

APPENDIX B
STANDARDS, CRITERIA, AND GUIDANCE

APPENDIX B

1.0 1SCG'S FOR SITE CHARACTERIZATION AND REMEDIAL INVESTIGATION

The following standards and criteria typically will apply to Site Characterizations and Remedial Investigations conducted in New York State:

- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes
- 6 NYCRR Part 375 – Environmental Remediation Programs
- 6 NYCRR Parts 700-706 - Water Quality Standards
- 6 NYCRR Part 182 - Endangered & Threatened Species of Fish & Wildlife
- 6 NYCRR Part 608 - Use and Protection of Waters
- 6 NYCRR Part 661 - Tidal Wetlands - Land Use Regulations
- 6 NYCRR Part 663 - Freshwater Wetlands Maps and Classification
- 6 NYCRR Part 257 - Air Quality Standards
- 10 NYCRR Part 5 of the State Sanitary Code - Drinking Water Supplies (May 1998)
- 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response
- 6 NYCRR Part 175 - Special Licenses and Permits--Definitions and Uniform Procedures

The following guidance typically applies to Site Characterizations and Remedial Investigations conducted in New York State:

- STARS #1 - Petroleum-Contaminated Soil Guidance Policy
- SPOTS #14 - Site Assessments at Bulk Storage Facilities (August 1994)
- TOGS 1.1.1 - Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations
- Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (October 1994)
- Technical Guidance for Screening Contaminated Sediments (January 1999)
- Niagara River Biota Contamination Project: Fish Flesh Criteria for Piscivorous Wildlife (July 1987)
- Wildlife Toxicity Assessment for Cadmium in Soils (May 1999)
- Air Guide 1 - Guidelines for the Control of Toxic Ambient Air Contaminants
- The 10 ppt Health Advisory Guideline for 2,3,7,8-TCDD in Sportfish Flesh
- The 1 ppm Health Advisory Guideline for Cadmium in Sportfish Flesh
- Criteria for the Development of Health Advisories for Sportfish Consumption
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006, including the September 2013, August 2015, May 2017, and February 2024 updates)
- DER Interim Strategy for Groundwater Remediation at Contaminated Sites in New York State

2.0 SCGS FOR REMEDY SELECTION

The following standards and criteria typically apply to the remedy selection process conducted in New York State:

- 6 NYCRR Part 375 - Environmental Remediation Programs
- 6 NYCRR Part 376 - Land Disposal Restrictions
- 6 NYCRR Part 608 - Use and Protection of Waters
- 6 NYCRR Part 661 - Tidal Wetlands - Land Use Regulations
- 6 NYCRR Part 663 - Freshwater Wetlands - Permit Requirements
- 6 NYCRR Parts 700-706 - Water Quality Standards
- 19 NYCRR Part 600 - Waterfront Revitalization and Coastal Resources

The following guidance typically applies to the remedy selection process conducted in New York State:

- TAGM 4044 - Accelerated Remedial Actions at Class 2, Non-RCRA Regulated Landfills (March 1992)
- TAGM 4051 - Early Design Strategy (August 1993)
- Citizen Participation in New York's Hazardous Waste Site Remediation Program: A Guidebook (June 1998)
- TAGM 3028 - "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- Freshwater Wetlands Regulations - Guidelines on Compensatory Mitigation (October 1993)
- Air Guide 1 - Guidelines for the Control of Toxic Ambient Air Contaminants
- Technical Guidance for Screening Contaminated Sediments (January 1999)
- USEPA Office of Solid Waste and Emergency Response Directive 9355.047FS Presumptive Remedies: Policy and Procedures (September 1993)
- USEPA Office of Solid Waste and Emergency Response Directive 9355.048FS Presumptive Remedies:
- Site Characterization and Technology Selection for CERCLA sites with Volatile Organic Compounds in Soils (September 1993)
- USEPA Office of Solid Waste and Emergency Response Directive 9355.049FS Presumptive Remedy for CERCLA Municipal Landfills (September 1993)

3.0 SCGS FOR UNDERGROUND STORAGE TANK CLOSURE

The following standards and criteria typically apply to UST closures conducted in New York State:

- 6 NYCRR Part 612 - Registration of Petroleum Storage Facilities (February 1992)
- 6 NYCRR Part 613 - Handling and Storage of Petroleum (February 1992)
- 6 NYCRR Part 614 - Standards for New and Substantially Modified Petroleum Storage Tanks (February 1992)
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes (November 1998)
- 6 NYCRR Subpart 374-2 - Standards for the Management of Used Oil
- 6 NYCRR Parts 700-706 - Water Quality Standards
- 40 CFR Part 280 - Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks

The following guidance typically applies to UST closures conducted in New York State:

- Commissioner Policy, CP-51 – Soil Cleanup Guidance
- STARS #1 - Petroleum-Contaminated Soil Guidance Policy
- STARS #2 - Biocell and Biopile Designs for Small-Scale Petroleum-Contaminated Soil Projects
- SPOTS #14 - Site Assessments at Bulk Storage Facilities (August 1994)
- Spill Response Guidance Manual
- Permanent Closure of Petroleum Storage Tanks
- TAGM 3028 - "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- TOGS 1.1.1 - Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations
- Air Guide 1 - Guidelines for the Control of Toxic Ambient Air Contaminants
- NYSDOH Environmental Health Manual CSFP-530 - "Individual Water Supplies - Activated Carbon Treatment Systems"

4.0 SCGS FOR REMEDIAL ACTION

The following standards and criteria typically apply to Remedial Actions conducted in New York State:

- 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response
- 40 CFR Part 144 - Underground Injection Control Program
- 10 NYCRR Part 67 – Lead
- 12 NYCRR Part 56 - Industrial Code Rule 56 (Asbestos)
- 6 NYCRR Part 175 - Special Licenses and Permits--Definitions and Uniform Procedures

- 6 NYCRR Part 361 - Siting of Industrial Hazardous Waste Facilities
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes (November 1998)
- 6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (November 1998)
- 6 NYCRR Subpart 373-4 - Facility Standards for the Collection of Household Hazardous Waste and Hazardous Waste from Conditionally Exempt Small Quantity Generators (November 1998)
- 6 NYCRR Subpart 374-1 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (November 1998)
- 6 NYCRR Subpart 374-3 - Standards for Universal Waste (November 1998)
- 6 NYCRR Part 375 - Inactive Hazardous Waste Disposal Sites (as amended January 1998)
- 6 NYCRR Part 376 - Land Disposal Restrictions
- 19 NYCRR Part 600 - Waterfront Revitalization and Coastal Resources
- 6 NYCRR Part 608 - Use and Protection of Waters
- 6 NYCRR Part 661 - Tidal Wetlands - Land Use Regulations
- 6 NYCRR Part 663 - Freshwater Wetlands - Permit Requirements
- 6 NYCRR Parts 700-706 - Water Quality Standards (June 1998)
- 6 NYCRR Part 750 through 758 - Implementation of NPDES Program in NYS ("SPDES Regulations")
- Technical Guidance for Screening Contaminated Sediments (January 1999)

The following guidance typically applies to Remedial Actions conducted in New York State:

- TAGM 4013 - Emergency Hazardous Waste Drum Removal/ Surficial Cleanup Procedures (March 1996)
- TAGM 4046 - Determination of Soil Cleanup Objectives and Cleanup Levels (January 1994)
- TAGM 4059 - Making Changes To Selected Remedies (May 1998)
- STARS #1 - Petroleum-Contaminated Soil Guidance Policy
- STARS #2 - Biocell and Biopile Designs for Small-Scale Petroleum-Contaminated Soil Projects
- TAGM 3028 - "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- Citizen Participation in New York's Hazardous Waste Site Remediation Program: A Guidebook (June 1998)
- TOGS 1.1.1 - Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations
- TOGS 1.3.8 - New Discharges to Publicly Owned Treatment Works
- TOGS 2.1.2 - Underground Injection/Recirculation (UIR) at Groundwater Remediation Sites
- Air Guide 1 - Guidelines for the Control of Toxic Ambient Air Contaminants

- State Coastal Management Policies
- OSWER Directive 9200.4-17 - Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (November 1997)
- NYSDOH Environmental Health Manual CSFP-530 - "Individual Water Supplies - Activated Carbon Treatment Systems"
- DER-31 – Green Remediation

5.0 SCGS FOR SITE MANAGEMENT

The following standards and criteria typically apply to Site Management activities conducted in New York State:

- 6 NYCRR Part 175 - Special Licenses and Permits--Definitions and Uniform Procedures

The following guidance typically applies to Site Management activities conducted in New York State:

- Groundwater Monitoring Well Decommissioning Procedures (May 1995)
- The activity is a component of a program selected by a process complying with the public participation requirements of Section 5.1.10, to the extent applicable.
- NYSDOH Environmental Health Manual CSFP-530 - "Individual Water Supplies - Activated Carbon Treatment Systems.

