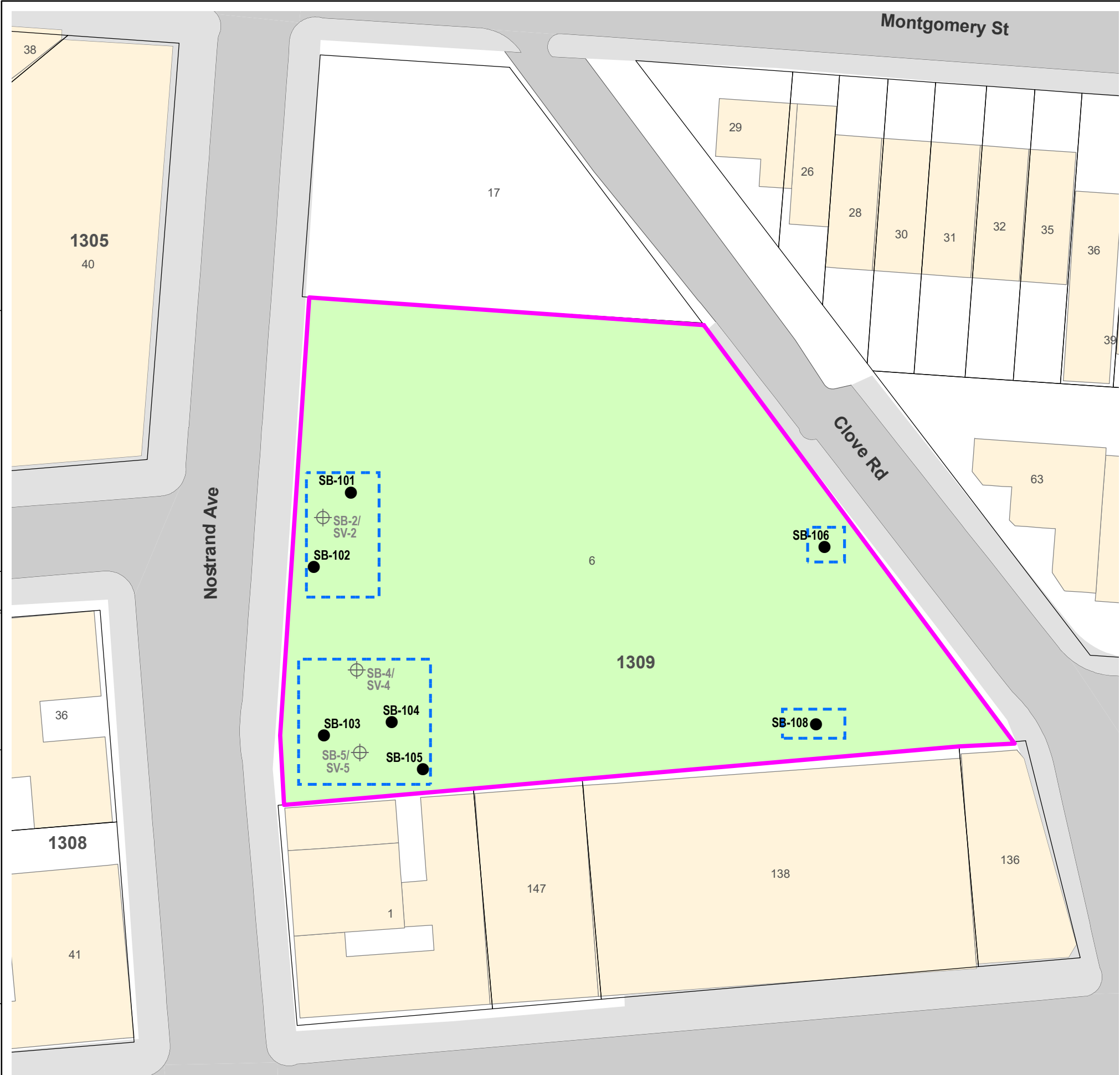
PROJECT NO.

210225

FIGURE

2

© 2021 AKRF W:\Projects\210225 - 975 NOSTRAND AVENUE\Technical\GIS and Graphics\SAR\BCP RMWP\210225 Figure 3 Proposed Remedial Site Excavation Plan.mxd 8/18/2021 2:33:03 PM isalus




LEGEND

- PROJECT SITE BOUNDARY
- LOT BOUNDARY AND TAX LOT NUMBER
- 1309** BLOCK NUMBER
- BUILDING
- PREVIOUS SOIL BORING/SOIL VAPOR POINT (EBI CONSULTING, 2020)
- SOIL BORING LOCATION (AKRF, 2021)
- PROPOSED EXTENT OF TRACK 1 OR TRACK 2 CLEANUP
- PROPOSED HOT-SPOT EXCAVATION RANGING FROM 3 TO 15 FEET BELOW GRADE



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



 440 Park Avenue South, New York, NY 10016	
975 Nostrand Avenue Brooklyn, New York	PROPOSED REMEDIAL SITE EXCAVATION PLAN
DATE 8/18/2021	
PROJECT NO. 210225	
FIGURE 3	

APPENDIX A
HEALTH AND SAFETY PLAN & COMMUNITY AIR MONITORING PLAN

975 NOSTRAND AVENUE

BROOKLYN, NEW YORK

Health and Safety Plan and Community Air Monitoring Plan

**BCP Site Number: TBD
AKRF Project Number: 210225**

Prepared for:

Nostrand Green LLC
826 Broadway, 11th Floor
New York, NY 10003

Prepared by:



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

AUGUST 2021

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FIGURE

Figure 1 – Hospital Route Map

ATTACHMENTS

Attachment A – Potential Health Effects from On-Site Contaminants
Attachment B – Report Forms
Attachment C – Emergency Hand Signals
Attachment D – Special Requirements for COVID-19

1.0 INTRODUCTION

This Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) were prepared by AKRF, Inc. (AKRF) on behalf of Nostrand Green LLC (the “Volunteer”) for the 1.369-acre site located at 975 Nostrand Avenue in Brooklyn, NY (the “Site”). The Site is also identified as Tax Block 1309, Lot 6. The Site is located in a mixed-use commercial and residential neighborhood with some institutional uses including a public school and a church. The Site is bounded to the north by a vacant lot; to the east by Clove Road, followed by multi-family residential buildings; to the south by mixed residential and commercial uses; and to the west by Nostrand Avenue followed by mixed residential and commercial uses and Sullivan Place. This Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) has been designed to provide workplace safety while completing the field requirements of the IRMWP. The work is being done in support of the Site’s enrollment into the New York State Department of Environmental Conservation’s (NYSDEC’s) Brownfield Cleanup Program (BCP).

Based on a review of historical Sanborn maps and City Directories, the Site was developed with a trucking company as early as 1908. At that time, a portion of an unspecified road intersected the eastern portion of the Property in a north-south direction. Prior to the construction of the current building, the Site was occupied by various uses including stores, a parking garage, a printing facility, upholstery facility, a carpenter, an auto repair shop, a printing press, hand laundry facility, an exterminator, and an auto school.

Based on an evaluation of the data and information from investigations conducted at the Site to date, soil at the Site contains elevated levels of metals, semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), and pesticides. No field evidence of petroleum contamination was noted in the soil borings.

This HASP and CAMP 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 the AKRF's Generic HASP and all Occupation Safety and Health Administration (OSHA)-applicable regulations for the work activities required for the project. This HASP also includes supplemental requirements to minimize potential exposure related to COVID-19 (see Attachment D). All project personnel are furthermore directed that they are not permitted to enter Permit Required Confined Spaces (as defined by OSHA). For issues unrelated to contaminated materials, all non-AKRF employees are to be bound by all applicable OSHA regulations as well as any more stringent requirements specified by their employer in their corporate HASP or otherwise. AKRF is not responsible for providing oversight for issues unrelated to contaminated materials for non-employees. This oversight shall be the responsibility of the employer of that worker or other official designated by that employer.

2.0 HEALTH AND SAFETY GUIDELINES AND PROCEDURES

2.1 Hazard Evaluation

2.1.1 Hazards of Concern

Check all that apply		
<input checked="" type="checkbox"/> Organic Chemicals	<input checked="" type="checkbox"/> Inorganic Chemicals	<input type="checkbox"/> Radiological
<input checked="" type="checkbox"/> Biological	<input type="checkbox"/> Explosive/Flammable	<input type="checkbox"/> Oxygen Deficient Atm.
<input checked="" type="checkbox"/> Heat Stress	<input checked="" type="checkbox"/> Cold Stress	<input type="checkbox"/> Carbon Monoxide
Comments: No personnel are permitted to enter permit-required confined spaces.		

2.1.2 Physical Characteristics

Check all that apply		
<input checked="" type="checkbox"/> Liquid	<input checked="" type="checkbox"/> Solid	<input type="checkbox"/> Sludge
<input checked="" type="checkbox"/> Vapors	<input type="checkbox"/> Unknown	<input type="checkbox"/> Other
Comments:		

2.1.3 Hazardous Materials

Check all that apply					
Chemicals	Solids	Sludges	Solvents	Oils	Other
<input type="checkbox"/> Acids	<input type="checkbox"/> Ash	<input type="checkbox"/> Paints	<input type="checkbox"/> Halogens	<input type="checkbox"/> Transformer	<input type="checkbox"/> Lab
<input type="checkbox"/> Caustics	<input checked="" type="checkbox"/> Asbestos	<input type="checkbox"/> Metals	<input checked="" type="checkbox"/> Petroleum	<input type="checkbox"/> Other DF	<input type="checkbox"/> Pharm
<input checked="" type="checkbox"/> Pesticides	<input type="checkbox"/> Tailings	<input type="checkbox"/> POTW	<input checked="" type="checkbox"/> Other Chlorinated	<input type="checkbox"/> Motor or Hydraulic Oil	<input type="checkbox"/> Hospital
<input checked="" type="checkbox"/> Petroleum	<input checked="" type="checkbox"/> Other	<input type="checkbox"/> Other	Organic Solvents	<input checked="" type="checkbox"/> Gasoline	<input type="checkbox"/> Rad
<input type="checkbox"/> Inks	Fill material			<input checked="" type="checkbox"/> Fuel Oil	<input type="checkbox"/> MGP
<input checked="" type="checkbox"/> PCBs				<input checked="" type="checkbox"/> Waste Oil	<input type="checkbox"/> Mold
<input checked="" type="checkbox"/> Metals					<input type="checkbox"/> Cyanide
<input checked="" type="checkbox"/> Other: SVOCs					

2.1.4 Chemicals of Concern

Chemical	REL/PEL/STEL	Health Hazards
Arsenic	REL C: 0.002 mg/m ³ PEL: 0.010 mg/m ³	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen].
Asbestos	No exposure limits listed.	Asbestosis (chronic exposure): dyspnea (breathing difficulty), interstitial fibrosis, restricted pulmonary function, finger clubbing; irritation eyes; [potential occupational carcinogen].
Benzene	REL: 0.1 ppm N STEL: 1 ppm PEL: 1 ppm O STEL: 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen].
Chromium	REL: 0.5 mg/m ³ PEL: 1 mg/m ³	Irritation eyes, skin; lung fibrosis (histologic).
Copper	REL: 1 mg/m ³ PEL: 1 mg/m ³	Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; In Animals: lung, liver, kidney damage; anemia.
DDD, DDE, & DDT	REL: 0.5 mg/m ³ PEL: 1 mg/m ³	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen].
Ethylbenzene	REL: 100 ppm N STEL: 125 ppm PEL: 100 ppm	Irritation eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects.
Fuel Oils	REL: 100 mg/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.

Chemical	REL/PEL/STEL	Health Hazards
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.
Nickel	REL: 0.015 mg/m ³ PEL: 1 mg/m ³	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen].
PAHs	REL: 0.1 mg/m ³ PEL: 0.2 mg/m ³	Effects reported from occupational exposure to PAHs include chronic bronchitis, chronic cough irritation, bronchogenic cancer, dermatitis, cutaneous photosensitization, and pilosebaceous reactions. Reported health effects associated with chronic exposure to coal tar and its by-products (e.g., PAHs): Skin: erythema, burns, and warts on sun-exposed areas with progression to cancer. The toxic effects of coal tar are enhanced by exposure to ultraviolet light. Eyes: irritation and photosensitivity. Respiratory system: cough, bronchitis, and bronchogenic cancer. Gastrointestinal system: leukoplakia, buccal-pharyngeal cancer, and cancer of the lip. Hematopoietic system: leukemia (inconclusive) and lymphoma. Genitourinary system: hematuria and kidney and bladder cancers.
PCBs	REL: 0.001 mg/m ³ PEL: 0.5 mg/m ³	Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen].
Tetrachloroethylene	PEL: 100 ppm PEL C: 200 ppm; max peak: 300 ppm	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen].
Toluene	REL: 100 ppm N STEL: 150 ppm PEL: 200 ppm PEL C: 300 ppm; 10-min max peak: 500 ppm	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Trichloroethylene	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].

Chemical	REL/PEL/STEL	Health Hazards
Xylene	REL: 100 ppm N STEL: 150 ppm PEL: 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Zinc	REL: 5 mg/m ³ REL C: 15 mg/m ³ N STEL: 10 mg/m ³ PEL: 5 mg/m ³ (ZnO fume); 15 mg/m ³ (ZnO dust)	Chills, elevated body temperature, myalgia, cough, fatigue, chest pain, stomach cramps, nausea, anemia, changes in cholesterol levels, and vomiting.
Notes: REL: Recommended exposure limit (NIOSH) PEL: Permissible exposure limits (OSHA) STEL: Short-term exposure limit N: NIOSH O: OSHA C: Ceiling		

The potential health effects from these known and suspected on-site contaminants are provided in 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 and will be on-site whenever field work is occurring. The SSO will have a 4-year college degree in occupational safety or a related science/engineering field, and experience in 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 perform environmental oversight activities in the work area while intrusive activities are being performed will have completed a 40-hour training course that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards. In addition, all personnel will have up-to-date 8-hour refresher training. The training will allow personnel to recognize and understand the potential hazards to health and safety. All field personnel must attend a training program, whose purpose is to:

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

Each member of the field crew will be instructed in these objectives before he/she goes onto the Site. A Site safety meeting will be conducted at the start of the project and will be conducted daily, as necessary, to account for changes in Site conditions. 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 PPE. The medical examination will, at a minimum, be provided annually and upon termination of hazardous waste Site work.

2.5 Site Work Zones

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

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

Appropriate barriers will be set up to secure the area and prevent any unauthorized personnel from approaching within 15 feet of the work area.

Site Work Zones

Task	Exclusion Zone	CRZ	Support Zone
Remedial Excavation	15 feet from the excavator	25 feet from the excavator	As Needed

2.6 Air Monitoring

The purpose of the air monitoring program is to identify any exposure of the field personnel to potential environmental hazards in the soil and soil vapor. Results of the air monitoring will be used to determine the appropriate response action, if needed.