APPENDIX C
ENVIRONMENTAL FOOTPRINT ANALYSIS



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Ms. Brittany Taranto
NYSDEC
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, NY, 12233-7016

06.18.2025

Re: Environmental Footprint Analysis (EFA)
John Tynan Senior Residence
41 First Street, Brooklyn, NY
NYSDEC BCP Site No. C224401

Dear Ms. Taranto:

This Environmental Footprint Analysis (EFA) has been prepared by AKRF, Inc. (AKRF) on behalf of Catholic Charities Progress of Peoples Development Corporation (the “Client”) for the site [New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Site No. C224401] located at the above-referenced location, also identified as New York City Tax Block 451, portion of Lot 25 (the “Site”). As further detailed in the November 2023 NYSDEC Memorandum, DER-31: Green and Sustainable Remediation Initiative, beginning January 1, 2024, all remedial work plans and reports submitted to NYSDEC pursuant to a remedial program under Part 375 are required to address green and sustainable remediation (GSR) in accordance with DER-31. The EFA requirement was incorporated into the NYSDEC Decision Document as a requirement for selection between the two remedy alternatives — Track 1 and Track 4.

This EFA focuses on the primary components of the remedy: demolition of existing building (Track 1 only), excavation and disposal of contaminated soil, import of approved materials (stone, soil etc.) for backfill, and installation of a passive sub-slab depressurization system (SSDS). Remedial activities including backfilling the Site after excavation, as well as the below-ground portion of the SSDS installation, would be performed using import of approximately 14,467 tons of crushed stone for Track 1 and approximately 1,607 tons for Track 4. Remedial activities also will include removal and off-site disposal of soil/fill materials, and daily use of heavy machinery.

This EFA was performed consistent with NYSDEC guidelines, the methodologies used in the Environmental Protection Agency (EPA) Spreadsheets for Environmental Footprint Analysis (SEFA) tool, and the requirements of the Climate Leadership and Community Protection Act (CLCPA).

GREENHOUSE GASES

Greenhouse gases (GHGs) are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth’s surface, the atmosphere, and clouds. The general warming of the Earth’s atmosphere caused by this phenomenon is known as the “greenhouse effect.” The United States Environmental Protection Agency (EPA) identifies seven types of GHGs that are relevant for GHG inventory purposes: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride (NF₃), and sulfur hexafluoride (SF₆). There are no significant direct or indirect sources of HFCs, PFCs, NF₃, or SF₆ associated with the selected remedy; therefore, the GHG assessment focuses on CO₂, N₂O, and methane.

To present a complete inventory of all GHGs, component emissions are added together and presented as carbon dioxide equivalent (CO₂e) emissions—a unit representing the quantity of each GHG weighted by its effectiveness using CO₂ as a reference. This is achieved by multiplying the quantity of each GHG emitted

by a factor called global warming potential (GWP). GWPs account for the lifetime and the radiative forcing¹ of each chemical over a period of 20 years (e.g., CO₂ has a much shorter atmospheric lifetime than N₂O and therefore has a much lower GWP). The GWPs for the main GHGs discussed here are presented in **Table 1**.

Table 1
Global Warming Potential (GWP) for Major GHGs

Greenhouse Gas	20-Year Horizon GWP
Carbon Dioxide (CO ₂)	1
Methane (CH ₄)	84
Nitrous Oxide (N ₂ O)	264
Source: 6 NYCRR 496.5	

Statewide GHG Inventory and Emission Limit

In July 2019, New York State enacted the CLCPA establishing statewide GHG emission limits that represent a 40 percent reduction from 1990 levels by 2030, and an 85 percent reduction from 1990 levels by 2050. Among other requirements to meet the state's emission reduction goals, the CLCPA directs state agencies to determine if their decisions are consistent with the statewide GHG emission limits established by the CLCPA in the Environmental Conservation Law (ECL) Article 75².

As part of the regulations adopted at 6 NYCRR Part 496 in 2020, the New York State Energy Research and Development Authority (NYSERDA) developed the 1990 baseline GHG emissions for New York State consistent with the calculation requirements specified under the CLCPA. The statewide inventory is separated into four sectors—Energy Sector, Industrial Processes and Product Use, Agriculture Forestry and Other Land Use, and Waste. The GHG emissions associated with the selected remedy would fall within the Energy Sector (including emissions from the direct fuel combustion and electricity usage), the Industrial Processes and Product Use Sector (the embodied emissions from the manufacturing process of materials brought to the Site), and the Waste Sector (emissions associated with the end of life for materials removed from the Site for disposal).

The GHG inventory performed by NYSERDA determined a statewide 1990 annual baseline emission total of 409.78 million metric tons (MMT) of CO₂e. As established in 6 NYCRR Part 496, the statewide annual CO₂e emission limits for 2030 and 2050 as 245.87 MMT and 61.47 MMT, respectively.

METHODOLOGY

On-Site Fuel Usage

Direct Emissions

Consistent with the SEFA tool, on-site fuel (i.e., direct) emissions were estimated based on the fuel consumption associated with construction equipment used during implementation of the remedy. On-site emissions were calculated for non-road construction engines based on specific estimates of construction activity and fuel consumption data from the NONROAD emissions module within model EPA's MOVES model. The detailed data, including the number, type, power rating, and hours of operation for all construction engines was coupled with fuel consumption rate data from EPA's MOVES model to estimate total fuel consumption throughout the duration of the construction activities.

Direct GHG emissions from Site work were calculated based on fuel consumption over the duration to complete the remedies — approximately eighteen months to complete Track 1 and six months to complete Track 4. The quantity of fuel was then multiplied by a unit-specific CO₂ emission factor of 10.21 kg per

¹ *Radiative forcing* is a measure of the influence a gas has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the gas as a GHG.

² CLCPA Section 7(2).

gallon of diesel—taken from EPA’s Emission Factors for Greenhouse Gas Inventories. In order to develop CO_{2e} emission factors, emission factors of N₂O and CH₄ for diesel construction equipment (1.01 g/gallon and 0.94 g/gallon, respectively) were also taken from EPA’s Emission Factors Hub.

Upstream Emissions

Upstream GHG emissions were also projected based upon the estimated fuel consumption required for the selected remedy. Upstream emission factors for diesel have been specified by NYSDEC for upstream and out-of-state emissions.³

Off-Site Fuel Usage

Consistent with the SEFA tool, GHG emissions associated with the truck and worker trips to the Site were estimated. The numbers of trucks (concrete trucks, dump trucks, and tractor trailers) and workers for each phase of construction activity were used to estimate truck and vehicle VMT. Distances for truck deliveries were developed based on estimates of the origin and destination of materials. Table 18-7 of the *CEQR Technical Manual* was used to determine the percentage of vehicle miles traveled by road type, and the most recent version of the EPA MOVES model provided an estimate of truck GHG emission factors, which were used to produce the associated emissions attributable to the selected remedy.

GHG emissions generated by the selected remedy associated with the number of vehicle trips by mode (e.g., worker cars, delivery trucks) were calculated using the estimated number vehicles traveling to the Site to develop total vehicle miles traveled (VMT). VMT was calculated using an average round-trip commute distance of 25.3 miles for construction workers in the New York City Region (based on the average trip to work distance for the New York Metropolitan Area area)⁴; and representative round-trip distances for truck deliveries were based on EPA default one-way distances of 50 miles for construction waste and debris, and 25 miles for soil disposal and material deliveries.

Based upon a duration of eighteen months to complete Track 1, 84,618VMT were estimated for construction worker travel. Construction/delivery truck trips were estimated to result in 93,746VMT. In the six months to complete Track 4, 25,086 VMT were estimated for construction worker travel. Construction/delivery truck trips were estimated to result in 9,376 VMT. GHG emissions were then estimated directly using CO_{2e} emission factors from the most recent version of the EPA MOVES model (MOVES4).

Material Emissions

Emissions related to the production of construction materials (embodied emissions) were estimated based on the quantity of materials to be brought to the Site along with the appropriate CO_{2e} emission factors used in the SEFA tool. The Track 1 remedy will import approximately 14,467 tons of stone and 1,205 tons of soil while Track 4 will import approximately 2,411 tons of stone.