2.6.1 Work Zone Air Monitoring

Real time air monitoring will be performed with the photoionization detector (PID) and Dust Trak particulate meter (or equivalent). Measurements will be taken prior to commencement of work and continuously during the work, as outlined in the following table. Measurements will be made as close to the workers as practicable and at the breathing height of the workers. The SSO shall set up the equipment at the beginning of the project and confirm that it is working properly. His/her 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 the background level for that day. The final measurement for the day will be performed after the end of work. The action levels and required responses are listed in the following table:

Instrument	Action Level	Response Action
PID	Less than 10 ppm in breathing zone	Level D or D-Modified
	Between 10 ppm and 50 ppm	Level C
	More than 50 ppm	Stop work. Resume work when readings are less than 50 ppm. Re-access Site conditions and response actions if elevated PID readings remain.
Dust Trak	Less than 0.25 mg/m ³ above background in breathing zone	Level D or D-Modified
	More than 0.25 mg/m ³ above background in breathing zone	Stop work. Resume work when readings are less than 1.25 mg/m ³ .
mg/m ³ = milligrams per cubic meter ppm = parts per million		

2.6.2 Community Air Monitoring Plan

Community air monitoring will be conducted during all intrusive Site activities consistent with the New York State Department of Health (NYSDOH) Generic CAMP and NYSDEC DER-10 procedures. Real-time air monitoring for volatile organic compounds and particulates at the perimeter of the exclusion zone will be performed as described below:

VOC Monitoring

Periodic monitoring for VOCs will be conducted during non-intrusive activities such as the collection of excavation soil endpoint samples using hand-held roving equipment. Periodic monitoring may include obtaining measurements upon arrival at a location and upon leaving the location.

Continuous monitoring for VOCs will be conducted during ground intrusive activities, including excavation and tank removal. 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 PID equipped with a 10.6 eV lamp capable of calculating 15-minute running average concentrations. The following actions will be taken based on organic vapor levels measured:

- If total organic vapor levels exceed 5 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.
- More frequent intervals of monitoring will be conducted if required as determined by the SSO. All PID readings will be recorded and available for NYSDEC and NYSDOH personnel to review. Instantaneous readings, if any, will also be recorded.

Particulate Monitoring

Continuous monitoring for particulates will be conducted during all ground intrusive activities, which will involve the measurement of respirable dust. Community air monitoring for dust particulates will be conducted using a MIE 1000 Personal DataRam or equivalent to measure the concentration of airborne respirable particulates less than 10 micrometers in size (PM10). The dust monitor will be capable of calculating 15-minute running average concentrations and equipped with an audible alarm to indicate exceedance of action levels. An inspection of the monitoring stations will be conducted on at least an hourly basis. Background readings and any readings that trigger response actions will be recorded in the project logbook, which will be available on-site for NYSDOH and/or NYSDEC review. If the downwind particulate concentrations are greater than 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) 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 $150 \mu\text{g}/\text{m}^3$ above the background (upwind concentration) and provided that no visible dust is migrating from the work area. If particulate levels persist at $150 \mu\text{g}/\text{m}^3$ above the background, work must be stopped until dust suppression measures bring particulate levels to below $150 \mu\text{g}/\text{m}^3$ above background.

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 be automatically 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:

- The NYSDEC, NYSDOH, and 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 Health and Safety Officer; and
- All Emergency contacts will go into effect as appropriate.

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

2.6.3 Personal Protection Equipment

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

AKRF field personnel and other site personnel shall wear, at a minimum, Level D personal protective equipment. The protection will be based on the air monitoring described in this section.

Personal Protection Equipment Requirements

LEVEL OF PROTECTION & PPE		All Tasks
Level D (X) Steel Toe Shoes (X) Hard Hat (within 25 ft of drill rig/excavator) (X) Work Gloves	(X) Safety Glasses () Face Shield (X) Ear Plugs (within 25 ft of drill rig/excavator) (X) Nitrile Gloves (X) Tyvek for drill operator if NAPL present	Yes
Level C (in addition to Level D) (X) Half-Face Respirator OR (X) Full Face Respirator () Full-Face Powered Air Purifier Respirator (PAPR)	() Particulate Cartridge () Organic Cartridge (X) Dual Organic/Particulate Cartridge	If PID > 10 ppm for a 15-minute average (breathing zone)
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breath or any odors detected).		

2.7 General Work Practices

To protect their health and safety, all 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, fire extinguisher, and disposable eye washes. A muster point location will be made known to all parties on Site during the Site safety meeting. 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 driven to the Kings County Hospital Center in Brooklyn by on-site personnel. Directions to the hospital are provided below, and a hospital route map is attached.

3.1 Hospital Directions

Hospital Name:	Kings County Hospital Center
Phone Number:	(718) 245-3131
Address/Location:	489 Clarkson Avenue, Brooklyn, NY 11207
Directions:	Turn Left from the site onto Nostrand Avenue. Turn LEFT onto Clarkson Avenue. The Emergency Room will be on the LEFT.

3.2 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF, Inc.	Axel Schwendt	Project Director	646-388-9529 (office)
	Ashutosh Sharma	Project Manager	646-388-9865 (office)
	Thomas Giordano	SSO	914-602-6956 (cell)
975 Nostrand Avenue	Marlee Busching-Truscott	BCP Volunteer Representative	212-777-9500
New York State Department of Environmental Conservation	TBD	Project Manager	-
New York State Department of Health	TBD	Project Manager	-
Ambulance, Fire Department & Police Department	-	-	911
NYSDEC Spill Hotline	-	-	800-457-7362

4.0 APPROVAL & ACKNOWLEDGMENTS OF HASP

APPROVAL

Signed: _____ Date: _____

AKRF Project Manager

Signed: _____ Date: _____

AKRF Health and Safety Officer

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

AFFIDAVIT

I, _____ (name), of _____ (company name), have read the Health and Safety Plan (HASP) for the 975 Nostrand Avenue Site. I agree to conduct all on-site work in accordance with the requirements set forth in this HASP and understand that failure to comply with this HASP could lead to my removal from the site.

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

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Signed: _____ Company: _____ Date: _____

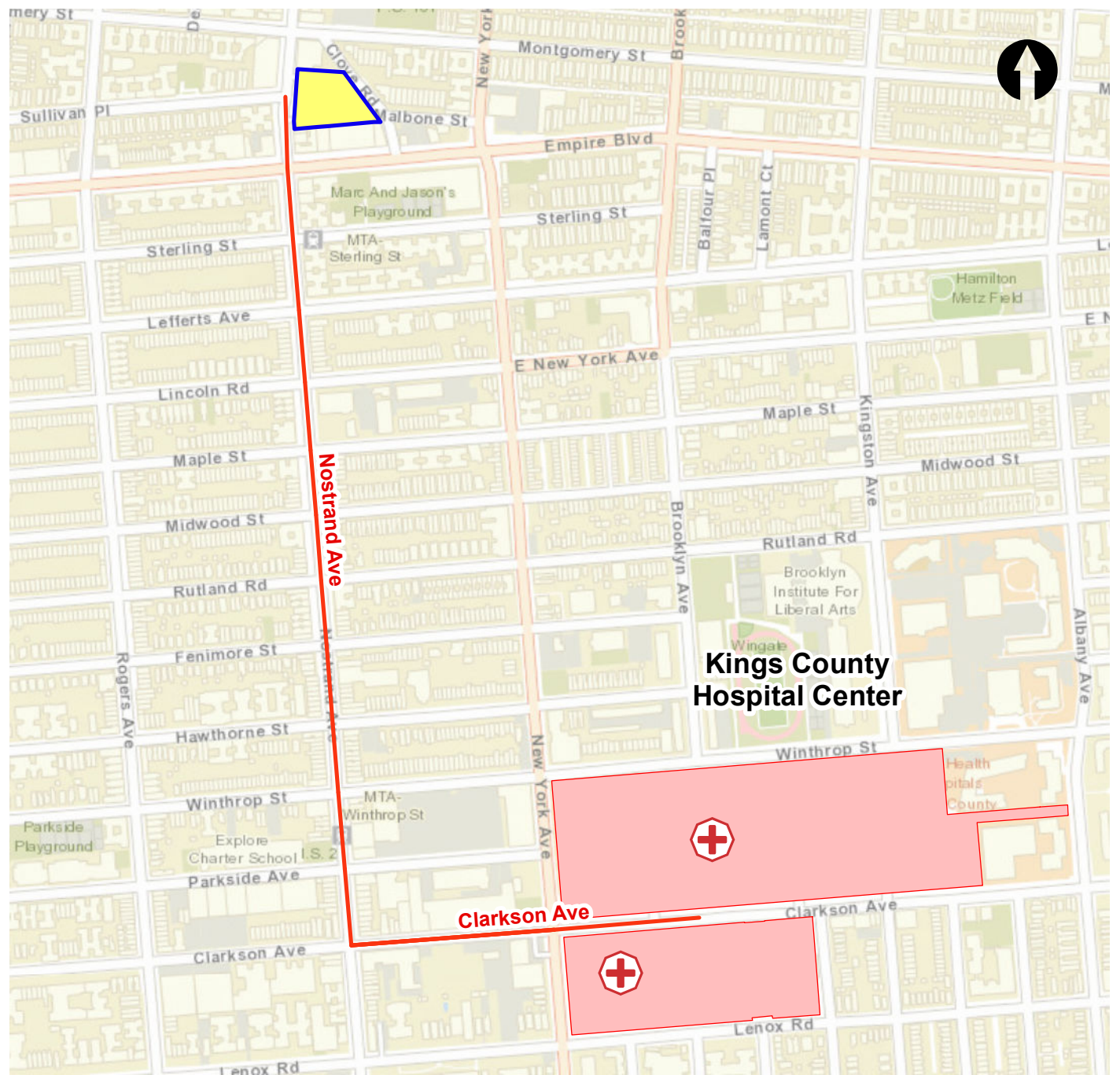
Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____




Signed: _____ Company: _____ Date: _____

FIGURE 1
HOSPITAL ROUTE MAP

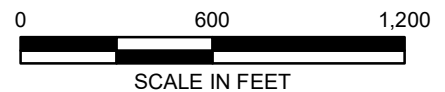


Service Layer Credits: ESRI World Street Map 2021

LEGEND

-  PROJECT SITE BOUNDARY
-  ROUTE TO HOSPITAL
-  HOSPITAL LOCATION

Kings County Hospital Emergency Room
489 Clarkson Ave, Brooklyn, NY 11203
+17182453131



440 Park Avenue South, New York, NY 10016

975 Nostrand Avenue
Brooklyn, New York

HOSPITAL ROUTE MAP

DATE 8/18/2021
PROJECT NO. 210225
FIGURE 1

ATTACHMENT A
POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

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

HIGHLIGHTS: Exposure to higher than average levels of arsenic occurs mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found at 1,014 of the 1,598 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Organic arsenic compounds are used as pesticides, primarily on cotton plants.

What happens to arsenic when it enters the environment?

- ☐ Arsenic cannot be destroyed in the environment. It can only change its form.
- ☐ Arsenic in air will settle to the ground or is washed out of the air by rain.
- ☐ Many arsenic compounds can dissolve in water.
- ☐ Fish and shellfish can accumulate arsenic, but the arsenic in fish is mostly in a form that is not harmful.

How might I be exposed to arsenic?

- ☐ Eating food, drinking water, or breathing air containing arsenic.
- ☐ Breathing contaminated workplace air.
- ☐ Breathing sawdust or burning smoke from wood treated with arsenic.
- ☐ Living near uncontrolled hazardous waste sites containing arsenic.
- ☐ Living in areas with unusually high natural levels of arsenic in rock.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. Ingesting high levels of inorganic arsenic can result in death. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

appearance of small “corns” or “warts” on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Organic arsenic compounds are less toxic than inorganic arsenic compounds. Exposure to high levels of some organic arsenic compounds may cause similar effects as inorganic arsenic.

How likely is arsenic to cause cancer?

Several studies have shown that inorganic arsenic can increase the risk of lung cancer, skin cancer, bladder cancer, liver cancer, kidney cancer, and prostate cancer. The World Health Organization (WHO), the Department of Health and Human Services (DHHS), and the EPA have determined that inorganic arsenic is a human carcinogen.

How can arsenic affect children?

We do not know if exposure to arsenic will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to inorganic arsenic.

It is likely that health effects seen in children exposed to high amounts of arsenic will be similar to the effects seen in adults.

How can families reduce the risk of exposure to arsenic?

- ☐ If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
- ☐ If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

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

There are tests to measure the level of arsenic in blood, urine, hair, or fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict how the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or canceled many uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration has set limits of 10 µg arsenic per cubic meter of workplace air (10 µg/m³) for 8 hour shifts and 40 hour work weeks.

Source of Information

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

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



This fact sheet answers the most frequently asked health questions (FAQs) about asbestos. 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, individual susceptibility and personal habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to asbestos usually occurs by breathing contaminated air in workplaces that make or use asbestos. Asbestos is also found in the air of buildings that are being torn down or renovated. Asbestos exposure can cause serious lung problems and cancer. This substance has been found at 83 of the 1,585 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is asbestos?

Asbestos is the name given to a group of six different fibrous minerals (amosite, chrysotile, crocidolite, and the fibrous varieties of tremolite, actinolite, and anthophyllite) that occur naturally in the environment. Asbestos minerals have separable long fibers that are strong and flexible enough to be spun and woven and are heat resistant. Because of these characteristics, asbestos has been used for a wide range of manufactured goods, mostly in building materials (roofing shingles, ceiling and floor tiles, paper products, and asbestos cement products), friction products (automobile clutch, brake, and transmission parts), heat-resistant fabrics, packaging, gaskets, and coatings. Some vermiculite or talc products may contain asbestos.

What happens to asbestos when it enters the environment?

Asbestos fibers can enter the air or water from the breakdown of natural deposits and manufactured asbestos products. Asbestos fibers do not evaporate into air or dissolve in water. Small diameter fibers and particles may remain suspended in the air for a long time and be carried long distances by wind or water before settling down. Larger diameter fibers and particles tend to settle more quickly.

Asbestos fibers are not able to move through soil. Asbestos fibers are generally not broken down to other compounds and will remain virtually unchanged over long periods.

How might I be exposed to asbestos?

We are all exposed to low levels of asbestos in the air we breathe. These levels range from 0.00001 to 0.0001 fibers per milliliter of air and generally are highest in cities and industrial areas.

People working in industries that make or use asbestos products or who are involved in asbestos mining may be exposed to high levels of asbestos. People living near these industries may also be exposed to high levels of asbestos in air.

Asbestos fibers may be released into the air by the disturbance of asbestos-containing material during product use, demolition work, building or home maintenance, repair, and remodeling. In general, exposure may occur only when the asbestos-containing material is disturbed in some way to release particles and fibers into the air.

Drinking water may contain asbestos from natural sources or from asbestos-containing cement pipes.

How can asbestos affect my health?

Asbestos mainly affects the lungs and the membrane that surrounds the lungs. Breathing high levels of asbestos fibers for a long time may result in scar-like tissue in the lungs and in the pleural membrane (lining) that surrounds the lung. This disease is called asbestosis and is usually found in workers exposed to asbestos, but not in the general public. People with asbestosis have difficulty breathing, often a cough, and in severe cases heart enlargement. Asbestosis is a serious disease and can eventually lead to disability and death.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Breathing lower levels of asbestos may result in changes called plaques in the pleural membranes. Pleural plaques can occur in workers and sometimes in people living in areas with high environmental levels of asbestos. Effects on breathing from pleural plaques alone are not usually serious, but higher exposure can lead to a thickening of the pleural membrane that may restrict breathing.

How likely is asbestos to cause cancer?

The Department of Health and Human Services (DHHS), the World Health Organization (WHO), and the EPA have determined that asbestos is a human carcinogen.

It is known that breathing asbestos can increase the risk of cancer in people. There are two types of cancer caused by exposure to asbestos: lung cancer and mesothelioma. Mesothelioma is a cancer of the thin lining surrounding the lung (pleural membrane) or abdominal cavity (the peritoneum). Cancer from asbestos does not develop immediately, but shows up after a number of years. Studies of workers also suggest that breathing asbestos can increase chances of getting cancer in other parts of the body (stomach, intestines, esophagus, pancreas, and kidneys), but this is less certain. Early identification and treatment of any cancer can increase an individual's quality of life and survival.

Cigarette smoke and asbestos together significantly increase your chances of getting lung cancer. Therefore, if you have been exposed to asbestos you should stop smoking. This may be the most important action that you can take to improve your health and decrease your risk of cancer.

How can asbestos affect children?

We do not know if exposure to asbestos will result in birth defects or other developmental effects in people. Birth defects have not been observed in animals exposed to asbestos.

It is likely that health effects seen in children exposed to high levels of asbestos will be similar to the effects seen in adults.

How can families reduce the risk of exposure to asbestos?

Materials containing asbestos that are not disturbed or deteriorated do not, in general, pose a health risk and can be left alone. If you

suspect that you may be exposed to asbestos in your home, contact your state or local health department or the regional offices of EPA to find out how to test your home and how to locate a company that is trained to remove or contain the fibers.

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

Low levels of asbestos fibers can be measured in urine, feces, mucus, or lung washings of the general public. Higher than average levels of asbestos fibers in tissue can confirm exposure but not determine whether you will experience any health effects.

A thorough history, physical exam, and diagnostic tests are needed to evaluate asbestos-related disease. Chest x-rays are the best screening tool to identify lung changes resulting from asbestos exposure. Lung function tests and CAT scans also assist in the diagnosis of asbestos-related disease.

Has the federal government made recommendations to protect human health?

In 1989, EPA banned all new uses of asbestos; uses established before this date are still allowed. EPA established regulations that require school systems to inspect for damaged asbestos and to eliminate or reduce the exposure by removing the asbestos or by covering it up. EPA regulates the release of asbestos from factories and during building demolition or renovation to prevent asbestos from getting into the environment.

EPA has proposed a concentration limit of 7 million fibers per liter of drinking water for long fibers (lengths greater than or equal to 5 µm). The Occupational Safety and Health Administration has set limits of 100,000 fibers with lengths greater than or equal to 5 µm per cubic meter of workplace air for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2001. Toxicological Profile for Asbestos. Update. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address 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.



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

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

What is benzene?

(Pronounced bĕn'zĕn')

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

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

What happens to benzene when it enters the environment?

- ☐ Industrial processes are the main source of benzene in the environment.
- ☐ Benzene can pass into the air from water and soil.
- ☐ It reacts with other chemicals in the air and breaks down within a few days.
- ☐ Benzene in the air can attach to rain or snow and be carried back down to the ground.

- ☐ It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- ☐ Benzene does not build up in plants or animals.

How might I be exposed to benzene?

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

How can benzene affect my health?

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

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

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

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

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

How likely is benzene to cause cancer?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

Glossary

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

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

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

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

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

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



This fact sheet answers the most frequently asked health questions (FAQs) about chromium. 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 chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and cause cancer. Ingesting high levels of chromium(VI) may result in anemia or damage to the stomach or intestines. Chromium(III) is an essential nutrient. Chromium has been found in at least 1,127 of the 1,669 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, and soil. It can exist in several different forms. Depending on the form it takes, it can be a liquid, solid, or gas. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- ☐ Chromium can be found in air, soil, and water after release from the manufacture, use, and disposal of chromium-based products, and during the manufacturing process.
- ☐ Chromium does not usually remain in the atmosphere, but is deposited into the soil and water.
- ☐ Chromium can easily change from one form to another in water and soil, depending on the conditions present.
- ☐ Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

- ☐ Eating food containing chromium(III).

- ☐ Breathing contaminated workplace air or skin contact during use in the workplace.
- ☐ Drinking contaminated well water.
- ☐ Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the lining of the nose, nose ulcers, runny nose, and breathing problems, such as asthma, cough, shortness of breath, or wheezing. The concentrations of chromium in air that can cause these effects may be different for different types of chromium compounds, with effects occurring at much lower concentrations for chromium(VI) compared to chromium(III).

The main health problems seen in animals following ingestion of chromium(VI) compounds are irritation and ulcers in the stomach and small intestine and anemia. Chromium(III) compounds are much less toxic and do not appear to cause these problems.

Sperm damage and damage to the male reproductive system have also been seen in laboratory animals exposed to chromium(VI).

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive to chromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

How likely is chromium to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have determined that chromium(VI) compounds are known human carcinogens. In workers, inhalation of chromium(VI) has been shown to cause lung cancer. Chromium(VI) also causes lung cancer in animals. An increase in stomach tumors was observed in humans and animals exposed to chromium(VI) in drinking water.

How can chromium affect children?

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Some developmental effects have been observed in animals exposed to chromium(VI).

How can families reduce the risks of exposure to chromium?

- ☐ Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.
- ☐ Chromium is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- ☐ Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

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

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. Chromium can be measured in hair, urine, and blood.

Higher than normal levels of chromium in blood or urine may indicate that a person has been exposed to chromium. However, increases in blood and urine chromium levels cannot be used to predict the kind of health effects that might develop from that exposure.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to chromium in drinking water at concentrations of 1 mg/L for up to 10 days is not expected to cause any adverse effects in a child.

The FDA has determined that the chromium concentration in bottled drinking water should not exceed 1 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 0.0005 mg/m³ chromium(VI), 0.5 mg/m³ chromium(III), and 1.0 mg/m³ chromium(0) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Chromium (Draft for Public Comment). 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.



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

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

What is copper?

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

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

What happens to copper when it enters the environment?

- ☐ Copper can enter the environment from the mining of copper and other metals and from factories that make or use metallic copper or copper compounds.
- ☐ It can also enter the environment through domestic waste water, combustion of fossil fuels and wastes, wood production, phosphate fertilizer production, and natural sources (e.g., windblown dust from soils, volcanoes, decaying vegetation, forest fires, and sea spray).
- ☐ Copper in soil strongly attaches to organic material and minerals.

- ☐ Copper that dissolves in water becomes rapidly bound to particles suspended in the water.
- ☐ Copper does not typically enter groundwater.
- ☐ Copper carried by particles emitted from smelters and ore processing plants is carried back to the ground by gravity or in rain or snow.
- ☐ Copper does not break down in the environment.

How might I be exposed to copper?

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

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

How can copper affect my health?

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

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

How likely is copper to cause cancer?

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

How can copper affect children?

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

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

How can families reduce the risk of exposure to copper?

- ☐ The greatest potential source of copper exposure is through drinking water, especially in water that is first drawn in the morning after sitting in copper pipes and brass faucets overnight.
- ☐ To reduce exposure, run the water for at least 15-30 seconds before using it.
- ☐ If you are exposed to copper at work, you may carry

copper home on your skin, clothes, or tools. You can avoid this by showering, and changing clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

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

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

Has the federal government made recommendations to protect human health?

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

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.1 mg per cubic meter (0.1 mg/m³) of copper fumes (vapor generated from heating copper) and 1 mg/m³ of copper dusts (fine metallic copper particles) and mists (aerosol of soluble copper) in workroom air during an 8-hour work shift, 40-hour workweek.

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

References

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

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



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

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

What are DDT, DDE, and DDD?

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

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

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

- ☐ DDT entered the environment when it was used as a pesticide; it still enters the environment due to current use in other countries.
- ☐ DDE enters the environment as contaminant or breakdown product of DDT; DDD also enters the environment as a breakdown product of DDT.
- ☐ DDT, DDE, and DDD in air are rapidly broken down by sunlight. Half of what's in air breaks down within 2 days.
- ☐ They stick strongly to soil; most DDT in soil is broken down slowly to DDE and DDD by microorganisms; half the DDT in soil will break down in 2-15 years, depending on the type of soil.

- ☐ Only a small amount will go through the soil into groundwater; they do not dissolve easily in water.
- ☐ DDT, and especially DDE, build up in plants and in fatty tissues of fish, birds, and other animals.

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

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

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

DDT affects the nervous system. People who accidentally swallowed large amounts of DDT became excitable and had tremors and seizures. These effects went away after the exposure stopped. No effects were seen in people who took small daily doses of DDT by capsule for 18 months. A study in humans showed that women who had high amounts of a form of DDE in their breast milk were unable to

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breast feed their babies for as long as women who had little DDE in the breast milk. Another study in humans showed that women who had high amounts of DDE in breast milk had an increased chance of having premature babies. In animals, short-term exposure to large amounts of DDT in food affected the nervous system, while long-term exposure to smaller amounts affected the liver. Also in animals, short-term oral exposure to small amounts of DDT or its breakdown products may also have harmful effects on reproduction.

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

Studies in DDT-exposed workers did not show increases in cancer. Studies in animals given DDT with the food have shown that DDT can cause liver cancer. The Department of Health and Human Services (DHHS) determined that DDT may reasonably be anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) determined that DDT may possibly cause cancer in humans. The EPA determined that DDT, DDE, and DDD are probable human carcinogens.

How can DDT, DDE, and DDD affect children?

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

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

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

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

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

- ☐ Most families will be exposed to DDT by eating food or drinking liquids contaminated with small amounts of DDT.
- ☐ Cooking will reduce the amount of DDT in fish.
- ☐ Washing fruit and vegetables will remove most DDT from their surface.
- ☐ Follow health advisories that tell you about consumption of fish and wildlife caught in contaminated areas.

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

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

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) sets a limit of 1 milligram of DDT per cubic meter of air (1 mg/m³) in the workplace for an 8-hour shift, 40-hour workweek.

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

References

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

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



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

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

What is ethylbenzene?

(Pronounced ěth/ əl běn/ zěn')

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

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

What happens to ethylbenzene when it enters the environment?

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

How might I be exposed to ethylbenzene?

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

How can ethylbenzene affect my health?

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

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

How likely is ethylbenzene to cause cancer?

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

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

How can ethylbenzene affect children?

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

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

How can families reduce the risk of exposure to ethylbenzene?

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

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

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

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

Ethylbenzene is found in the blood, urine, breath, and

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

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

Has the federal government made recommendations to protect human health?

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

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

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

References

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

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



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 fyoo'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

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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, light-headedness, 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/m³) for a 40-hour workweek.

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

Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

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

References

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

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



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

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

What is lead?

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

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

What happens to lead when it enters the environment?

- ☐ Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- ☐ When lead is released to the air, it may travel long distances before settling to the ground.
- ☐ Once lead falls onto soil, it usually sticks to soil particles.
- ☐ Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

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

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

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

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

How can lead affect my health?

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

How likely is lead to cause cancer?

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

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

How can lead affect children?

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

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

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

How can families reduce the risks of exposure to lead?

- ☐ Avoid exposure to sources of lead.
- ☐ Do not allow children to chew on mouth surfaces that may have been painted with lead-based paint.
- ☐ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.
- ☐ Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children
- ☐ If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces

often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

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

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

Has the federal government made recommendations to protect human health?

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

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

References

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

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



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

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

What is mercury?

(Pronounced mŭr'kyə-rē)

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

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

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

What happens to mercury when it enters the environment?

- ☐ Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- ☐ It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.

- ☐ Methylmercury may be formed in water and soil by small organisms called bacteria.
- ☐ Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

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

How can mercury affect my health?

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

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea,

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vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

How likely is mercury to cause cancer?

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

How can mercury affect children?

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

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

How can families reduce the risk of exposure to mercury?

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

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

Pregnant women and children should keep away from

rooms where liquid mercury has been used.

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

References

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

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



This fact sheet answers the most frequently asked health questions (FAQs) about nickel. 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: Nickel is a naturally occurring element. Pure nickel is a hard, silvery-white metal used to make stainless steel and other metal alloys. Skin effects are the most common effects in people who are sensitive to nickel. Workers who breathed very large amounts of nickel compounds developed chronic bronchitis and lung and nasal sinus cancers. Nickel has been found in at least 882 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is nickel?

Nickel is a very abundant natural element. Pure nickel is a hard, silvery-white metal. Nickel can be combined with other metals, such as iron, copper, chromium, and zinc, to form alloys. These alloys are used to make coins, jewelry, and items such as valves and heat exchangers. Most nickel is used to make stainless steel.

Nickel can combine with other elements such as chlorine, sulfur, and oxygen to form nickel compounds. Many nickel compounds dissolve fairly easy in water and have a green color. Nickel compounds are used for nickel plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions. Nickel is found in all soil and is emitted from volcanoes. Nickel is also found in meteorites and on the ocean floor. Nickel and its compounds have no characteristic odor or taste.

What happens to nickel when it enters the environment?

- ☐ Nickel is released into the atmosphere by industries that make or use nickel, nickel alloys, or nickel compounds. It is also released into the atmosphere by oil-burning power plants, coal-burning power plants, and trash incinerators.
- ☐ In the air, it attaches to small particles of dust that settle to the ground or are taken out of the air in rain or snow; this usually takes many days.

☐ Nickel released in industrial waste water ends up in soil or sediment where it strongly attaches to particles containing iron or manganese.

☐ Nickel does not appear to accumulate in fish or in other animals used as food.

How might I be exposed to nickel?

- ☐ By eating food containing nickel, which is the major source of exposure for most people.
- ☐ By skin contact with soil, bath or shower water, or metals containing nickel, as well as by handling coins or touching jewelry containing nickel.
- ☐ By drinking water that contains small amounts of nickel.
- ☐ By breathing air or smoking tobacco containing nickel.
- ☐ Higher exposure may occur if you work in industries that process or use nickel.

How can nickel affect my health?