Waste Emissions

Emissions associated with disposed materials exported from the Site were estimated based on the quantity of materials to be removed, the description of those materials, the potential destination, and the appropriate CO_{2e} emission factors used in the SEFA tool. Both remedies will require export of a total of 12 tons of hazardous lead soil. Track 1 and Track 4 will require export of 30,127 and 2,399 tons of non-hazardous soil, respectively. All exported materials to be sent to hazardous or non-hazardous waste landfill facilities for disposal, as applicable. Therefore, emissions associated with both waste handling and transportation of the materials to the disposal facility were included in the off-site fuel usage estimates.

³ NYSDEC. Appendix A of the *2024 Statewide GHG Emission Report*. December 2024.

⁴ New York State Department of Transportation (NYSDOT). *2009 NHTS, New York State Add-On*. Key Tables. Table 3: Average Travel Day Person-Trip Length by Mode and Purpose, trip-to work distance for SOV in NYMTC 10-county area. 2011.

PROJECTED CARBON FOOTPRINT

The estimated GHG emissions for the selected remedy are presented in **Tables 2 and 3**. Detailed calculations can be found in Appendix A.

Table 2
Summary of GHG Emissions—Track 1
(metric tons CO₂e)

Core Element	Energy Consumption (MMBtu)	Direct Emissions	Indirect Emissions	Total
On-Site Fuel Usage	8,475	630	205	836
Off-Site Fuel Usage	3,166	0	234	234
Material	777	0	34	34
Waste	4,855	0	344	344
Total	17,274	630	817	1,448
Note: Totals may not sum due to rounding. See detailed calculations in Appendix A.				

Table 3
Summary of GHG Emissions—Track 4
(metric tons CO₂e)

Core Element	Energy Consumption (MMBtu)	Direct Emissions	Indirect Emissions	Total
On-Site Fuel Usage	2,086	155	50	206
Off-Site Fuel Usage	401	0	30	30
Material	120	0	5	5
Waste	386	0	27	27
Total	2,992	155	113	268
Note: Totals may not sum due to rounding. See detailed calculations in Appendix A.				

If you have any questions or require additional information, please contact me at (646) 388-9846 or Ashutosh Sharma at (646) 388-9865.

Sincerely,
AKRF, Inc.



Kevin Edwards
Senior Technical Director

Enclosures:

Appendix A – GHG Emissions Detailed Calculations

APPENDIX A
GHG EMISSIONS DETAILED CALCULATIONS

41 First Street - Track 1
Environmental Footprint Analysis
Construction Emissions Summary

Table B
Summary of GHG Emissions--Track 1
(metric tons CO2e)

Core Element	Energy Consumption (MMBtu)	Direct Emissions	Indirect Emissions	<i>Total</i>
On-Site Fuel Usage	8,475	630	205	836
Off-Site Fuel Usage	3,166	0	234	234
Material	777	0	34	34
Waste	4,855	0	344	344
Total	17,274	630	817	1,448
Note: Totals may not sum due to rounding. See detailed calculations in Attachment A.				

41 First Street - Track 1
Environmental Footprint Analysis
Construction Task Schedule

Representative Start Date 7/1/2026

Site	Task	Duration		
		Days	Start	End
41 First St	Demo	67	7/1/2026	10/1/2026
	Export	136	10/2/2026	4/10/2027
	Import	154	4/11/2027	11/11/2027
	Mob/Demob	33	11/12/2027	12/28/2027
	Total	323	7/1/2026	12/28/2027

41 First St

Excavated Soil		
<i>Non-Hazardous</i>	30,127	ton
<i>Lead</i>	12	ton
<i>TCE</i>	-	ton
TOTAL	30,139	ton
Stone Import	9,645	CY
	14,467	ton
Soil Import	803	CY
	1,205	ton
Excavated Demo Material	137	CY
	206	ton

41 First Street - Track 1

Environmental Footprint Analysis

Truck Schedule

Import/Export Material Type	Material Origin/Destination	Tonnage	Total Trucks	Travel Distance (mi)
DEMOLITION DISPOSAL				
	TOTAL			
	Landfill (SEFA Default)	206	7	50.0
SOIL DISPOSAL				
	TOTAL	30,139	1,340	
	Landfill (SEFA Default)	30,139	1,340	25.0
	Recycling (SEFA Default)	0	0	50.0
	Non-BCP Landfill (SEFA Default)	0	0	25.0
STONE IMPORT				
	TOTAL	14,467	482	
	Remediation Import (SEFA Deault)	14,467	482	25.0
SOIL IMPORT				
	TOTAL	1,205	40	
	Remediation Import (SEFA Deault)	1,205	40	25.0

41 First Street - Track 1

Environmental Footprint Analysis

Worker Projections

						2026												2027													
Site	Start Date	End Date	Task	Workers Per Day	Modal Split	Auto Occupancy	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28
41 First St																															
	Jul-26	Oct-26	Demo	11	43%	1.17	0	0	0	0	0	0	93	89	93	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oct-26	Apr-27	Export	25	43%	1.17	0	0	0	0	0	0	0	0	0	193	202	221	202	193	221	64	0	0	0	0	0	0	0	0	0
	Apr-27	Nov-27	Import	25	43%	1.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	138	202	211	202	211	211	202	83	0	0
	Nov-27	Dec-27	Mob/Demob	25	43%	1.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	129	184	0
Monthly trips (trip/month)							0	0	0	0	0	0	93	89	93	197	202	221	202	193	221	202	202	211	202	211	211	202	211	184	

						2026													2027													
Site	Start Date	End Date	Task	One Way Trip Distance (mi)		Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28		
41 First St																																
	Jul-26	Oct-26	Demo	12.64		0	0	0	0	0	0	2346	2244	2346	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Oct-26	Apr-27	Export	12.64		0	0	0	0	0	0	0	0	0	4878	5110	5575	5110	4878	5575	1626	0	0	0	0	0	0	0	0	0		
	Apr-27	Nov-27	Import	12.64		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3484	5110	5342	5110	5342	5342	5110	2090	0	0		
	Nov-27	Dec-27	Mob/Demob	12.64		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5110	0	5110	0	5342	0	3252	4645	4645		
Monthly VMT (mi/month)						0	0	0	0	0	0	2346	2244	2346	4980	5110	5575	5110	4878	5575	5110	5110	5342	5110	5342	5342	5110	5342	4645	4645		

[illegible]

41 First Street - Track 1
Environmental Footprint Analysis
Truck Emissions

							2026												2027												
Site	Start Date	End Date	Task	Truck Activity	Origin/Destination	Total Trucks	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28
41 First St																															
	Jul-26	Oct-26	Demo			7	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oct-26	Apr-27	Export	Demo Disposal	SEFA Default																										
	Apr-27	Nov-27	Import	Soil Disposal	SEFA Default	1,340	0	0	0	0	0	0	0	0	0	207	207	227	207	197	227	69	0	0	0	0	0	0	0	0	
				Stone Import	SEFA Default	482	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	66	69	69	69	69	66	28	0	
	Nov-27	Dec-27	Mob/Demob	Soil Import	SEFA Default	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	6	6	6	6	5	2	0	
Monthly trips (trip/month)							0	0	0	0	0	0	2	2	2	207	207	227	207	197	227	120	71	75	75	75	75	71	31	0	

							2026												2027												
Site	Start Date	End Date	Task	Truck Activity	Origin/Destination	One Way Trip Distance	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28
41 First St																															
	Jul-26	Oct-26	Demo																												
				Demo Disposal	SEFA Default	50	0.0	0.0	0.0	0.0	0.0	0.0	200.0	215.1	225.3	10.2	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Oct-26	Apr-27	Export																												
				Soil Disposal	SEFA Default	25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10,341.8	10,341.8	11,326.7	10,341.8	9,849.3	11,326.7	3,447.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Apr-27	Nov-27	Import																												
				Stone Import	SEFA Default	25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	2,348.5	3,288.0	3,444.5	3,444.5	3,444.5	3,444.5	3,288.0	1,409.1	0.0
				Soil Import	SEFA Default	25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	195.6	273.9	286.9	286.9	286.9	286.9	273.9	117.4	0.0
Nov-27	Dec-27	Mob/Demob																													
Monthly VMT (mi/month)							0.0	0.0	0.0	0.0	0.0	0.0	200.0	215.1	225.3	10,352.1	10,341.8	11,326.7	10,341.8	9,849.3	11,326.7	5,991.4	3,561.8	3,731.4	3,731.4	3,731.4	3,731.4	3,561.8	1,526.5	0.0	