The most common harmful health effect of nickel in humans is an allergic reaction. Approximately 10-20% of the population is sensitive to nickel. People can become sensitive to nickel when jewelry or other things containing it are in direct contact with the skin for a long time. Once a person is sensitized to nickel, further contact with the metal may produce a reaction. The most common reaction is a skin rash at the site of contact. The skin rash may also

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occur at a site away from the site of contact. Less frequently, some people who are sensitive to nickel have asthma attacks following exposure to nickel. Some sensitized people react when they consume food or water containing nickel or breathe dust containing it.

People working in nickel refineries or nickel-processing plants have experienced chronic bronchitis and reduced lung function. These persons breathed amounts of nickel much higher than levels found normally in the environment.

Workers who drank water containing high amounts of nickel had stomach ache and suffered adverse effects to their blood and kidneys.

Damage to the lung and nasal cavity has been observed in rats and mice breathing nickel compounds. Eating or drinking large amounts of nickel has caused lung disease in dogs and rats and has affected the stomach, blood, liver, kidneys, and immune system in rats and mice, as well as their reproduction and development.

How likely is nickel to cause cancer?

Cancers of the lung and nasal sinus have resulted when workers breathed dust containing high levels of nickel compounds while working in nickel refineries or nickel processing plants. The Department of Health and Human Services (DHHS) has determined that nickel metal may reasonably be anticipated to be a carcinogen and that nickel compounds are known human carcinogens. The International Agency for Research on Cancer (IARC) has determined that some nickel compounds are carcinogenic to humans and that metallic nickel may possibly be carcinogenic to humans. The EPA has determined that nickel refinery dust and nickel subsulfide are human carcinogens.

How can nickel affect children?

It is likely that the health effects seen in children exposed to nickel will be similar to those seen in adults. We do not know whether children differ from adults in their susceptibility to nickel. Human studies that examined whether nickel can harm the fetus are inconclusive. Animal studies have found increases in newborn deaths and

decreased newborn weight after ingesting very high amounts of nickel. Nickel can be transferred from the mother to an infant in breast milk and can cross the placenta.

How can families reduce the risks of exposure to nickel?

- ❑ Avoiding jewelry containing nickel will eliminate risks of exposure to this source of the metal.
- ❑ Exposures of the general population from other sources, such as foods and drinking water, are almost always too low to be of concern.

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

There are tests available to measure nickel in your blood, feces, and urine. More nickel was measured in the urine of workers who were exposed to nickel compounds that dissolve easily in water than in the urine of workers exposed to nickel compounds that are hard to dissolve. This means that it is easier to tell if you have been exposed to soluble nickel compounds than less-soluble compounds. The nickel measurements do not accurately predict potential health effects from exposure to nickel.

Has the federal government made recommendations to protect human health?

The EPA recommends that drinking water should contain no more than 0.1 milligrams of nickel per liter of water (0.1 mg/L). To protect workers, the Occupational Safety and Health Administration (OSHA) has set a limit of 1 mg of nickel per cubic meter of air (1 mg/m³) for metallic nickel and nickel compounds in workplace air during an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Nickel (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.



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

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

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl'ī-sī'klīk ār'ə-măt'īk 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; smoke-houses; 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.

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

How can PAHs affect my health?

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

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

How likely are PAHs to cause cancer?

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

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

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

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any

health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

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

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



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

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

- ☐ PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- ☐ PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- ☐ PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- ☐ PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these

aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

- ☐ Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
- ☐ Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
- ☐ Breathing air near hazardous waste sites and drinking contaminated well water.
- ☐ In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects

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of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported. In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risk of exposure to PCBs?

- ☐ You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.
- ☐ Children should be told not play with old appliances,

electrical equipment, or transformers, since they may contain PCBs.

- ☐ Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.
- ☐ If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

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

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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



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

HIGHLIGHTS: Trichloroethylene is a colorless liquid which is used as a solvent for cleaning metal parts. Drinking or breathing high levels of trichloroethylene may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, and possibly death. Trichloroethylene has been found in at least 852 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is trichloroethylene?

Trichloroethylene (TCE) is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers.

Trichloroethylene is not thought to occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical.

What happens to trichloroethylene when it enters the environment?

- ❑ Trichloroethylene dissolves a little in water, but it can remain in ground water for a long time.
- ❑ Trichloroethylene quickly evaporates from surface water, so it is commonly found as a vapor in the air.
- ❑ Trichloroethylene evaporates less easily from the soil than from surface water. It may stick to particles and remain for a long time.
- ❑ Trichloroethylene may stick to particles in water, which will cause it to eventually settle to the bottom sediment.
- ❑ Trichloroethylene does not build up significantly in

plants and animals.

How might I be exposed to trichloroethylene?

- ❑ Breathing air in and around the home which has been contaminated with trichloroethylene vapors from shower water or household products such as spot removers and typewriter correction fluid.
- ❑ Drinking, swimming, or showering in water that has been contaminated with trichloroethylene.
- ❑ Contact with soil contaminated with trichloroethylene, such as near a hazardous waste site.
- ❑ Contact with the skin or breathing contaminated air while manufacturing trichloroethylene or using it at work to wash paint or grease from skin or equipment.

How can trichloroethylene affect my health?

Breathing small amounts may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating.

Breathing large amounts of trichloroethylene may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and liver damage.

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Drinking large amounts of trichloroethylene may cause nausea, liver damage, unconsciousness, impaired heart function, or death.

Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear.

Skin contact with trichloroethylene for short periods may cause skin rashes.

How likely is trichloroethylene to cause cancer?

Some studies with mice and rats have suggested that high levels of trichloroethylene may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of trichloroethylene in drinking water or in workplace air have found evidence of increased cancer. Although, there are some concerns about the studies of people who were exposed to trichloroethylene, some of the effects found in people were similar to effects in animals.

In its 9th Report on Carcinogens, the National Toxicology Program (NTP) determined that trichloroethylene is “reasonably anticipated to be a human carcinogen.” The International Agency for Research on Cancer (IARC) has determined that trichloroethylene is “probably carcinogenic to humans.”

Is there a medical test to show whether I’ve been exposed to trichloroethylene?

If you have recently been exposed to trichloroethylene, it can be detected in your breath, blood, or urine. The breath test, if it is performed soon after exposure, can tell if you have been exposed to even a small amount of trichloroethylene.

Exposure to larger amounts is assessed by blood

and urine tests, which can detect trichloroethylene and many of its breakdown products for up to a week after exposure. However, exposure to other similar chemicals can produce the same breakdown products, so their detection is not absolute proof of exposure to trichloroethylene. This test isn’t available at most doctors’ offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level for trichloroethylene in drinking water at 0.005 milligrams per liter (0.005 mg/L) or 5 parts of TCE per billion parts water.

The EPA has also developed regulations for the handling and disposal of trichloroethylene.

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

Glossary

Carcinogenicity: The ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or gas.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

ppm: Parts per million.

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

Solvent: A chemical that dissolves other substances.

References

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

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

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

HIGHLIGHTS: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Tetrachloroethylene has been found in at least 771 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is tetrachloroethylene?

(Pronounced tět'rə-klôr' ō-ěth'ə-lēn')

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels.

What happens to tetrachloroethylene when it enters the environment?

- ☐ Much of the tetrachloroethylene that gets into water or soil evaporates into the air.
- ☐ Microorganisms can break down some of the tetrachloroethylene in soil or underground water.
- ☐ In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain.
- ☐ It does not appear to collect in fish or other animals that live in water.

How might I be exposed to tetrachloroethylene?

- ☐ When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- ☐ When you drink water containing tetrachloroethylene, you are exposed to it.

How can tetrachloroethylene affect my health?

High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death.

Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high."

In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of tetrachloroethylene are not known.

Results from some studies suggest that women who work in dry cleaning industries where exposures to tetrachloroethyl-

ToxFAQs Internet home page via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

ene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. However, it is not known if tetrachloroethylene was responsible for these problems because other possible causes were not considered.

Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that tetrachloroethylene can cause liver and kidney damage. Exposure to very high levels of tetrachloroethylene can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

How likely is tetrachloroethylene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Tetrachloroethylene has been shown to cause liver tumors in mice and kidney tumors in male rats.

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

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood.

Because it is stored in the body's fat and slowly released into the bloodstream, tetrachloroethylene can be detected in the breath for weeks following a heavy exposure.

Tetrachloroethylene and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform. These tests aren't available at most doctors' offices, but can be per-

formed at special laboratories that have the right equipment.

Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been exposed to tetrachloroethylene or the other chemicals.

Has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

References

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

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



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

HIGHLIGHTS: Exposure to toluene occurs from breathing contaminated workplace air, in automobile exhaust, some consumer products paints, paint thinners, fingernail polish, lacquers, and adhesives. Toluene affects the nervous system. Toluene has been found at 959 of the 1,591 National Priority List sites identified by the Environmental Protection Agency

What is toluene?

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

Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

What happens to toluene when it enters the environment?

☐ Toluene enters the environment when you use materials that contain it. It can also enter surface water and groundwater from spills of solvents and petroleum products as well as from leaking underground storage tanks at gasoline stations and other facilities.

☐ When toluene-containing products are placed in landfills or waste disposal sites, the toluene can enter the soil or water near the waste site.

☐ Toluene does not usually stay in the environment long.

☐ Toluene does not concentrate or buildup to high levels in animals.

How might I be exposed to toluene?

☐ Breathing contaminated workplace air or automobile exhaust.

☐ Working with gasoline, kerosene, heating oil, paints, and lacquers.

☐ Drinking contaminated well-water.

☐ Living near uncontrolled hazardous waste sites containing toluene products.

How can toluene affect my health?

Toluene may affect the nervous system. Low to moderate levles can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite, and

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

hearing and color vision loss. These symptoms usually disappear when exposure is stopped.

Inhaling High levels of toluene in a short time can make you feel light-headed, dizzy, or sleepy. It can also cause unconsciousness, and even death.

High levels of toluene may affect your kidneys.

How likely is toluene to cause cancer?

Studies in humans and animals generally indicate that toluene does not cause cancer.

The EPA has determined that the carcinogenicity of toluene can not be classified.

How can toluene affect children?

It is likely that health effects seen in children exposed to toluene will be similar to the effects seen in adults. Some studies in animals suggest that babies may be more sensitive than adults.

Breathing very high levels of toluene during pregnancy can result in children with birth defects and retard mental abilities, and growth. We do not know if toluene harms the unborn child if the mother is exposed to low levels of toluene during pregnancy.

How can families reduce the risk of exposure to toluene?

☐ Use toluene-containing products in well-ventilated areas.

☐ When not in use, toluene-containing products should be tightly covered to prevent evaporation into the air.

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

There are tests to measure the level of toluene or its breakdown products in exhaled air, urine, and blood. To determine if you have been exposed to toluene, your urine or blood must be checked within 12 hours of exposure. Several other chemicals are also changed into the same breakdown products as toluene, so some of these tests are not specific for toluene.

Has the federal government made recommendations to protect human health?

EPA has set a limit of 1 milligram per liter of drinking water (1 mg/L).

Discharges, releases, or spills of more than 1,000 pounds of toluene must be reported to the National Response Center.

The Occupational Safety and Health Administration has set a limit of 200 parts toluene per million of workplace air (200 ppm).

References

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

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



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

SUMMARY: Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. This substance has been found in at least 658 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is xylene?

(Pronounced zī'lēn)

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar and is formed during forest fires. You can smell xylene in air at 0.08–3.7 parts of xylene per million parts of air (ppm) and begin to taste it in water at 0.53–1.8 ppm.

Chemical industries produce xylene from petroleum. It's one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

What happens to xylene when it enters the environment?

- ☐ Xylene has been found in waste sites and landfills when discarded as used solvent, or in varnish, paint, or paint thinners.
- ☐ It evaporates quickly from the soil and surface water into the air.

- ☐ In the air, it is broken down by sunlight into other less harmful chemicals.
- ☐ It is broken down by microorganisms in soil and water.
- ☐ Only a small amount of it builds up in fish, shellfish, plants, and animals living in xylene-contaminated water.

How might I be exposed to xylene?

- ☐ Breathing xylene in workplace air or in automobile exhaust.
- ☐ Breathing contaminated air.
- ☐ Touching gasoline, paint, paint removers, varnish, shellac, and rust preventatives that contain it.
- ☐ Breathing cigarette smoke that has small amounts of xylene in it.
- ☐ Drinking contaminated water or breathing air near waste sites and landfills that contain xylene.
- ☐ The amount of xylene in food is likely to be low.

How can xylene affect my health?

Xylene affects the brain. High levels from exposure for short periods (14 days or less) or long periods (more than 1 year) can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of

ToxFAQs Internet home page via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

How likely is xylene to cause cancer?

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

Human and animal studies have not shown xylene to be carcinogenic, but these studies are not conclusive and do not provide enough information to conclude that xylene does not cause cancer.

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

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 10 ppm of xylene in drinking water.

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

The Occupational Safety and Health Administration (OSHA) has set a maximum level of 100 ppm xylene in workplace air for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) also recommend exposure limits of 100 ppm in workplace air.

NIOSH has recommended that 900 ppm of xylene be considered immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Evaporate: To change from a liquid into a vapor or a gas.

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

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

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



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.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Inhaling large amounts of zinc (as dusts or fumes) can cause a specific short-term disease called metal fume fever. We do not know the long-term effects of breathing high levels of zinc.

Putting low levels of zinc acetate and zinc chloride on the skin of rabbits, guinea pigs, and mice caused skin irritation. Skin irritation will probably occur in people.

How likely is zinc to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified zinc for carcinogenicity. Based on incomplete information from human and animal studies, the EPA has determined that zinc is not classifiable as to its human carcinogenicity.

How can zinc affect children?

Zinc is essential for proper growth and development of young children. It is likely that children exposed to very high levels of zinc will have similar effects as adults. We do not know whether children are more susceptible to the effects of excessive intake of zinc than the adults.

We do not know if excess zinc can cause developmental effects in humans. Animal studies have found decreased weight in the offspring of animals that ingested very high amounts of zinc.

How can families reduce the risks of exposure to zinc?

- ☐ Children living near waste sites that contain zinc may be exposed to higher levels of zinc through breathing contaminated air, drinking contaminated drinking water, touching or eating contaminated soil.
- ☐ Discourage your children from eating soil or putting their hands in their mouths and teach them to wash their hands frequently and before eating.
- ☐ If you use medicines or vitamin supplements containing

zinc, make sure you use them appropriately and keep them out of the reach of children.

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

There are tests available to measure zinc in your blood, urine, hair, saliva, and feces. These tests are not usually done in the doctor's office because they require special equipment. High levels of zinc in the feces can mean high recent zinc exposure. High levels of zinc in the blood can mean high zinc consumption and/or high exposure. Tests to measure zinc in hair may provide information on long-term zinc exposure; however, the relationship between levels in your hair and the amount of zinc you were exposed to is not clear.

Has the federal government made recommendations to protect human health?

The EPA recommends that drinking water should contain no more than 5 milligrams per liter of water (5 mg/L) because of taste. The EPA requires that any release of 1,000 pounds (or in some cases 5,000 pounds) into the environment be reported to the agency.

To protect workers, the Occupational Safety and Health Administration (OSHA) has set an average limit of 1 mg/m³ for zinc chloride fumes and 5 mg/m³ 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.



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)

<input type="checkbox"/> Injury	<input type="checkbox"/> Illness	<input type="checkbox"/> Near Miss
<input type="checkbox"/> Property Damage	<input type="checkbox"/> Fire	<input type="checkbox"/> Chemical Exposure
<input type="checkbox"/> On-site Equipment	<input type="checkbox"/> Motor Vehicle	<input type="checkbox"/> Electrical
<input type="checkbox"/> Mechanical	<input type="checkbox"/> Spill	<input type="checkbox"/> 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

ATTACHMENT D
SPECIAL REQUIREMENTS FOR COVID-19

ON-SITE AND OFF-SITE PROCEDURES TO LIMIT CONTAMINATION AND POTENTIAL SPREAD OF COVID-19

Sources: [CDC - COVID-19 Spread and Prevention Information](#); [OSHA - Workplace Preparation](#)

[Guidance; CDC - Guidance on Extended Use/Limited Reuse of Respiratory Protection](#)

- 1) Maintain minimum 6-foot separation from others whenever possible (social distancing). The virus is thought to spread mainly from person-to-person, between people who are in close contact, through respiratory droplets produced when an infected person coughs or sneezes.
- 2) Wash your hands frequently with soap and water. Wash for at least 20 seconds and, if no soap is present, use a hand sanitizer that contains at least 60% alcohol.
- 3) Wear nitrile gloves whenever possible and be especially mindful of touching common surfaces.
- 4) Disinfect commonly touched surfaces frequently, and items frequently used in public immediately upon returning home.
- 5) Face Coverings and Masks:
 - a) On-site: Wear a cloth face covering or mask at all times when there is no issue with maintaining social distancing. N95/KN95 masks or respirators should be reserved for situations where social distancing on-site is difficult or impossible. Appropriate circumstances for donning an N95/KN95 mask or respirator on-site include, but are not necessarily limited to, going inside the Site trailer; and/or entering, exiting, or traversing the Site if proper social distancing cannot be achieved. This tiered approach will help maintain the supply of N95/KN95 masks so they are available for the highest risk scenarios.
 - b) Off-site During Work-related Commute: The CDC now recommends wearing cloth face coverings in public settings where other social distancing measures are difficult to maintain (<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html>). A mask or cloth face covering should be worn during your commute to and from the site if you are unable to achieve proper social distancing. Appropriate times to wear a mask or cloth face covering include, but are not necessarily limited to, walking on crowded sidewalks, traveling in a shared vehicle, and/or if you are required to enter an occupied indoor space to acquire supplies for the site.
- 6) Wear safety glasses or goggles at all times while on-site and some form of eye covering (e.g., sunglasses, prescription and non-prescription glasses, or safety glasses) should be considered when commuting.
- 7) Avoid touching your face (eyes, nose, and mouth).

- 8) Cover your nose and mouth when coughing, sneezing, etc./ cough into elbow.
- 9) Do not spit.
- 10) Try to take your temperature regularly.
- 11) Talk to your supervisor if you, your friends or family members that you live with or spend time with have displayed symptoms of COVID-19, tested positive, or are afflicted with even the common cold/flu.
- 12) Talk to your supervisor if anyone you know at the site tested positive for the COVID-19.
- 13) Follow any additional health & safety protocols required at the site or elsewhere.

APPENDIX B
QUALITY ASSURANCE PROJECT PLAN

975 NOSTRAND AVENUE

BROOKLYN, NEW YORK

Quality Assurance Project Plan

BCP Site Number: TBD
AKRF Project Number: 210225

Prepared for:

Nostrand Green LLC
826 Broadway, 11th Floor
New York, NY 10003

Prepared by:



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

AUGUST 2021

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Table 2 -	Sample Nomenclature Examples

ATTACHMENTS

Attachment A -	Resumes for Project QA/QC Officer, Project Director, Project Manager, and Field Team Leader
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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the protocols and procedures that will be followed during implementation of the Interim Remedial Measures (IRM) Work Plan (IRMWP) at the 1.369-acre site located at 975 Nostrand Avenue in Brooklyn, New York (the “Site”). The Site is also identified as Block 1309, Lot 6. The objective of the QAPP is to provide for Quality Assurance (QA) and maintain Quality Control (QC) of environmental investigative, sampling, and remedial activities conducted during Site remediation and excavation. Adherence to the QAPP will ensure that defensible data will be obtained while completing the remedial work.

2.0 PROJECT TEAM

The project team will be drawn from 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 CFR Part 1910. The following sections describe the key project personnel and their responsibilities.

2.1 Project Director

The project director will be responsible for the general oversight of all aspects of the project, including scheduling, budgeting, data management, and decision-making regarding the field program. The project director will communicate regularly with all members of the AKRF project team and the New York State Department of Environmental Conservation (NYSDEC) to ensure a smooth flow of information between involved parties. Axel Schwendt will serve as the project director for the IRM. Mr. Schwendt’s resume is included in Attachment A.

2.2 Project Manager

The project manager will be responsible for directing and coordinating all elements of the IRM. He will prepare reports and participate in meetings with the Site owner and/or the NYSDEC. Ashutosh Sharma will serve as the project manager for the IRM. Mr. Sharma’s resume is included in Attachment A.

2.3 Remedial Engineer

The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the remedial program and will certify in the Final Engineering Report (FER) that the remedial activities were observed by qualified environmental professionals under her supervision and that the remediation requirements set forth in the IRMWP and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with that Plan. The Remedial Engineer for this project will be Rebecca Kinal, P.E. Ms. Kinal’s resume is included in Attachment A.

2.4 Field Team Leader

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 work plan and Health and Safety Plan (HASP). He will report to the Project Manager on a regular basis regarding daily progress and any deviations from the work plan. The field team leader will be a qualified, responsible person, able to act professionally and promptly during soil disturbing activities. Thomas Giordano will be the field team leader for the IRM. Mr. Giordano’s resume is included in Attachment A.

2.5 Project Quality Assurance/Quality Control Officer

The QA/QC Officer will be responsible for adherence to the QAPP. She will review the procedures with all personnel prior to commencing any fieldwork and will assess implementation of the required procedures. Rebecca Kinal will serve as the QA/QC officer for the IRM.

2.6 Laboratory Quality Assurance/Quality Control Officer

The laboratory QA/QC officer will be responsible for quality control procedures and checks in the laboratory and ensuring adherence to laboratory protocols. He/she will track the movement of samples from the time they are checked in at the laboratory to the time that analytical results are issued. He/she will conduct a final check on the analytical calculations and sign off on the laboratory reports. The laboratory QA/QC officer will be determined upon selection of a contract laboratory(s) for the IRM.

3.0 STANDARD OPERATING PROCEDURES

The following sections describe the standard operating procedures (SOPs) for the remedial activities performed under the IRMWP. During these operations, safety monitoring will be performed as described in the project HASP and all field personnel will wear appropriate personal protective equipment.

3.1 Remedial Measures

3.1.1 Excavation of Soil

Subsurface investigations conducted by EBI Consulting in December 2020 and AKRF in August 2021 indicated concentrations of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and metals above Unrestricted Use Soil Cleanup Objectives (UUSCOs) and/or Restricted Residential Soil Cleanup Objectives (RRSCOs). Additionally, soil vapor analytical results detected low level concentrations of VOCs above the laboratory detection limits in the soil vapor samples. Groundwater samples were not collected during these investigations.

Soil excavation will be conducted as described in the IRM Work plan to remove material exceeding the Track 1 or Track 2 soil cleanup objectives. The soil excavation will be conducted in accordance with a Health and Safety Plan (HASP), designed to provide workplace safety while completing the IRM.

3.1.2 Tank Removal

In the event that tanks are confirmed or encountered at the Site, the tank(s) and any appurtenances will be cleaned, removed and disposed of in accordance with accepted industry standards and applicable Federal, State, and local regulatory agency requirements. Tank and soil removal from the vicinity of discovered underground storage tanks will be conducted in consultation with the NYSDEC.

Typical tank removal procedures are summarized below:

1. Open fill cap or vent pipe and measure for product. Collect a sample of the product. Tank contents will be sampled in accordance with applicable federal, state and local requirements and tested in accordance with the requirements of the receiving facility. Proper disposal of tank contents at an approved facility will be dictated by sample results.

2. Excavate to expose the tank. Vacuum liquid tank contents and pumpable tank bottom residue.
3. Excavate around the tank with care to avoid release of tank and piping contents. Hand excavation around the tank may be necessary. The sides of all excavated areas will be properly stabilized in accordance with OSHA regulations. Continuously monitor the excavated areas in the worker breathing zone for the presence of flammable, toxic or oxygen deficient atmosphere with a photoionization (PID), a combustible gas indicator (CGI), and an oxygen meter.
4. Inert the tank of flammable vapors using dry ice and verify using an oxygen meter (less than 7 percent) or other industry-approved method [e.g., National Fire Protection Association (NFPA) and/or American Petroleum Institute (API)]. An access hole will be cut in the tank and the tank will be thoroughly cleaned of residual liquids and sludges.
5. Entry of the tank, if necessary, shall be conducted in conformance with OSHA confined space requirements.
6. Remaining fuels, loose slurry, sludge materials and wastewater will be collected in DOT-approved drums, sampled and analyzed for disposal characterization. After disposal characterization, waste material will be removed and disposed of in accordance with applicable regulations.
7. Remove the tank and all associated piping from the ground and clean the outside of the tank. The tank and piping will be rendered "not reusable," removed from the site and disposed of according to applicable regulations with proper documentation. Remove and dispose of all concrete tank support structures or vaults as encountered.
8. After tank removal, examine for evidence of petroleum releases in accordance with NYSDEC requirements.
9. Suspect materials will be field-screened with a PID. If soil contamination is present, excavate and remove contaminated soil from the tank areas in accordance with the IRM. Material will be excavated until field screening with a PID yields concentrations of less than 20 parts per million (ppm) and until there are no remaining visible signs of contamination or odors. Endpoint sampling will be conducted as directed by the NYSDEC.
10. Photo-document all procedures and record all procedures in a bound field notebook.

3.2 Soil Sampling

3.2.1 Soil Screening

During soil excavation and any potential tank removal activities, the excavated material will be inspected by AKRF field personnel for evidence of contamination (i.e., separate phase liquid, staining, sheening and/or odors) and field-screened using a PID calibrated at the start of each day in accordance with the manufacturer's instructions. In the event that contamination is discovered during excavation, the excavation will be expanded laterally and in depth until there is no evidence of contamination.

3.2.2 Soil Sampling

Depending upon conditions encountered during construction and monitoring of the Site, soil sampling may be required. Any soil sampling will be conducted according to the following procedures:

- Characterize the sample according to the modified Burmister soil classification system.
- Collect an aliquot of soil from each sampling location and place in a labeled sealable plastic bag. The bag should be labeled with the soil boring number and the depth the sample was collected. Place the plastic bag in a chilled cooler to await selection of samples for laboratory analysis.
- After selecting which samples will be analyzed in the laboratory, fill the required laboratory-supplied sample jars with the soil from the selected sampling location or labeled sealable plastic bags. Seal and label the sample jars as described in Section 4.4 of this QAPP and place in an ice-filled cooler.
- Decontaminate any soil sampling equipment between sample locations as described in Section 3.5 of this QAPP.
- Record boring number, sample depth and sample observations (evidence of contamination, PID readings, soil classification) in field log book and boring log data sheet, if applicable.

3.3 Excavation Backfill

Any imported soil will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(a). Approval will also be based on an evaluation of the land use, protection of groundwater, and protection of ecological resources criteria. Soil will be considered appropriate for use as on-site imported backfill if contaminant concentrations are below the lesser of the 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) for proposed Track 1 Cleanup areas or Restricted Residential Use Soil Cleanup Objectives (RRSCOs) for proposed Track 2 areas, and the Protection of Groundwater Soil Cleanup Objectives (PGWSCOs). Soil that meets the 'exempt' fill requirements under 6 NYCRR Part 360, but does not meet backfill or cover soil objectives for this Site, will not be imported to the Site without prior approval by NYSDEC. Solid waste will not be imported to the Site.

Native material from a virgin quarry source need not be sampled prior to use as backfill on the Site. All other imported material will be tested via collection of one composite sample per 1,000 cubic yards of material from each source. Samples will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, target analyte list (TAL) metals by EPA Method 6000/7000 series, PCBs by EPA Method 8082, pesticides by EPA Method 8081, 1,4-dioxane by EPA Method 8270, and the standard list of 21 per- and polyfluoroalkyl substances (PFAS) compounds by modified EPA Method 537.

3.4 Materials Reuse On-Site

Organic matter (wood, roots, stumps, etc.) or other solid is prohibited for reuse on-site. Soil that does not exhibit evidence of contamination during field screening, and is free of demolition debris will be stockpiled and tested at a frequency of one sample per 1,000 cubic yards and characterized if reuse is contemplated. Each sample will be tested for VOCs by EPA Method 8260, TCL SVOCs by EPA Method 8270, PCBs by EPA Method 8082, pesticides by EPA Method 8081, TAL metals by EPA Method 6000/7000 series, 1,4-dioxane by EPA Method 8270, and the standard list of 21 PFAS compounds by modified EPA Method 537. Samples will be shipped to the laboratory with appropriate chain of custody documentation. The samples will be analyzed in a laboratory following New York State Department of Health (NYSDOH) Analytical Services Protocol (ASP) Category B deliverables.

3.5 Decontamination of Sampling Equipment

All non-disposable sampling equipment (hand augers, sampling spoons, etc.) will be either dedicated or decontaminated between sampling locations. 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® and bristle brush.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air-dry the equipment, if possible.

Decontamination will be conducted within five-gallon buckets to capture decontamination water.

3.6 Management Of Investigation Derived Waste

All excavated soil will be stockpiled and disposed of in accordance with the IRMWP. If field evidence of gross contamination is identified, wastewater from equipment decontamination will be drummed and staged near the point of generation, and will be properly disposed of off-site based on laboratory results. If free of visible contamination, disposable personal protective equipment (PPE) and sampling equipment (scoops, gloves, rope, etc.) will be placed in heavy-duty plastic bags and disposed of properly.

4.0 SAMPLING AND LABORATORY PROCEDURES

4.1 Soil Sampling

Post-excavation endpoint soil samples will be collected to evaluate the conditions of the soil remaining in place. Sampling will be conducted in accordance with the following procedures:

- Field screening for evidence of contamination (e.g., odors, staining, elevated PID measurements). Using a hand auger or sampling spoon, remove a small amount of soil from the bottom or sidewall of the excavation. A grab sample can also be collected from the excavator bucket after targeted soil removal from the excavation. Place the soil in a zip-lock bag and insert the PID through the sealed bag to obtain an organic vapor concentration measurement.
- After selecting which samples will be analyzed in the laboratory, fill the required laboratory-supplied sample jars with the soil from the selected sampling location or labeled sealable plastic bags. Seal and label the sample jars as described in Section 4.4 of this QAPP and place in an ice-filled cooler.
- Decontaminate any soil sampling equipment between sample locations as described in Section 3.5 of this QAPP.
- Record boring number, sample depth and sample observations (evidence of contamination, PID readings, soil classification) in field log book and boring log data sheet, if applicable.