Total VMT

93,746 mi

Fuel Consumption

19,557 gallon

2,699 MMBtu

							2026												2027													
Site	Start Date	End Date	Task	Truck Activity	Origin/Destination	CO2e Emission Factor	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	
41 First St																																
	Jul-26	Oct-26	Demo																													
	Oct-26	Apr-27	Export	Demo Disposal	SEFA Default	2,129	0	0	0	0	0	0	426	458	480	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Soil Disposal	SEFA Default	2,129	0	0	0	0	0	0	0	0	0	22,019	22,019	24,116	22,019	20,970	24,116	7,340	0	0	0	0	0	0	0	0	0	
	Apr-27	Nov-27	Import	Stone Import	SEFA Default	2,129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,000	7,000	7,334	7,334	7,334	7,334	7,000	3,000	0	
				Soil Import	SEFA Default	2,129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	416	583	611	611	611	611	583	250	0
Nov-27	Dec-27	Mob/Demob																														
Monthly Emissions (kg/month)							0	0	0	0	0	0	426	458	480	22,040	22,019	24,116	22,019	20,970	24,116	12,756	7,583	7,945	7,945	7,945	7,945	7,583	3,250	0		
Monthly Emissions (MT/month)							0	0	0	0	0	0	0	0	0	22	22	24	22	21	24	13	8	8	8	8	8	8	8	3	0	

Total Emissions

199,593 kg

200 metric ton

41 First Street - Track 1
Environmental Footprint Analysis
Equipment Schedule

										Fuel Consumption Factor (g/hp-hr)	Short-Term BSFC Factor (lb/day)	Fuel Consumption Factor (gal/hp-hr)	Short-Term BSFC Factor (gal/day)
	Start Date	End Date	Equipment	Engine type	Size (hp)	Qty	Daily use	Average Use	Load	2026	2026	2026	2026
Demo													
	7/1/2026	10/1/2026	Excavator	diesel	200	1	75%	50%	59%	168.2826573	131.3339039	0.0529233	18.7348488
	7/1/2026	10/1/2026	Jackhammer/pavement breaker	air	0	2	25%	25%		-	-	-	-
	7/1/2026	10/1/2026	Rebar bender	electric	15Amps	2	50%	25%		-	-	-	-
	7/1/2026	10/1/2026	Welding equipment	electric	0	2	25%	25%		-	-	-	-
	7/1/2026	10/1/2026	Generator	diesel	30	1	25%	25%	43%	185.0655186	2.631597431	0.0582014	0.3753987
	7/1/2026	10/1/2026	Pile driver	diesel	450	2	50%	50%	43%	166.4682708	284.0577611	0.0523527	40.5209855
	7/1/2026	10/1/2026	Portable water pump	electric	15	1	5%	20%		-	-	-	-
	7/1/2026	10/1/2026	Dozer	diesel	310	1	50%	25%	59%	168.2825728	67.8558163	0.0529233	9.6796670
	7/1/2026	10/1/2026	Concrete pump	diesel	400	1	100%	20%	59%	168.2826262	140.0894717	0.0529233	19.9838351
	7/1/2026	10/1/2026	Wheeled front end loader	diesel	200	1	50%	25%	59%	168.2826765	43.7779730	0.0529233	6.2449503
	7/1/2026	10/1/2026	100 ton crawler crane	diesel	300	1	75%	50%	43%	166.4683718	142.0289667	0.0523527	20.2605050
Export													
	10/2/2026	4/10/2027	Excavator	diesel	250	3	100%	100%	59%	168.2826573	1313.339039	0.052923302	187.3484885
Import													
	4/11/2027	11/11/2027	Excavator	diesel	250	3	100%	100%	59%	168.2826573	1313.339039	0.052923302	187.3484885

Demo	811.7754901		115.8001906
Export	1313.339039		187.3484885
Import	1313.339039		187.3484885

41 First Street - Track 1 Environmental Footprint Analysis Equipment Emissions

					2026												2027												
Site	Start Date	End Date	Task	Annual BSFC Factor (lb/day)	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28
41 First St	Jul-26 Oct-26 Apr-27 Nov-27	Oct-26 Demo Apr-27 Export Nov-27 Import Dec-27 Mob/Demob		811.7754901 1313.339039 1313.339039 0	18671 17859 18671 27,580 28,893 31,520												28,893 27,580 31,520 9,193 19,700 28,893 30,207 28,893 30,207 30,207 28,893 11,820												

					2026												2027												
Site	Start Date	End Date	Task	Annual Fuel Consumption (gal/day)	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28
41 First St																													
	Jul-26	Oct-26	Demo	115.8001906																									
	Oct-26	Apr-27	Export	187.3484885																									
	Apr-27	Nov-27	Import	187.3484885																									
	Nov-27	Dec-27	Mob/Demob	0																									

Monthly Fuel Consumption (gal/month)

Total Fuel Consumption
61,416 gal
8,475 MMBtu

[illegible]

Monthly Emissions (kg/month)

[illegible]

Monthly Emissions (kg/month)

					Annual NZO Emissions (kg/month)												Annual NZO Emissions (kg/month)													
Site	Start Date	End Date	Task		2026												2027													
					Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	
41 First St																														
	Jul-26	Oct-26	Demo		0.2130724 0.2038083 0.2130724																									
	Oct-26	Apr-27	Export		0.3147455 0.3297333 0.3597091												0.33	0.314745	0.359709098	0.104915										
	Apr-27	Nov-27	Import																	0.224818	0.329733	0.344721	0.329733	0.344721	0.344721	0.329733	0.134891			
	Nov-27	Dec-27	Mob/Demob																											

Monthly Emissions (kg/month)

[illegible]

Monthly Emissions (kg/month)

Monthly Emissions (MT/month)

Total Emissions
630,465 kg
630 metric ton

					Annual Upstream CO2e Emissions (kg/month)												Annual Upstream CO2e Emissions (kg/month)													
Site	Start Date	End Date	Task		2026												2027												Jan-28	
					Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27		
41 First St																														
	Jul-26	Oct-26	Demo									8899.851	8512.9009	8899.851																
	Oct-26	Apr-27	Export												13146.65	13772.681	15024.743		13,772.68	13146.65	15024.74327	4382.217								
	Apr-27	Nov-27	Import																			9390.465	13772.68	14398.71	13772.68	14398.71	14398.71			
	Nov-27	Dec-27	Mob/Demob																					13772.68	5634.279					

Monthly Emissions (kg/month)

Monthly Emissions (MT/month)

Total Emissions
205,222 kg
205 metric ton

	Emissions Summary (metric ton)																							Annual Total	
	Monthly																								
Equipment-Direct	0	0	0	0	0	0	27	26	0	40	42	46	42	40	46	42	42	44	42	44	44	42	17	0	630
Equipment-Indirect	0	0	0	0	0	0	9	9	0	13	14	15	14	13	15	14	14	14	14	14	14	14	6	0	205
Trucks	0	0	0	0	0	0	0	0	0	22	22	24	22	21	24	13	8	8	8	8	8	8	3	0	200
Cars	0	0	0	0	0	0	1	1	1	2	2	2	2	1	2	2	2	2	2	2	2	2	2	1	36
Materials																									34
Waste																									344
Total	0	0	0	0	0	0	37	36	1	77	80	87	80	76	87	70	65	68	66	68	68	65	28	1	1439

41 First Street - Track 1 Environmental Footprint Analysis Imported Material Emissions

							Lookup ID					
							3	4	5	6	7	8
Material	SEFA Lookup	Quantity	Unit	Conversion	Quantity	Unit	Energy Usage (MMBtu)	GHG (lb CO2e)	NOx (lb)	SOx (lb)	PM (lb)	HAPs (lb)
Stone	Round Gravel	9,645	CY	3000	28,934,000	lb	718	69,442	521	131	76	9
Soil	Sand	1,205	ton	2000	2,410,000	lb	60	5,784	43	11	6	1
Total							777	75,226	564	142	82	10
								37.613	0.282	0.071	0.041	0.005
								34,122				
								34				