4.2 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. An Environmental Laboratory

Approval Program (ELAP)-certified laboratory will be used for all chemical analyses in accordance with DER-10 2.1(b) and 2.1(f), including Category B Deliverables.

Table 1
Laboratory Analytical Methods for Analysis Groups

Matrix	Analysis	EPA Method	Bottle Type	Preservative	Hold Time
Soil	VOCs	8260C	Encore sampler (3) or Terracore Sampler (1)	4 °C 0 °C within 24 hrs	48 hours to extract 14 days to analyze
	SVOCs	8270D	Glass 8 oz. Jar	4 °C	14 days to extract 40 days to analyze
	TAL Metals	6000/7000 Series, 6010C, and 7196A	Glass 8 oz. Jar	4 °C	6 months holding time; Mercury 28 days holding time
	Pesticides	8081B	Glass 8 oz. Jar	4 °C	14 days to extract 40 days to analyze
	PCBs	8082A	Glass 8 oz. Jar	4 °C	14 days to extract 40 days to analyze
	1,4-Dioxane	8270D; 0.1 mg/kg RL	Glass 8 oz. Jar	4 °C	14 days to extract; 40 days to analyze
	PFAS	Modified 537.1; 0.2 ng/L RL	4 oz. HDPE Plastic Container	≤ 6 °C,	14 days to extract; 40 days to analyze

4.3 Quality Control Sampling

In addition to the laboratory analysis of the endpoint samples and characterization soil samples for reuse and off-site disposal, additional analysis will be included for quality control measures, as required by the Category B sampling techniques. These samples will include field blanks, equipment blanks (for non-disposable sampling equipment), trip blanks, matrix spike/matrix spike duplicates (MS/MSD), and blind duplicate samples at a frequency of one sample per 20 field samples collected.

4.4 Sample Handling

4.4.1 Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody (COC) documents, and laboratory reports using an alpha-numeric code. Groundwater samples will be identified by the monitoring well number, and soil samples will be identified with the sample depth interval (in parenthesis). Soil samples will be labeled with the depth interval and its location carefully measured and logged in the field book.

The blind duplicate samples will be labeled with a dummy sample location to ensure that they are submitted as blind samples to the laboratory. The dummy identification will consist of the sample type followed by a letter. Trip blanks and field blanks will be identified with “TB” and “FB”, respectively, with the collection date in a YYYY/MM/DD format (e.g., TB_20210907 for a trip blank collected on September 7, 2021).

Table 2 provides examples of the sampling identification scheme.

Table 2
Sample Nomenclature Examples

Sample Description	Sample Designation
Endpoint soil sample EP-01 collected from 17 feet below grade on September 7, 2021	EP-01_17_20210907
Matrix spike/matrix spike duplicate sample from EP-01 on September 7, 2021	EP-01_17_20210907_MS EP-01_17_20210907_MSD
Blind duplicate sample collected from EP-04 at 17 feet below grade on September 7, 2021	EP-X_17_20210907
Second blind duplicate soil sample collected from EP-20 on September 15, 2021	EP-X2_17_20210915

4.4.2 Sample Labeling and Shipping

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

- Project identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- 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 or delivered via courier to the laboratory at least twice per week. At the start and end of each workday, field personnel will add ice to the coolers as needed.

The samples will be prepared for shipment/delivery by placing each sample in a sealable plastic bag, then wrapping each container in bubble wrap to prevent breakage, adding freezer packs and/or fresh ice in sealable plastic bags and the chain-of-custody (COC) form. Samples will be shipped overnight (e.g., Federal Express) or transported by a laboratory courier. Samples collected for PFAS analysis will be collected in separate jars and will be kept in separate coolers and segregated from other samples in accordance with NYSDEC's January 2021 *Sampling, Analysis, and Assessment of PFAS Under NYSDEC's Part 375 Remedial Programs*. All coolers shipped to the laboratory will be sealed with mailing tape and a COC seal to ensure that the coolers remain sealed during delivery. Soil vapor samples will not require chilling.

4.4.3 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; and 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.

4.5 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 applicable. Additional calibration will be performed throughout the day as needed. 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 calibrated each day using 100 ppm isobutylene standard gas.

ATTACHMENT A

**RESUMES OF PROJECT QA/QC OFFICER, PROJECT DIRECTOR, PROJECT MANAGER, AND FIELD
TEAM LEADER**

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.



REBECCA KINAL, P.E.

**VICE PRESIDENT-ENVIRONMENTAL
ENGINEER** | p. 2

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



REBECCA KINAL, P.E.

**VICE PRESIDENT-ENVIRONMENTAL
ENGINEER** | p. 3

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.



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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.

Dauids 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).



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Mr. Schwendt is a Vice President for AKRF with over 20 years of experience in the environmental consulting field. Mr. Schwendt has extensive experience in Phase II studies involving subsurface soil and groundwater investigations, and has been involved in all aspects of soil and groundwater remediation, including those related to manufactured gas plants (MGP). He has designed, managed and implemented large-scale site investigations and remedial measures for various properties, including those under different regulatory programs such as the New York State Department of Environmental Conservation's (NYSDEC) Voluntary Cleanup Program and Brownfield Cleanup Program, New York State's Spill Response Program, the Mayor's Office of Environmental Remediation (OER) E-Designation Program, New Jersey's Industrial Site Recovery Act (ISRA), and Pennsylvania's Land Recycling program. Mr. Schwendt manages the hazardous materials tasks for the company's Environmental Impact Statements (EISs) and also conducts and manages Phase I Environmental Site Assessments (ESAs) for various individual clients and industries as well as for area-wide rezoning projects.

Mr. Schwendt has extensive experience in underground and aboveground storage tank (UST and AST) management, including tank removals, installations, and upgrades. He has designed and implemented remedial investigations surrounding UST and AST releases and overseen the installation and maintenance of pump-and-treat and other remedial systems. He has performed storage tank compliance audits and maintenance inspections all across the country and prepared Spill Prevention, Control, and Countermeasures Plans (SPCC Plans) for over 100 individual facilities, including designing and conducting the personnel training programs.

Mr. Schwendt worked with several other firms prior to joining AKRF, which provided him with a variety of skills. He has expertise with Chemical Bulk Storage Spill Prevention Reports, Environmental Emergency Response Plans, Integrated Contingency Plans, and multi-phase compliance audits, including some international projects. He has also performed various types of hydrogeologic testing, including pilot tests, slug tests, pump tests and groundwater modeling, and has been responsible for data review and management.

BACKGROUND

Education

B.A., Earth Science and Environmental Studies, Tulane University, 1991

M.S., Geology, University of Delaware, 2002

Years of Experience

Year started in company: 2002

Year started in industry: 1995

RELEVANT EXPERIENCE

New York City Department of Design and Construction (NYCDDC) Feasibility and Pre-Scoping Services for East Side Coastal Resiliency, New York, NY

Mr. Schwendt assisted with the subsurface exploration program for a multidisciplinary design team selected by the New York City agency partnership of NYCDDC, New York City Department of Parks and Recreation (NYCDPR), and Office of Recovery and Resiliency (ORR) for the Feasibility Study and Pre-Scoping Services for East Side Coastal Resiliency (ESCR) project. The AKRF Team provided technical analysis and pre-scoping



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services, including complex conceptual 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 petroleum-related contamination along a 2.5 mile study area from Montgomery Street to East 23rd Street to develop a Subsurface Investigation Work Plan for approval by the New York City Department of Environmental Protection (NYCDEP). The program included both public and private utility mark-out services across vast areas of the project containing critical infrastructure to enable the installation of 81 deep borings, 515 shallow borings, and 10 temporary groundwater wells.

New York City Health and Hospitals Corporation (NYCHHC)'s Post-Sandy mitigation program at Bellevue, Coler-Goldwater, Coney Island, and Metropolitan Hospitals

AKRF is assisting the NYCHHC in the recovery, reconstruction and hazard mitigation of Bellevue Hospital, Coler Hospital, and Coney Island Hospital and other NYCHHC facilities, which were damaged as a result of the Hurricane Sandy disaster. The majority of the funding for these projects will be reimbursed from the Federal Emergency Management Agency (FEMA). AKRF is collecting baseline information and develop study plan and approach, including assessing for critical path approvals, preparing FEMA NEPA Environmental Assessments (EAs), conducting additional studies required by Federal Regulations for FEMA, permitting, and providing design/bid support. Mr. Schwendt is responsible for the hazardous materials tasks associated with the program, including conducting Phase I ESAs and subsurface (Phase II) investigations, and preparing necessary work plans and Remedial Action Plans (RAPs)/Construction Health and Safety Plans (CHASPs) for federal, state and city agency review and approval.

NYCDEP Task Order Contracts (TOCs) for Design and Construction Management Services Professional Engineering Design Services and Construction Management (PEDS)

AKRF is currently serving as environmental review and permitting subcontractor under all four NYCDEP TOCs contracts and both PEDS contracts that were recently awarded. In addition to the preparation of environmental review/ULURP documentation and permit applications, AKRF's responsibilities include site selection support, site/civil design, and the preparation of various permit management plans and regulatory compliance tracking in accordance with DEP's Project Delivery Manual. Mr. Schwendt is providing Hazardous Materials consulting services for the TOCs and PEDS contracts, including:

- Prospect Expressway Pump Station Upgrade;
- Clearview Pump Station Reconstruction;
- Rockaway Wastewater Treatment Plant Level 1 Biological Nutrient Removal (BNR) Upgrade; and
- Oakwood Beach Wastewater Treatment Plant Headworks Improvements.

Verdopolis JFK Airport Facility, Queens, NY

On behalf of Verdopolis JFK, AKRF prepared documentation for a New York State Department of Environmental Conservation (NYSDEC) Part 360 Solid Waste Management Facility Permit application. The facility, which would be constructed at the abandoned Hangar 16 site of the John F. Kennedy International Airport (JFK Airport), would process 180,000 tons per year of source separated, pre-consumer organic waste generated largely by food preparation facilities at JFK Airport. Using an anaerobic digestion process, the proposed facility would convert the food waste, which would otherwise be discarded in a landfill or incinerated, into three usable products. Mr. Schwendt assisted in preparing the application package, including preparation of the Engineering Report, Operations and Maintenance Plan, Contingency Plan, Facility Closure Plan, Hiring and Training Plan,



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Chemical Bulk Storage Spill Prevention Report, and the Spill Control Prevention and Countermeasure Plan (SPCC Plan). Mr. Schwendt also prepared a Phase I Environmental Site Assessment (ESA) of the property to ascertain potential environmental conditions that may be exposed during site development activities.

2477 Third Avenue, Bronx, NY

Mr. Schwendt prepared the application to enter the former 2477 Third Avenue gasoline station property into the New York State Department of Environmental Conservation's (NYSDEC) Brownfield Cleanup Program (BCP). Since its acceptance into the program, Mr. Schwendt has been managing and coordinating the remedial investigation of the site, including shallow and deep aquifer groundwater testing, delineation of known areas of soil contamination, soil vapor analyses, and investigation for potential non-aqueous phase liquid (DNAPL) from past industrial activities in the surrounding area. Mr. Schwendt was responsible for developing work plans for approval by the NYSDEC and New York State Department of Health (NYSDOH), and for preparing summary reports for public comment. As part of the project, Mr. Schwendt coordinated with the client, lawyers, and architects of the planned development, tenants of neighboring properties, NYSDEC, NYSDOH, and the New York City Department of Environmental Protection (NYCDEP). Mr. Schwendt is also conducting the work necessary to address a hazardous materials E-Designation assigned to the property.

E-Designation Properties/Voluntary Cleanup Program, New York City, NY

Mr. Schwendt has assisted various public and private clients with addressing E-Designations assigned by the New York City Department of Environmental Protection (NYCDEP) to properties throughout New York City. He has prepared the required Phase I Environmental Site Assessments (Phase I ESAs) and implemented Phase II testing to the satisfaction of the New York Office of Environmental Remediation (OER). Based on the results of the testing, he has prepared Remedial Action Plans (RAPs) and Construction Health and Safety Plans (CHASPs) for approval by the NYCOER, which included strategies for mitigating on-site environmental conditions and plans for incorporating environmental engineering controls into proposed construction projects. Mr. Schwendt's clients promptly receive the Notice of Satisfaction necessary to acquire building permits from the New York City Department of Buildings (DOB). Mr. Schwendt has also managed several projects enrolled in the New York City Voluntary Cleanup Program.

St. George Ferry Terminal, Staten Island, NY

Mr. Schwendt prepared a Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) for the Department of Transportation's (DOT) St. George Ferry Terminal facility in Staten Island. The facility's bulk containers store over 600,000-gallons of petroleum used to fuel boilers and emergency generators, provide oil for maintenance and repair of equipment and vessels, and to fuel the ferry vessels. Mr. Schwendt also consulted the DOT on how to upgrade the facility's fueling systems to comply with the SPCC and New York State Department of Environmental Conservation (NYSDEC) regulations.

Mount Sinai Medical Center, Manhattan, NY

Mr. Schwendt managed the Hazardous Materials task for the environmental assessment of the Mount Sinai Medical Center, which is constructing a 700,000 sf, mixed-use residential and bio-medical research facility building. His work included managing the Phase I Environmental Site Assessment (ESA), Phase II investigation, and preparing the Remedial Action Plan (RAP) and Construction Health and Safety Plan (CHASP) approved by the New York City Department of Environmental Protection (NYCDEP).

Lincoln Center Development Project, New York, NY

On behalf of the Lincoln Center Development Project, Inc., Mr. Schwendt conducted a Subsurface (Phase II) Investigation in the area of an underground storage tank (UST) farm located beneath the lower garage level of the West 62nd Street parking garage at Lincoln Center. The Phase II study was prompted by a request from the New York State Department of Environmental Conservation (NYSDEC) to properly close out the tanks. The tank farm includes seventeen (17) 550-gallon gasoline USTs and one (1) 550-gallon waste oil UST. The purpose of this Phase



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II investigation was to determine whether historic leaks from the tanks had affected the subsurface and to assist with future tank closure activities. The Phase II report was submitted to the NYSDEC for review and included a request to close the tanks in-place instead of removing them due to the structural constraints of the tank farm location. Mr. Schwendt also managed the closure of the 18 UST's to the satisfaction of the NYSDEC.

512-522 Vanderbilt Avenue, Brooklyn, NY

On behalf of the Empire State Development Corporation (ESDC), AKRF was retained to provide hazardous material consulting services in connection with the former gasoline station property located at 512-522 Vanderbilt Avenue. Mr. Schwendt performed a Phase I Environmental Site Assessment (ESA), a geophysical survey of the site, and a soil and groundwater subsurface investigation. Data from the investigation would be used to assess remedial strategies during development of the site.

Whitney Museum of American Art, Gansevoort Facility, New York, NY

AKRF has provided various consulting services in support of the Whitney Museum of American Art's long-term planning requirements. Tasks have included transportation surveys, traffic counts, attendance projections, visual impact and shadow studies, economic benefit studies, and two Environmental Assessment Statements (EASs) for proposed new facilities for the Museum. Mr. Schwendt was responsible for the hazardous materials elements of the assessment, including preparing a Phase I ESA and conducting several Subsurface (Phase II) Investigations for review by the New York City department of Environmental Protection (NYCDEP) and Mayor's Office of Environmental Remediation (OER). Mr. Schwendt prepared and managed the implementation of the OER-approved Remedial Action Plan (RAP) for the construction project and is responsible for satisfying all of the associated regulatory reporting requirements. Environmental work at the site also included mitigating a petroleum spill discovered during site excavation activities and coordinating all remedial efforts with the New York State Department of Environmental Conservation's (NYSDEC) Department of Environmental Remediation (DER).

New York Botanical Garden, Bronx, NY

The New York Botanical Garden (NYBG) proposed to construct an accessory parking garage of approximately 825 spaces at Bedford Park Boulevard and Webster Avenue in the Bronx to provide a parking garage for staff and visitors who cannot be accommodated within NYBG's on-site facilities. Mr. Schwendt was the Project Manager for the environmental assessment's hazardous materials work, which included a Phase I Environmental Site Assessment (ESA), Phase II Investigation and the preparation of a Remedial Action Plan (RAP) and a Construction Health and Safety Plan (CHASP) to the satisfaction of the New York City Department of Environmental Protection (NYCDEP). As construction proceeds, Mr. Schwendt will be responsible for managing the environmental monitoring during all subsurface work and preparing the post-construction Closure Report required by the NYCDEP in order to receive the Notice of Satisfaction necessary to obtain occupancy permits from the New York City Department of Buildings (DOB).

Roberto Clemente State Park, Bronx, NY

AKRF participated in the rehabilitation of an existing ballfield, redevelopment of the existing picnic areas, and shoreline restoration along the Harlem River at Roberto Clemente State Park. AKRF is charged with preparing the Joint Permit Application which is necessary to procure the federal, state and local permits and approvals for the shoreline redevelopment. Mr. Schwendt worked with the firm's engineering group to conduct testing to pre-characterize soil to assist with the management of soil during construction. The testing included pre-characterization of soil for on-site reuse in accordance with the New York State Department of Environmental Conservation (NYSDEC) tidal wetland permit requirements and testing for physical parameters required for landscape planning.

Long Island Power Authority (LIPA), Long Island, NY



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Mr. Schwendt managed the preparation of Phase I Environmental Site Assessments and Phase II Investigations, along with the Hazardous Materials chapters for Environmental Impact Statements, for properties owned or to be acquired by LIPA to identify potential sources of environmental contaminants prior to power station and power line installation.

Rose Plaza on the River, Brooklyn, NY

Mr. Schwendt conducted a Subsurface (Phase II) Investigation at the 470 Kent Avenue property located in Brooklyn, New York. The objective of the subsurface investigation was to characterize the subsurface soil and groundwater conditions and determine whether past or present on-site and/or off-site potential sources of contamination have adversely affected the site. Results of the Phase II study were also used to evaluate any potential environmental risks and/or the need for remedial action at the site prior to future development. The proposed development of the site includes the construction of approximately 665 market rate dwelling units and approximately 33,750 square feet of commercial uses. The scope of the Phase II study was based on a Phase I Environmental Site Assessment (January 2004) performed by AKRF, which identified recognized environmental conditions for the site, including the potential for soil and groundwater contamination from a historical on-site manufactured gas plant, and potential underground storage tanks. Phase II activities were conducted in accordance with AKRF's Sampling Protocol and site-specific Health and Safety Plan (HASP), which was reviewed and approved by the New York City Department of Environmental Protection (NYCDEP).

Albert Einstein College of Medicine Environmental Investigation, Bronx, NY

Mr. Schwendt managed a Subsurface (Phase II) Investigation at an approximately eight-acre portion of the Jacobi Medical Center fronting on Eastchester Road in the Bronx, New York. The site, owned by New York City, contained an old boiler house, a storage warehouse, a laundry facility, and several paved parking areas. The objective of the subsurface investigation was to characterize the subsurface conditions on the property and determine whether past or present on-site and/or off-site potential sources of contamination have adversely affected the site.

Storage Deluxe, Various Locations, NY

Mr. Schwendt is currently the project manager for assisting Storage Deluxe with the ongoing expansion of their self-storage facilities primarily in the five boroughs of New York City and Westchester County. He conducts and manages environmental due diligence needs related to their property transactions, including Phase I Environmental Site Assessments (ESAs), Phase II investigations, and geophysical surveys, as well as consulting on petroleum bulk storage tank management. He assists Storage Deluxe in making decisions with respect to environmental risk issues.

South Bronx Overall Economic Development Corporation (SoBRO) Port Morris Brownfield Opportunity Areas (BOA), Bronx, NY

Mr. Schwendt is assisting SoBRO with the in-depth and thorough analysis of existing conditions, opportunities, and reuse potential for properties located in the proposed Port Morris Brownfield Opportunity Area with an emphasis on the identification and reuse potential of strategic brownfield sites that may be catalysts for revitalization. His work so far has included the preparation of Phase I Environmental Site Assessments (ESAs) and conducting Phase II investigations for the catalyst sites and advising on the suitability of enacting zoning changes to permit various property uses. Mr. Schwendt also assisted SoBRO with the BOA application process.

Kings Plaza, LLC Total Energy Plant, Brooklyn, NY

Mr. Schwendt has conducted regular environmental compliance reviews of the Kings Plaza Total Energy Plant (TEP) in Brooklyn, New York. The reviews were conducted to observe operations and to review environmental permits, agency correspondence, operating records, recordkeeping and monitoring procedures, and regulatory reporting requirements. As a result of the review, Mr. Schwendt provided the TEP with recommendations for the



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management of various waste streams and petroleum/chemical bulk storage associated with facility operations and prepared a Spill Control Prevention and Countermeasure Plan (SPCC Plan) for the facility.

270 Greenwich Street, New York NY

Mr. Schwendt conducted a subsurface (Phase II) investigation that included the advancement of soil borings and the collection of soil and groundwater samples from the 270 Greenwich Street property in the Tribeca neighborhood of New York City. The site will be developed with approximately 402 dwelling units (172 rental units and 230 for sale condominiums), approximately 224,084 gross square feet of destination and local retail space, and below-grade public parking. The purpose of this Phase II subsurface investigation was to ascertain subsurface soil and groundwater quality beneath the site and determine whether past on- or off-site operations have affected the property. The subsurface investigation was also intended to determine whether there are any special handling or disposal requirements for pumped groundwater, should dewatering be necessary during site development. The Phase II study included soil and groundwater sampling as well as a geophysical investigation to determine whether unknown underground storage tanks were present at the site. Field activities were performed in accordance with Mr. Schwendt's Sampling Protocol and Health and Safety Plan (HASp), which were approved by the New York City Department of Environmental Protection (NYCDEP).

Columbia University Manhattanville Rezoning and Academic Mixed-Use Development, New York, NY

Mr. Schwendt managed the hazardous materials task on the Environmental Impact Statement (EIS) for approximately 4 million square feet of new academic, research and neighborhood uses to be constructed north of Columbia University's existing Morningside Heights campus. The work included more than 25 Phase I Environmental Site Assessments (ESAs) for the properties within the rezoning area and estimates for upcoming investigation and remediation. In addition, a Preliminary Environmental Site Assessment (PESA) was completed for the whole project area. Recognized environmental concerns in the area included: current and historical underground storage tanks; current and historical auto-related use such as repair shops and gasoline stations; two historical manufactured gas holders; and a Consolidated Edison cooling plant located on West 132nd Street. Mr. Schwendt conducted a subsurface investigation at the site to characterize the subsurface conditions on the property and determine whether past or present on-site and/or off-site potential sources of contamination have adversely affected the study site, and to use the analytical data to evaluate any potential environmental risks and/or the need for remedial action at the site prior to future development. Based on the results of the investigation, Mr. Schwendt prepared a Remedial Action Plan (RAP) and Construction Health and Safety Plan (CHASP) for the project, which was approved by the New York City Department of Environmental Protection (NYCDEP).

Hudson River Park, New York, NY

Mr. Schwendt serves as the on-call environmental consultant for the ongoing development of the Hudson River Park, the approximately 5 to 6 mile section of waterfront property from Battery Place to 59th Street along the western edge of Manhattan. He conducts subsurface investigations, coordinates tank removals, implements soil and groundwater remediations, provides guidance on construction and environmental health and safety issues, interfaces with regulatory agencies as necessary, and manages the mitigation of environmental conditions encountered during site development activities.

Brooklyn Bridge Park, Brooklyn, NY

AKRF is providing environmental planning and review services for the development of a new 70-acre park that will revitalize 1.5 miles of the East River waterfront between Jay Street and Atlantic Avenue. When completed, the park will provide open space, recreational facilities, a hotel, restaurants, and retail, historic, and educational venues. Mr. Schwendt was involved with the completion of the Environmental Impact Statement (EIS) and conducted a Phase I Environmental Site Assessment (ESA) and Phase II Subsurface Investigation for the proposed Brooklyn



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Bridge Park area. He serves as the park's on-call consultant for addressing environmental conditions as development progresses and has conducted several tank removals and contaminated soil delineation and remediation projects for various sections of the park.

Titan Property Management, Rego Park, NY

Mr. Schwendt was involved with an extensive site investigation for a property involved in the New York State Voluntary Cleanup Program. The property was resting on a plume of PCE contamination. The goal of the investigation was to determine whether the property is the source of the contamination and to collect data to provide information for the design and implementation of a site remedial system. The investigation involved extensive soil, soil gas, and groundwater investigation, and included the investigation of surrounding properties.

ABCO Refrigeration Company, Long Island, NY

Mr. Schwendt managed a tank closure and dry well assessment and remediation project for the ABCO Refrigeration Company. Historic contamination was found seeping from the ground in the location of an old underground storage tank, which is believed to be a source of adverse impact. An adjacent drywell was impacted by the tank as well as from past dumping activities of a former typewriter ribbon ink manufacturing company. A site-wide investigation of the ten drywells was also implemented at the request of the Nassau County Department of Health. Mr. Schwendt undertook soil remedial activities that led to the property receiving closure with respect to the underground storage tank. Drywell remedial activities were successful and the site received approval from the United States Environmental Protection Agency (USEPA) to continue use of on-site drywells.

Levin Management Corporation Property—Site Investigation, Pelham Manor, NY

Mr. Schwendt was involved in the site investigation of a former manufactured gas plant (MGP) that handled petroleum off-loading and storage until the late 1950s. Soils have also been observed to have been affected by non-aqueous phase liquid (NAPL) consisting of oil- and tar-like material. Floating or light NAPL (LNAPL) has also been detected in on-site groundwater. The objectives of the site investigation were to collect additional data to further determine the extent of NAPL-affected soil both above and below the water table throughout the site and to further delineate groundwater contamination throughout the site. The site investigation also sought to confirm the on-site groundwater flow direction and that NAPL had not migrated to the downgradient perimeter of the site, including Eastchester Creek. Mr. Schwendt was brought on board for this project for his expertise in soil and groundwater MGP contaminant delineation.

NYCDEP Bureau of Environmental Engineering 26th Ward Wastewater Treatment Plant—Site Investigation, Brooklyn, New York

Mr. Schwendt managed and conducted environmental sampling and testing at the 26th Ward Wastewater Treatment Plant property located in Brooklyn, New York. This investigation was performed to determine the presence or absence of contamination in the soil and groundwater that would affect the proposed construction of a new raw sewage pump station. Mr. Schwendt provided the 26th Ward with the protocol necessary for the special handling and disposal of the excavated soil as well as for the groundwater that would be pumped during dewatering operations.

Olnick Organization, New York, NY

AKRF was retained by the Olnick Organization to prepare and implement an Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) for their aboveground storage tank system for an office building in Manhattan. Mr. Schwendt performed the site inspections and provided the Olnick Organization with a list of recommendations for upgrades to their fuel transfer piping system that would bring the facility into compliance with SPCC regulations. He also provided Olnick with a plan for implementing the required SPCC training program for their facility personnel.



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Site investigations of former MGP Facilities/Properties for Consolidated Edison, New York City, NY & Westchester County, NY

While with another firm, Mr. Schwendt worked on this project, which included a service station in New York City and an electrical substation in Westchester County, New York. Mr. Schwendt performed the site characterizations, including subsurface soil and groundwater impact delineation and aquifer testing. The findings from these characterizations are being used by Consolidated 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.

UST Site Investigation and Remediation for Consolidated Edison Service Center, Queens, NY

While with another firm, Mr. Schwendt worked on this project, which included due diligence site reviews, soil boring installation, monitoring well installation, hydrogeologic testing, and water quality sampling. Risk-based closures incorporating natural attenuation and groundwater monitoring activities have been proposed. Remedial work plans are under development for other facilities where more aggressive remedial actions are required. Mr. Schwendt also performed subsurface investigations and site characterizations for several other Consolidated Edison facilities including soil-gas surveys and a radiological scoping survey.

Petroleum Bulk Storage Management Program for Bell Atlantic-New York (now Verizon), Manhattan, Brooklyn, Queens, Bronx, Staten Island, and Long Island, NY

While with another firm, Mr. Schwendt personally designed and conducted subsurface investigations for underground storage tank (UST) remediations including characterization of releases, soil and ground water investigations, pilot tests, slug tests, pump tests, groundwater modeling, horizontal and vertical impact delineation, and preparation of compliance documentation for regulatory agencies. He performed oversight of the installation of 'pump and treat' remedial systems and performed maintenance activities. He also supervised UST installations, upgrades and closures; implemented tank tightness testing programs; addressed on-site health and safety issues and other regulatory requirements; prepared closure reports; and managed soil disposal.

Hertz Rent-A-Car Corporate Headquarters, Park Ridge, NJ

While with another firm, Mr. Schwendt served as an in-house consultant/project manager for the environmental department at Hertz's corporate office in Park Ridge, New Jersey. He managed Phase I and Phase II investigations for real estate purchases, leases and acquisitions throughout the United States and Canada. He coordinated Hertz's subcontractors and environmental consulting firms, reviewed reports, and made recommendations to the legal and real estate departments with respect to environmental risk issues.