SEFA Tool Material Table

		Lookup ID					
		3	4	5	6	7	8
Construction Materials	Unit	Energy Usage (MMBtu/unit)	GHG (lb CO2e/unit)	NOx (lb/unit)	SOx (lb/unit)	PM (lb/unit)	HAPs (lb/unit)
Aluminum, Rolled Sheet	lb	0.0633	9.15	0.0148	0.0283	0.0088	0.00102
Asphalt, mastic	lb	0.0412	0.85	0.00271	0.00798	0.000766	0.00107
Asphalt, paving-grade	lb	0.5	8.58	0.0299	0.0969	0.0091	0.0133
Ethanol, Corn, 95%	lb	0.0318	-0.0199	0.00425	0.00303	0.000469	0.0000846
Ethanol, Corn, 99.7%	lb	0.0324	0.0591	0.00431	0.0031	0.000472	0.000087
Ethanol, Petroleum, 99.7%	lb	0.0205	1.25	0.00199	0.00214	0.000277	0.0000589
Gravel/Sand Mix, 65% Gravel	lb	0.0000248	0.0024	0.000018	0.00000452	0.00000261	0.000000308
Gravel/sand/clay	lb	0.000028	0.00335	0.0000165	0.000015	0.000002	2.05E-10
HDPE	lb	0.0332	1.94	0.00325	0.00409	0.000439	0.0000641
Photovoltaic system (installed)	W	0.0336	4.47	0.015	0.032	0.00063	0.0000029
PVC	lb	0.0262	2.02	0.004	0.00274	0.000372	0.000375
Portland cement, US average	lb	0.0139	1.34	0.00654	0.0104	0.00378	0.00097
Ready-mixed concrete, 20 MPa	ft3	0.217	19.5	0.0975	0.154	0.057	0.0141
Round Gravel	lb	0.0000248	0.0024	0.000018	0.00000452	0.00000261	0.000000308
Sand	lb	0.0000248	0.0024	0.000018	0.00000452	0.00000261	0.000000308
Stainless Steel	lb	0.0116	3.4	0.0075	0.012	0.0044	0.000144
Steel	lb	0.0044	1.1	0.0014	0.0017	0.00056	0.000067
Other refined construction materials	lb	0.01885	2.115	0.0040375	0.0051325	0.00144275	0.000162525
Other unrefined construction materials	lb	0.000028	0.00335	0.0000165	0.000015	0.000002	2.05E-10
Cheese Whey	lbs	0.0025	0.031	0.000062	0.000033	0.000002	NP
Emulsified vegetable oil	lbs	0.0077	3.44	0.0066	0.0019	0.000033	NP
Granular activated carbon, primary	lbs	0.0356	4.82	0.0793	0.128	0.000987	0.000657
Granular activated carbon, regenerated	lbs	0.00873	1.7	0.00733	0.0129	0.000886	0.000671
Hydrogen Peroxide, 50% in H2O	lbs	0.00979	1.19	0.00142	0.0024	0.000308	0.0000629
Iron (II) Sulfate	lbs	0.00147	0.167	0.000316	0.000589	0.000103	0.000023
Lime, Hydrated, Packed	lbs	0.00206	0.762	0.000513	0.000358	0.00013	0.00000657
Molasses	lbs	0.0044	0.48	0.0011	0.00024	0.0000041	NP
Phosphoric Acid, 70% in H2O	lbs	0.0067	0.882	0.00282	0.0294	0.00171	0.000163
Potassium Permanganate	lbs	0.00981	1.16	0.00234	0.0032	0.000422	0.000122
Sodium Hydroxide, 50% in H2O	lbs	0.00977	1.09	0.00194	0.00352	0.000403	0.000129
Other Treatment Chemicals & Materials	lbs	0.015	1.67	0.003	0.0065	0.00061	0.000016

41 First Street - Track 1
Environmental Footprint Analysis
Waste Emissions

							Lookup ID					
							3	4	5	6	7	8
Material	SEFA Lookup	Quantity	Unit	Conversion	Quantity	Unit	Energy Usage (MMBtu)	GHG (lb CO2e)	NOx (lb)	SOx (lb)	PM (lb)	HAPs (lb)
Non-hazardous Soil Disposal	Off-site non-hazardous waste landfill	30,127	ton	1	30,127	ton	4,820	753,175	4,218	2,260	12,051	42
Lead Soil	Off-site hazardous waste landfill	12	ton	1	12	ton	2	330	2	1	5	0
TCE Soil	Off-site hazardous waste landfill	0	ton	1	0	ton	0	0	0	0	0	0
Demolition Disposal	Off-site non-hazardous waste landfill	206	ton	1	206	ton	33	5,147	29	15	82	0
Total							4,855	758,652	4,248	2,276	12,138	42 lb
								379.326	2.124	1.138	6.069	0.021 ton
								344,119				kg
								344				MT

SEFA Tool Waste Table

		Lookup ID					
		3	4	5	6	7	8
		Energy Usage	GHG	NOx	SOx	PM	HAPs
Waste Treatment	Unit	(MMBtu/unit)	(lb CO2e/unit)	(lb/unit)	(lb/unit)	(lb/unit)	(lb/unit)
Hazardous waste incineration	lb	0.00609	2.43	0.0016	0.00167	0.000209	0.000087
Off-site waste water treatment (POTW)	gal x 1000	0.015	4.4	0.016	0.015		
Off-site non-hazardous waste landfill	ton	0.16	25	0.14	0.075	0.4	0.0014
Off-site hazardous waste landfill	ton	0.18	27.5	0.154	0.0825	0.44	0.00154
Off-site Laboratory Analysis - Other	sample	0.058071029	6.85343842	0.131401957	0.303875767	0.045569824	0.033016529
Off-site Laboratory Analysis - Metals	sample	0.212	27.4693	0.6423	1.5072	0.2264	0.1643
Off-site Laboratory Analysis - Mercury	sample	0.073171472	9.325458	0.2127439	0.4982396	0.07473594	0.05423316
Off-site Laboratory Analysis - Inorganic Anions	sample	0.007402451	0.6459478	0.006768122	0.014792866	0.002202395	0.001554243
Off-site Laboratory Analysis - Alkalinity	sample	0.017439833	1.3381922	0.007010628	0.013249646	0.001940048	0.001283077
Off-site Laboratory Analysis - Perchlorate	sample	0.023884988	1.8717054	0.007980652	0.014153532	0.002054687	0.001287486
Off-site Laboratory Analysis - Nitrogen/Nitrate	sample	0.033647504	4.29897	0.09545918	0.2226646	0.03350992	0.0242506
Off-site Laboratory Analysis - Sulfate	sample	0.014122473	1.4726728	0.007980652	0.013602382	0.001979731	0.001201507
Off-site Laboratory Analysis - PCBs	sample	0.0512769	5.224902	0.08333388	0.19047744	0.02843934	0.021208252
Off-site Laboratory Analysis - VOCs	sample	0.076204487	9.016814	0.10449804	0.2270738	0.03395084	0.02358922
Off-site Laboratory Analysis - SVOCs	sample	0.071560184	7.870422	0.14594452	0.3373038	0.05048534	0.03725774

41 First Street - Track 1
Environmental Footprint Analysis
Grid Electricity Emissions

[illegible]

41 First Street - Track 1
Environmental Footprint Analysis
Water Emissions

														Lookup ID						
														2	3	4	5	6	7	8
Water Source	Lookup	Quantity	Unit	Conversion	Quantity	Unit	Energy Usage (MMBtu)	GHG (lb CO2e)	NOx (lb)	SOx (lb)	PM (lb)	HAPs (lb)								
NYC Public Water	Public Water (SEFA Default)	2,000	gal	0.001	2	gal x 1000	0	10	0	0	0	0	0							

41 First Street - Track 1
Environmental Footprint Analysis
Emission Factors

BSFC Emission Factors (g/hp-hr)									
ID	Equipment	Engine	SCC Code	HPmin	HPmax	HP	Equipment	Load	2026
	Dsl - Excavators	Diesel	2270002036	175	300	173-250	Excavator	59%	168.3
	Dsl - Excavators	Diesel	2270002036	26	75	36-75	Excavator	59%	186.9
	Dsl - Generator Sets	Diesel	2270006005	26	40	30	Generator	43%	185.1
	Dsl - Bore/Drill Rigs	Diesel	2270002033	301	600	450	Pile driver	43%	166.5
	Dsl - Crawler Tractor/Dozers	Diesel	2270002069	301	600	310	Dozer	59%	168.3
	Dsl - Other Construction Equipment	Diesel	2270002081	301	600	400	Concrete pump	59%	168.3
	Dsl - Rubber Tire Loaders	Diesel	2270002060	176	300	200	Wheeled front end loader	59%	168.3
	Dsl - Cranes	Diesel	2270002045	176	300	300	100 ton crawler crane	43%	166.5

*for excavator in 2006 Hpmax 300 used

Fuel Properties			
Densities	kg/L	g/gal	lb/gal
	Diesel 0.84	3,179.75	7.01
	Gasoline 0.74	2,801.21	6.18
	LPG 0.54	2,044.12	4.51