Temple University, Philadelphia, PA

Mr. Schwendt was a lead auditor for a multi-phase compliance audit of the five campuses of Temple University. The audit included an assessment of all of the Temple University Hospitals, the School of Medicine, the College of Science and Technology, the Tyler School of Art, the College of Engineering, Ambler College (Community and Regional Planning, Horticulture, and Landscape Architecture), the Physical Plant Department, and all university facilities and maintenance departments. Regulatory programs targeted as part of the audit included, but were not limited to, federal and state air and water programs, hazardous waste management, hazardous chemicals and substances, Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) for pesticides, emergency response, Community Right-to-Know, Toxic Substance Control Act (TSCA), and petroleum bulk storage regulations. Following completion of the audit, Mr. Schwendt prepared and implemented an environmental management system that conformed to the needs and culture of the Temple University organization.

University of Pennsylvania, Philadelphia, PA



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Mr. Schwendt was the lead auditor for an environmental compliance audit of the University of Pennsylvania's Department of Environmental Health and Radiation Safety. The audit included an assessment for the preparation and implementation of the university's Spill Prevention, Control, and Countermeasures Plans (SPCC Plans). Mr. Schwendt prepared and implemented the university's environmental management program and provided training for the facility personnel.

Wistar Institute, Philadelphia, PA

Mr. Schwendt was the lead auditor for an environmental compliance audit of the Wistar Institute, an independent non-profit biomedical research institute in West Philadelphia, Pennsylvania. The multi-phase audit comprised an assessment of the entire facility for compliance with federal, state and local environmental regulations and included the development of an environmental management system.

Seton Hall University, South Orange, NJ

Mr. Schwendt was a lead auditor for a multi-phase compliance audit of the Seton Hall University campus. The audit comprised an assessment of the entire facility for compliance with federal and state air and water programs, hazardous waste management programs, hazardous chemicals and substances programs, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) for pesticides, emergency response and Community Right-to-Know regulations, the Toxic Substance Control Act (TSCA), and petroleum bulk storage regulations. The audit included the development and implementation of an environmental management system for the Seton Hall University faculty and staff.

New York City College of Technology (City Tech) Academic Building, Brooklyn, New York

Mr. Schwendt is assisting the City University of New York (CUNY) and the Dormitory Authority of the State of New York (DASNY) in addressing the E-Designation assigned to the New York City College of Technology (City Tech) redevelopment project site in Brooklyn, New York. CUNY is proposing to construct an eight-story academic building with classrooms, laboratories, administrative space, and underground parking. Mr. Schwendt conducted the required Phase I Environmental Site Assessment (ESA) and Phase II testing to the satisfaction of the Mayor's Office of Environmental Remediation (OER) and will assist CUNY with entering the project site in the City's Voluntary Cleanup Program (VCP). The work will include preparing the required Remedial Action Plan (RAP) and Construction Health and Safety Plan (CHASP) and conducting the necessary environmental monitoring during construction. Mr. Schwendt will also prepare the closure documentation required for CUNY to receive the Notice of Satisfaction necessary to obtain occupancy permits from the New York City Department of Buildings (DOB).

New York University Langone Medical Center, New York, NY

Mr. Schwendt managed the hazardous materials task on the EAS for the NYU Langone Medical Center (NYULMC) development project in Manhattan, New York. NYULMC is in the process of developing the Kimmel Program, which consists of two new buildings on its main campus: the Kimmel Pavilion to house hospital functions and an Energy Building to house a combined heat and power (CHP) plant, primary electric service and emergency generators to support the campus, as well as space for patient care (specifically, radiation oncology). The work included conducting Phase I Environmental Site Assessments and Phase II subsurface investigations at each site to characterize the subsurface environmental conditions at the project site. Based on the results of the investigations, a Remedial Action Plan (RAP) and Construction Health and Safety Plan (CHASP) were prepared for each project phase for submission to the New York City Department of Environmental Protection (NYCDEP) and Mayor's Office of Environmental Remediation (OER). Mr. Schwendt will assist NYULMC by conducting the environmental monitoring required by the agency-approved RAPs/CHASPs as construction progresses, and will prepare the closure documentation required by the agencies to obtain Certificates of Occupancy from the New York City Department of Buildings (DOB).

DASNY Term Environmental Consultant 2006-2012 and 2012-2016, Various Locations, NY



AXEL E. SCHWENDT

VICE PRESIDENT

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Mr. Schwendt serves as a hazardous materials task leader under the firm's on-call contract with DASNY, through which AKRF is providing State Environmental Quality Review Act (SEQRA) and City Environmental Quality Review (CEQR) environmental review services for a wide range of educational, healthcare and other institutional projects, as well as specialized technical services in historic and archaeological resources, hazardous materials, traffic, air quality, noise, and natural resources. Mr. Schwendt has also assisted DASNY with addressing E-Designations and by conducting various types of environmental investigations, including Phase I and Phase II assessments.

NYCDEP Permit Resource Division On-Call Contract, New York, NY

Under subcontract to a national engineering firm, and as part of two successive Program Management contracts, AKRF is providing support in a wide range of technical areas related to environmental and engineering permits for NYCDEP capital projects. These services fall into two major categories: preparing detailed guidance documents that will be used by project designers and construction managers on future projects, in order to expedite permit approvals and prevent delays; and providing expert review and guidance regarding permits for current projects, in order to ensure completeness of permit applications and effective coordination with regulatory agencies. The technical areas covered by AKRF include: wetlands, groundwater, surface water, and other natural resources; hazardous materials; traffic and transportation; air quality; noise and vibration; historic and archaeological resources; stormwater management; open space and parkland; and a broad range of permits and approvals from the New York City Fire Department (FDNY), the New York City Police Department (NYPD), the New York City Department of Buildings (NYCDOB), and other municipal agencies. AKRF is also helping NYCDEP improve the overall process for tracking environmental and engineering permits and approvals, from the planning and design phases of a project to construction and long-term operation. Mr. Schwendt provides consulting services related to the hazardous materials issues.

ASHUTOSH SHARMA

SENIOR ENVIRONMENTAL SCIENTIST

Ashutosh Sharma is an Environmental Scientist providing expertise in Phase I and Phase II (subsurface) site investigation, remediation and cleanup of contaminated sites, and construction oversight. He has experience with subsurface soil, groundwater and sub-slab air/vapor sampling procedures, coordinating and running Community Air Monitoring Plans (CAMP) and is familiar with relevant United States Environmental Protection Agency (USEPA), New York State Department of Environmental Conservation (NYSDEC), and New York City Department of Environmental Protection (NYCDEP) environmental laws and regulations.

BACKGROUND

EDUCATION

M.S., Environmental Science, New Jersey Institute of Technology, 2007
B.Tech, Dr. B.R. Ambedkar National Institute of Technology, India, 2005

Years of Experience

Year started in industry: 2007
Year started in company: 2007

RELEVANT EXPERIENCE

NYU Langone Medical Center (NYULMC) – Kimmel Pavilion, New York, NY

New York University Langone Medical Center enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate the property located at 424 East 34th Street in Manhattan. The proposed development consisted of a new medical facility. Mr. Sharma provided construction oversight during site excavation, spill investigation and remediation, coordination and management of soil removal, oversight of the on-site air monitoring program, identification and proper management of contamination encountered during excavation work, and maintenance of critical paperwork.

551 Tenth Avenue, New York, NY

Extell 4110 LLC enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate the property located at 547-551 Tenth Avenue in Manhattan. The property was developed with a 52-story residential building with one sub-grade level. Mr. Sharma provided construction oversight during site excavation, spill remediation, coordination and management of soil removal and fill material imports, oversight of the on-site air monitoring program, identification and proper management of contamination encountered during excavation work, and maintenance of critical paperwork and preparation of the final closure report.

New York City School Construction Authority, Various Locations, NY

Under contract with the School Construction Authority (SCA) of New York City, AKRF is providing assistance with water disinfection projects for new schools and for plumbing upgrades for existing school buildings. Mr. Sharma has been providing assistance with contractor oversight work during the disinfection process as per the contract agreement.

Yankee Stadium Demolition, Bronx, NY

The New York City Economic Development Corporation (NYCEDC) project include demolition of the old Yankee Stadium and construction of a ball field known as Heritage Field. Mr. Sharma provided air monitoring and remedial action plan (RAP) oversight during the demolition and soil disturbance work.

East River Science Park, New York, NY

The New York City Economic Development Corporation (NYCEDC) proposed to construct two seventeen-story buildings to serve as a biomedical research center. The space between the two towers included an elevated atrium and an outdoor plaza on top of a parking garage. Mr. Sharma provided construction oversight during site excavation, coordination and management of soil removal and fill material imports, oversight of the on-site air monitoring program, identification and proper management of contamination encountered during excavation work, and maintenance of critical paperwork and preparation of the final closure report.

Whitney Museum of American Art, NY

Mr. Sharma provided assistance with subsurface soil and groundwater investigation, construction oversight and soil disposal management during the remediation phase of the project. The project included the construction of approximately 230,000-square foot museum building with one sub-grade level with exhibition galleries, administrative offices, accessory use (café and bookstore), storage space, and an approximately 4,000-square foot restaurant.

W 61st Street Site, NY

Mr. Sharma provided assistance with construction oversight during site excavation activities and helped prepare the final closure report for the site which, as part of the Brownfield Cleanup Program (BCP), was slated for redevelopment as two residential buildings with a courtyard and a tennis court.

164 Kent Avenue, Brooklyn, NY

The site was developed as mixed-use residential-commercial high rise towers with an esplanade and a pier on the East River. Mr. Sharma provided assistance with construction oversight during soil handling activities and running the Community Air Monitoring Plan (CAMP).

285 Jay Street, Brooklyn, NY

Under contract with the Dormitory Authority of the State New York (DASNY), AKRF completed a Phase II Subsurface investigation at the site of a proposed CUNY educational building to satisfy New York City E-designation requirements. As part of the work AKRF performed at the site, Mr. Sharma conducted subsurface soil and groundwater investigation work and coordinated with the driller and the property owner for successful completion of the work.

MTA Long Island Railroad, East Side Access Project, New York, NY

The Metropolitan Transportation Authority (MTA) sponsored the East Side Access project to connect the Long Island Railroad to the Grand Central Terminal, thereby allowing Long Island commuters direct access to the East Side of Manhattan. Mr. Sharma provided assistance with the execution of the Community Air Monitoring Plan (CAMP) at various locations during the construction phase.

2341–2357 Adam Clayton Powell Jr. Boulevard, New York, NY

AKRF performed a Phase II study to meet the requirements of the New York City Department of Environmental Protection (NYCDEP) and to determine whether subsurface conditions had been affected by the on-site and/or off-site petroleum storage tanks and to ascertain whether current or

former on- or off-site activities had adversely affected the subject property. Mr. Sharma conducted sub-surface soil and groundwater investigation at the abandoned site slated for future development. He was responsible for coordinating with the driller and the property owner for successful completion of the work.

THOMAS GIORDANO

ENVIRONMENTAL SCIENTIST

Thomas Giordano is an Environmental Scientist in AKRF's Hazardous Materials Department. He has experience in air monitoring and construction oversight. Mr. Giordano is a graduate of the Class of 2015 at the State University of New York, College at Oneonta, where he majored in both Environmental Science and Geography.

BACKGROUND

Education

B.S., Environmental Science, State University of New York, College at Oneonta, Oneonta, NY

B.A., Geography, State University of New York, College at Oneonta, Oneonta, NY

Certifications

40-Hour OSHA HAZWOPER Certified

10-Hour OSHA Construction Certified

Years of Experience

Year started in company: 2015

Year started in industry: 2014

RELEVANT EXPERIENCE

Larkin Plaza, Yonkers, NY

Mr. Giordano served as a field lead for this project, also a NYSDEC Brownfield Cleanup Program Site. His responsibilities included general construction oversight of excavation and foundation activities. Mr. Giordano also oversaw In-Situ Chemical Oxidation (ISCO) treatment of petroleum-contaminated groundwater and soils. He also conducted the implementation of Community Air Monitoring Program (CAMP) as well as oversight of non-hazardous soil disposal, installation of sections of the sub-slab depressurization system (SSDS) and the collection of confirmatory endpoint soil samples.

145 West Street, Brooklyn, NY (June 2015-Present)

Mr. Giordano received his 40-Hour OSHA HAZWOPER training in June 2015 and was placed as the field lead on this NYSDEC Brownfield Cleanup Program Site, an entire city block development in Greenpoint, Brooklyn. His responsibilities on-site included general construction oversight of excavation and foundation activities. He also conducted the oversight of the Community Air Monitoring Program (CAMP) as well as soil and vapor monitoring, signing of both hazardous and non-hazardous waste disposal manifests, oversight of the installation of the building's sub-slab depressurization system (SSDS) and the collection of field samples including soil and groundwater. Mr. Giordano has also conducted site turnover reporting after remedial completion at 145 West Street. Mr. Giordano is periodically involved with the project as it remains ongoing.

Tres Puentes, L.P. Bronx, NY (April 2016-Present)

Mr. Giordano served as the field lead for this project, a NYSDEC Brownfield Cleanup Program Site. His responsibilities included general construction oversight of excavation, foundation and deep foundation installation activities. He also conducted the oversight of the Community Air Monitoring Program (CAMP) as well as soil and



THOMAS GIORDANO

ENVIRONMENTAL SCIENTIST

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vapor monitoring, signing of non-hazardous waste disposal manifests, inspection of the installation of sub-slab vapor barrier products and the collection of field samples including soil, soil vapor and groundwater.

School Construction Association (SCA) Lead Water Sampling

Mr. Giordano conducted lead water sampling for the School Construction Association (SCA) at various sites throughout the spring of 2016.

Metropolitan Transportation Authority (MTA) Paratransit Facility, Bronx, NY

Mr. Giordano serves as the field lead on this project, under oversight of the NYSDEC. Mr. Giordano's responsibilities so far have included the firm's representative at contractor, client and on-site meetings, as well as conducting construction oversight during remedial work.

Miscellaneous Projects

Mr. Giordano has served as field coverage on various projects in 2017, most notably: Brookfield Manhattan West Southeast Tower, New York, NY; The Crossing at Jamaica, Jamaica, Queens and 810 Fulton Street, Brooklyn, NY.

Rego Park, Queens

Mr. Giordano conducted low-flow groundwater sampling in Rego Park, Queens.

Langan Engineering & Environmental Services (Summer 2014, Winter 2015)

As an Environmental Intern, Mr. Giordano was exposed to all phases of the environmental remediation process. Mr. Giordano assisted with Phase I property inspections, including the Long Island College Hospital, and residential sites. He also participated/assisted in Phase II waste characterizations on several projects. Mr. Giordano was on-site for Phase III, during construction, most notably: 501 West 17th Street (MGP site for the DEC), 50 West Street, and the Hudson Yards. Mr. Giordano participated in setting up the Community Air Monitoring Program at various sites, endpoint soil sampling, and groundwater sampling.