BSFC Emission Factors (gal/hp-hr)									
ID	Equipment	Engine	SCC Code	HPmin	HPmax	HP	Equipment	Load	2026
	Dsl - Excavators	Diesel	2270002036	175	300	173-250	Excavator	59%	0.0529
	Dsl - Excavators	Diesel	2270002036	26	75	36-75	Excavator	59%	0.0588
	Dsl - Generator Sets	Diesel	2270006005	26	40	30	Generator	43%	0.0582
	Dsl - Bore/Drill Rigs	Diesel	2270002033	301	600	450	Pile driver	43%	0.0524
	Dsl - Crawler Tractor/Dozers	Diesel	2270002069	301	600	310	Dozer	59%	0.0529
	Dsl - Other Construction Equipment	Diesel	2270002081	301	600	400	Concrete pump	59%	0.0529
	Dsl - Rubber Tire Loaders	Diesel	2270002060	176	300	200	Wheeled front end loader	59%	0.0529
	Dsl - Cranes	Diesel	2270002045	176	300	300	100 ton crawler crane	43%	0.0524

EPA Fuel Emission Factors

Diesel

GWP-100	GWP-20	kg/gal	GHG	GWP-20 Equivalent Emissions	GWP-100 Equivalent Emissions	SEFA Default
1	1	10.21	CO2	10.27 kg CO2e/gal	10.24268 kg CO2e/gal	10.20582833 kg CO2e/gal
28	84	0.00041	CH4	22.63168431 lb CO2e/gal	22.58124254 lb CO2e/gal	22.5 lb CO2e/gal
265	264	0.00008	N2O			

https://www.epa.gov/system/files/documents/2025-01/ghg-emission-factors-hub-2025.pdf

GWP-20 Equivalent Emissions with Upstream
13.607092 kg CO2e/gal
29.99850086 lb CO2e/gal

Gasoline

GWP-100	GWP-20	kg/gal	GHG	GWP-20 Equivalent Emissions	GWP-100 Equivalent Emissions	SEFA Default
1	1	8.78	CO2	8.83 kg CO2e/gal	8.81184 kg CO2e/gal	8.890410452 kg CO2e/gal
28	84	0.00038	CH4	19.47351852 lb CO2e/gal	19.42678052 lb CO2e/gal	19.6 lb CO2e/gal
265	264	0.00008	N2O			

ghg-emission-factors-hub-2025.pdf

MOVES TRUCKS FACTORS	PM2.5	PM10	CO	NOx	VOC	CO2e	SO2	Truck Mileage
2024 - Truck Idling (g/hr)	6.71	7.30	25.14	96.40		11.5036	7746.96	10205.8283 g/gal
2024 - Truck Cruising - 5mph (g/veh)	0.24	0.26	1.49	4.36		0.327756	438.16	2129.08 g/mi
2024 - Truck Cruising - 25mph (g/mi)	1.13	1.23	5.24	19.66		0.803909	2129.08	4.79353915 mpg
2024 - Auto Cruising - 25mph (g/mi)	0.01	0.01	2.17	0.24		0.0458798	305.848	0.20861413 gal per mi

Distance Traveled On-site: approximately 0.1 mile per truck

0.1 mile per truck

HHV

Diesel 0.138 mmBtu per gallon

Gasoline 0.125 mmBtu per gallon

NYSDEC Upstream Emission Factor

Table A1. 2021 Emission Rates for Upstream Out-of-State Sources (g/MMBtu)

	Diesel Fuel
CH4	117.000 g/MMBtu
N2O	0.250 g/MMBtu
CO2	13.634 g/MMBtu
CO2e	24.214 g/MMBtu

	Diesel Fuel
CH4	16.146 g/gal
N2O	0.035 g/gal
CO2	1,881 g/gal
CO2e	3,342 g/gal

NYSDEC, *Appendix A of the 2024 Statewide GHG Emission Report*. December 2024

eGRID Baseload Electricity Factor

Data Year	eGRID subregion acronym	eGRID subregion name	Unit	eGRID subregion annual CO2 total output emission rate	eGRID subregion annual CH4 total output emission rate	eGRID subregion annual N2O total output emission rate	eGRID subregion annual CO2 equivalent total output emission rate (GWP-100)	eGRID subregion annual CO2 equivalent total output emission rate (GWP-20)
2022	NYCW	NPCC NYC/Westchester	lb/MWh	602.088	0.056	0.008	605.872	608.904
			g/kWh	273.103	0.025	0.004	274.819	276.194

41 First Street - Track 4
Environmental Footprint Analysis
Construction Emissions Summary

Table B
Summary of GHG Emissions--Track 4
(metric tons CO2e)

Core Element	Energy Consumption (MMBtu)	Direct Emissions	Indirect Emissions	<i>Total</i>
On-Site Fuel Usage	2,086	155	50	206
Off-Site Fuel Usage	401	0	30	30
Material	120	0	5	5
Waste	386	0	27	27
Total	2,992	155	113	268
Note: Totals may not sum due to rounding. See detailed calculations in Attachment A.				

41 First Street - Track 4
Environmental Footprint Analysis
Construction Task Schedule

Representative Start Date 7/1/2026

Site	Task	Duration		
		Days	Start	End
41 First St	Export	56	7/1/2026	9/16/2026
	Import	62	9/17/2026	12/11/2026
	Mob/Demob	14	12/12/2026	12/31/2026
	Total	132	7/1/2026	12/31/2026

41 First St

Excavated Soil		
<i>Non-Hazardous</i>	2,399	ton
<i>Lead</i>	12	ton
<i>TCE</i>	-	ton
TOTAL	2,411	ton
Stone Import	1,607	CY
	2,411	ton

41 First Street - Track 4
Environmental Footprint Analysis
Truck Schedule

Import/Export Material Type	Material Origin/Destination	Tonnage	Total Trucks
STONE DISPOSAL			
	TOTAL	2,411	107
	Landfill (SEFA Default)	2,411	107
	Recycling (SEFA Default)	0	0
	Non-BCP Landfill (SEFA Default)	0	0
SOIL IMPORT			
	TOTAL	2,411	80
	Remediation Import (SEFA Deault)	2,411	80

Travel Distance (mi)
25.0
50.0
25.0
25.0

41 First Street - Track 4

Environmental Footprint Analysis

Worker Projections

[illegible][illegible]

Total VMT		Fuel Consumption
25,086 mi	863	gallons
	108	MMBtu

[illegible]

41 First Street - Track 4
Environmental Footprint Analysis
Truck Emissions

						2026												2027												
Site	Start Date	End Date	Task	Origin/Destination	Total Trucks	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28
41 First St																														
	Jul-26	Sep-26	Export	SEFA Default	107	0	0	0	0	0	0	44	40	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sep-26	Dec-26	Import	SEFA Default	80	0	0	0	0	0	0	0	0	13	29	27	12	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dec-26	Dec-26	Mob/Demob																											
Monthly trips (trip/month)						0	0	0	0	0	0	44.01031746	40.18333333	35.92427035	28.5172043	27.22096774	11.66612903	0	0	0	0	0	0	0	0	0	0	0	0	0

						2026												2027												
Site	Start Date	End Date	Task	Origin/Destination	One Way Trip Distance	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28
41 First St																														
	Jul-26	Sep-26	Export	SEFA Default	25	0	0	0	0	0	0	2,201	2,009	1,148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Sep-26	Dec-26	Import	SEFA Default	25	0	0	0	0	0	0	0	0	648	1,426	1,361	583	0	0	0	0	0	0	0	0	0	0	0	0	
	Dec-26	Dec-26	Mob/Demob																											
Monthly VMT (mi/month)						0	0	0	0	0	0	2200.515873	2009.166667	1796.213518	1425.860215	1361.048387	583.3064516	0	0	0	0	0	0	0	0	0	0	0	0	

Total VMT
9,376 mi

Fuel Consumption
1,956 gallon
270 MMBtu

						2026												2027													
Site	Start Date	End Date	Task	Origin/Destination	CO2e Emission Factor	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	
41 First St																															
	Jul-26	Sep-26	Export	SEFA Default	2,129	0	0	0	0	0	0	4,685	4,278	2,444	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Sep-26	Dec-26	Import			0	0	0	0	0	0	0	0	1,380	3,036	2,898	1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Dec-26	Dec-26	Mob/Demob	2,129	0	0	0	0	0	0	0	0	0	1,380	3,036	2,898	1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	
Monthly Emissions (kg/month)						0	0	0	0	0	0	4,685	4,278	3,824	3,036	2,898	1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monthly Emissions (MT/month)						0.0	0.0	0.0	0.0	0.0	0.0	4.7	4.3	3.8	3.0	2.9	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Total Emissions
19,962 kg
20 metric ton

41 First Street - Track 4
Environmental Footprint Analysis
Equipment Schedule

										Fuel Consumption Factor (g/hp-hr)	Short-Term BSFC Factor (lb/day)	Fuel Consumption Factor (gal/hp-hr)	Short-Term BSFC Factor (gal/day)
	Start Date	End Date	Equipment	Engine type	Size (hp)	Qty	Daily use	Average Use	Load	2026	2026	2026	2026
Export													
	7/1/2026	9/16/2026	Excavator	diesel	250	2	100%	100%	59%	168.2826573	875.5593596	0.052923302	124.8989923
Import													
	9/17/2026	12/11/2026	Excavator	diesel	250	2	100%	100%	59%	168.2826573	875.5593596	0.052923302	124.8989923

Export

Import

875.5593596		124.8989923
875.5593596		124.8989923

41 First Street - Track 4 Environmental Footprint Analysis Equipment Emissions

					2026												2027												
Site	Start Date	End Date	Task	Annual BSFC Factor (lb/day)	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28
41 First St																													
	Jul-26	Sep-26	Export	875.5593596											20,138	19,262	10,507												
	Sep-26	Dec-26	Import	875.5593596												9,631	19,262	19,262	7,880										
	Dec-26	Dec-26	Mob/Demob	0																									

					2026												2027																
Site	Start Date	End Date	Task	Annual Fuel Consumption (gal/day)	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28				
41 First St																																	
	Jul-26	Sep-26	Export	124.8989923													2,873	2,748	1,499														
	Sep-26	Dec-26	Import	124.8989923															1,374	2,748	1,124												
	Dec-26	Dec-26	Mob/Demob	0																													

Monthly Fuel Consumption (gal/month)

Total Fuel Consumption
15,113 gal
2,086 MMBtu

[illegible][illegible][illegible][illegible]

Total Emissions
155,141 kg
155 metric ton

[illegible]

Total Emissions
50,500 kg
50 metric ton

[illegible]

41 First Street - Track 4
Environmental Footprint Analysis
Imported Material Emissions

		Lookup ID											
		3	4	5	6	7	8						
Material	SEFA Lookup	Quantity	Unit	Conversion	Quantity	Unit	Energy Usage (MMBtu)	GHG (lb CO2e)	NOx (lb)	SOx (lb)	PM (lb)	HAPs (lb)	
Stone	Round Gravel	2,411	ton	2000	4,822,000	lb	120	11,573	87	22	13	1	
Total							120	11,573	87	22	13	1	lb
								5.786	0.043	0.011	0.006	0.001	ton
								5,249					kg
								5					MT

SEFA Tool Material Table

		Lookup ID							
		3	4	5	6	7	8		
Construction Materials	Unit	Energy Usage (MMBtu/unit)	GHG (lb CO2e/unit)	NOx (lb/unit)	SOx (lb/unit)	PM (lb/unit)	HAPs (lb/unit)		
Aluminum, Rolled Sheet	lb	0.0633	9.15	0.0148	0.0283	0.0088	0.00102		
Asphalt, mastic	lb	0.0412	0.85	0.00271	0.00798	0.000766	0.00107		
Asphalt, paving-grade	lb	0.5	8.58	0.0299	0.0969	0.0091	0.0133		
Ethanol, Corn, 95%	lb	0.0318	-0.0199	0.00425	0.00303	0.000469	0.0000846		
Ethanol, Corn, 99.7%	lb	0.0324	0.0591	0.00431	0.0031	0.000472	0.000087		
Ethanol, Petroleum, 99.7%	lb	0.0205	1.25	0.00199	0.00214	0.000277	0.0000589		
Gravel/Sand Mix, 65% Gravel	lb	0.0000248	0.0024	0.000018	0.00000452	0.00000261	0.000000308		
Gravel/sand/clay	lb	0.000028	0.00335	0.0000165	0.000015	0.000002	2.05E-10		
HDPE	lb	0.0332	1.94	0.00325	0.00409	0.000439	0.0000641		
Photovoltaic system (installed)	W	0.0336	4.47	0.015	0.032	0.00063	0.0000029		
PVC	lb	0.0262	2.02	0.004	0.00274	0.000372	0.000375		
Portland cement, US average	lb	0.0139	1.34	0.00654	0.0104	0.00378	0.00097		
Ready-mixed concrete, 20 MPa	ft3	0.217	19.5	0.0975	0.154	0.057	0.0141		
Round Gravel	lb	0.0000248	0.0024	0.000018	0.00000452	0.00000261	0.000000308		
Sand	lb	0.0000248	0.0024	0.000018	0.00000452	0.00000261	0.000000308		
Stainless Steel	lb	0.0116	3.4	0.0075	0.012	0.0044	0.000144		
Steel	lb	0.0044	1.1	0.0014	0.0017	0.00056	0.000067		
Other refined construction materials	lb	0.01885	2.115	0.0040375	0.0051325	0.00144275	0.000162525		
Other unrefined construction materials	lb	0.000028	0.00335	0.0000165	0.000015	0.000002	2.05E-10		
Cheese Whey	lbs	0.0025	0.031	0.000062	0.000033	0.000002	NP		
Emulsified vegetable oil	lbs	0.0077	3.44	0.0066	0.0019	0.000033	NP		
Granular activated carbon, primary	lbs	0.0356	4.82	0.0793	0.128	0.000987	0.000657		
Granular activated carbon, regenerated	lbs	0.00873	1.7	0.00733	0.0129	0.000886	0.000671		
Hydrogen Peroxide, 50% in H2O	lbs	0.00979	1.19	0.00142	0.0024	0.000308	0.0000629		
Iron (II) Sulfate	lbs	0.00147	0.167	0.000316	0.000589	0.000103	0.000023		
Lime, Hydrated, Packed	lbs	0.00206	0.762	0.000513	0.000358	0.00013	0.00000657		
Molasses	lbs	0.0044	0.48	0.0011	0.00024	0.0000041	NP		
Phosphoric Acid, 70% in H2O	lbs	0.0067	0.882	0.00282	0.0294	0.00171	0.000163		
Potassium Permanganate	lbs	0.00981	1.16	0.00234	0.0032	0.000422	0.000122		
Sodium Hydroxide, 50% in H2O	lbs	0.00977	1.09	0.00194	0.00352	0.000403	0.000129		
Other Treatment Chemicals & Materials	lbs	0.015	1.67	0.003	0.0065	0.00061	0.000016		

41 First Street - Track 4

Environmental Footprint Analysis

Waste Emissions

							Lookup ID					
							3	4	5	6	7	8
Material	SEFA Lookup	Quantity	Unit	Conversion	Quantity	Unit	Energy Usage (MMBtu)	GHG (lb CO2e)	NOx (lb)	SOx (lb)	PM (lb)	HAPs (lb)
Non-hazardous Soil Disposal	Off-site non-hazardous waste landfill	2,399	ton	1	2,399	ton	384	59,975	336	180	960	3
Lead Soil	Off-site hazardous waste landfill	12	ton	1	12	ton	2	330	2	1	5	0
TCE Soil	Off-site hazardous waste landfill	0	ton	1	0	ton	0	0	0	0	0	0
Total							386	60,305	338	181	965	3 lb
								30.153	0.169	0.090	0.482	0.002 ton
								27,354				kg
								27				MT

SEFA Tool Waste Table

		Lookup ID					
		3	4	5	6	7	8
Waste Treatment	Unit	Energy Usage (MMBtu/unit)	GHG (lb CO2e/unit)	NOx (lb/unit)	SOx (lb/unit)	PM (lb/unit)	HAPs (lb/unit)
Hazardous waste incineration	lb	0.00609	2.43	0.0016	0.00167	0.000209	0.000087
Off-site waste water treatment (POTW)	gal x 1000	0.015	4.4	0.016	0.015		
Off-site non-hazardous waste landfill	ton	0.16	25	0.14	0.075	0.4	0.0014
Off-site hazardous waste landfill	ton	0.18	27.5	0.154	0.0825	0.44	0.00154
Off-site Laboratory Analysis - Other	sample	0.058071029	6.85343842	0.131401957	0.303875767	0.045569824	0.033016529
Off-site Laboratory Analysis - Metals	sample	0.212	27.4693	0.6423	1.5072	0.2264	0.1643
Off-site Laboratory Analysis - Mercury	sample	0.073171472	9.325458	0.2127439	0.4982396	0.07473594	0.05423316
Off-site Laboratory Analysis - Inorganic Anions	sample	0.007402451	0.6459478	0.006768122	0.014792866	0.002202395	0.001554243
Off-site Laboratory Analysis - Alkalinity	sample	0.017439833	1.3381922	0.007010628	0.013249646	0.001940048	0.001283077
Off-site Laboratory Analysis - Perchlorate	sample	0.023884988	1.8717054	0.007980652	0.014153532	0.002054687	0.001287486
Off-site Laboratory Analysis - Nitrogen/Nitrate	sample	0.033647504	4.29897	0.09545918	0.2226646	0.03350992	0.0242506
Off-site Laboratory Analysis - Sulfate	sample	0.014122473	1.4726728	0.007980652	0.013602382	0.001979731	0.001201507
Off-site Laboratory Analysis - PCBs	sample	0.0512769	5.224902	0.08333388	0.19047744	0.02843934	0.021208252
Off-site Laboratory Analysis - VOCs	sample	0.076204487	9.016814	0.10449804	0.2270738	0.03395084	0.02358922
Off-site Laboratory Analysis - SVOCs	sample	0.071560184	7.870422	0.14594452	0.3373038	0.05048534	0.03725774

41 First Street - Track 4
Environmental Footprint Analysis
Grid Electricity Emissions

					2026												2027												
Site	Start Date	End Date	Eletrical Equipment	Daily Energy Demand (kWh/day)	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28
41 First St																													
	7/1/2026	12/31/2026	Mobile Office	50							1,150	1,100	1,150	1,100	1,100	1,150													
					-	-	-	-	-	-	1,150	1,100	1,150	1,100	1,100	1,150	-	-	-	-	-	-	-	-	-	-	-	-	-

Total Demand
6,750 kWh
23 MMBtu

					2026												2027												
Site	Start Date	End Date	Eletrical Equipment	Grid Baseload Emissions (g/kWh)	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28
41 First St																													
	7/1/2026	12/31/2026	Mobile Office	276.1942085							317,623	303,814	317,623	303,814	303,814	317,623													
											317,623	303,814	317,623	303,814	303,814	317,623													
											-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
											318	304	318	304	304	318	-	-	-	-	-	-	-	-	-	-	-	-	
											0.3	0.3	0.3	0.3	0.3	0.3	-	-	-	-	-	-	-	-	-	-	-	-	

Total Emissions
1,864,311 g
1,864 kg
2 MT

41 First Street - Track 4
Environmental Footprint Analysis
Water Emissions

		Lookup ID													
		2		3		4		5		6		7		8	
Water Source	Lookup	Quantity	Unit	Conversion	Quantity	Unit	Energy Usage (MMBtu)	GHG (lb CO2e)	NOx (lb)	SOx (lb)	PM (lb)	HAPs (lb)			
NYC Public Water	Public Water (SEFA Default)	1,200	gal	0.001	1	gal x 1000	0	6	0	0	0	0			
Total							0	6	0	0	0	0	lb		
								0.003	0.000	0.000	0.000	0.000	ton		
								3					kg		
								0					MT		

Water Usage Emission Factors

		Lookup ID					
		3	4	5	6	7	8
Water Source Type	Unit	Energy Usage (MMBtu/unit)	GHG (lb CO2e/unit)	NOx (lb/unit)	SOx (lb/unit)	PM (lb/unit)	HAPs (lb/unit)
Public Water (SEFA Default)	gal x 1000	0.0092	5	0.0097	0.0059	0.016	0.000015
Other	sample	0.071560184	7.870422	0.14594452	0.3373038	0.05048534	0.03725774

41 First Street - Track 4

Environmental Footprint Analysis

Emission Factors

BSFC Emission Factors (g/hp-hr)									
ID	Equipment	Engine	SCC Code	HPmin	HPmax	HP	Equipment	Load	2026
	Dsl - Excavators	Diesel	2270002036	175	300	173-250	Excavator	59%	168.3
	Dsl - Excavators	Diesel	2270002036	26	75	36-75	Excavator	59%	186.9

*for excavator in 2006 Hpmax 300 used

Fuel Properties			
Densities	kg/L	g/gal	lb/gal
	Diesel 0.84	3,179.75	7.01
	Gasoline 0.74	2,801.21	6.18
	LPG 0.54	2,044.12	4.51

BSFC Emission Factors (gal/hp-hr)									
ID	Equipment	Engine	SCC Code	HPmin	HPmax	HP	Equipment	Load	2026
	Dsl - Excavators	Diesel	2270002036	175	300	173-250	Excavator	59%	0.0529
	Dsl - Excavators	Diesel	2270002036	26	75	36-75	Excavator	59%	0.0588

EPA Fuel Emission Factors

Diesel

GWP-100	GWP-20	kg/gal	GHG	GWP-20 Equivalent Emissions	GWP-100 Equivalent Emissions	SEFA Default
1	1	10.21	CO2	10.27 kg CO2e/gal	10.24268 kg CO2e/gal	10.20582833 kg CO2e/gal
28	84	0.00041	CH4	22.63168431 lb CO2e/gal	22.58124254 lb CO2e/gal	22.5 lb CO2e/gal
265	264	0.00008	N2O			

ghg-emission-factors-hub-2025.pdf

GWP-20 Equivalent Emissions with Upstream	
13.607092	kg CO2e/gal
29.99850086	lb CO2e/gal

Gasoline

GWP-100		GWP-20	kg/gal	GHG	GWP-20 Equivalent Emissions		GWP-100 Equivalent Emissions		SEFA Default	
1	1		8.78	CO2	8.83	kg CO2e/gal	8.81184	kg CO2e/gal	8.890410452	kg CO2e/gal
28	84		0.00038	CH4	19.47351852	lb CO2e/gal	19.42678052	lb CO2e/gal	19.6	lb CO2e/gal
265	264		0.00008	N2O						

ghg-emission-factors-hub-2025.pdf

MOVES TRUCKS FACTORS	PM2.5	PM10	CO	NOx	VOC	CO2e	SO2	Truck Mileage	Car Mileage
2024 - Truck Idling (g/hr)	6.71	7.30	25.14	96.40		11.5036	7746.96	10205.8283 g/gal	8890.41 g/gal
2024 - Truck Cruising - 5mph (g/veh)	0.24	0.26	1.49	4.36		0.327756	438.16	2129.08 g/mi	305.848 g/mi
2024 - Truck Cruising - 25mph (g/mi)	1.13	1.23	5.24	19.66		0.803909	2129.08	4.79353915 mpg	29.06807 mpg
2024 - Auto Cruising - 25mph (g/mi)	0.01	0.01	2.17	0.24		0.0458798	305.848	0.20861413 gal per mi	0.034402 gal per mi
								0.02878875 MMBtu/mi	0.0043 MMBtu/mi

Distance Traveled On-site: approximately 0.1 mile per truck

HHV	
Diesel	0.138 mmBtu per gallon
Gasoline	0.125 mmBtu per gallon

NYSDEC Upstream Emission Factor

Table A1. 2021 Emission Rates for Upstream Out-of-State Sources (g/mmbtu)

	Diesel Fuel
CH4	117.000 g/MMBtu
N2O	0.250 g/MMBtu
CO2	13.634 g/MMBtu
CO2e	24.214 g/MMBtu

	Diesel Fuel
CH4	16.146 g/gal
N2O	0.035 g/gal
CO2	1.881 g/gal
CO2e	3.342 g/gal

NYSDEC, *Appendix A of the 2024 Statewide GHG Emission Report*. December 2024

eGRID Baseload Electricity Factor

Data Year	eGRID subregion acronym	eGRID subregion name	Unit	eGRID subregion annual CO2 total output emission rate	eGRID subregion annual CH4 total output emission rate	eGRID subregion annual N2O total output emission rate	eGRID subregion annual CO2 equivalent total output emission rate (GWP-100)	eGRID subregion annual CO2 equivalent total output emission rate (GWP-20)
2022	NYCW	NPCC NYC/Westchester	lb/MWh	602.088	0.056	0.008	605.872	608.904
			g/kWh	273.103	0.025	0.004	274.819	276.194

APPENDIX D
CLIMATE VULNERABILITY ASSESSMENT



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Ms. Brittany Taranto
NYSDEC
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, NY, 12233-7016

06.18.2025

**Re: Climate Vulnerability Analysis
41 First Street, Brooklyn, NY
NYSDEC BCP Site No. C224401**

Dear Ms. Taranto:

This Climate Vulnerability Analysis (CVA) has been prepared by AKRF, Inc. (AKRF) on behalf of Catholic Charities Progress of Peoples Development Corporation (the “Client”) for the Site [New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Site No. C224401] located at the above-referenced location, also identified as New York City Tax Block 451, portion of Lot 25 (the “Site”). As further detailed in the November 2023 NYSDEC Memorandum, DER-31: Green and Sustainable Remediation Initiative, beginning January 1, 2024, all remedial work plans and reports submitted to NYSDEC pursuant to a remedial program under Part 375 are required to address green and sustainable remediation (GSR) in accordance with DER-31. The EFA was incorporated into the NYSDEC Decision Document as a requirement for selection between the two remedy alternatives — Track 1 and Track 4.

This CVA focuses on the risks associated with the construction and operation of the primary components of each of the two remedy alternatives: existing building demolition (Track 1 only), excavation and disposal of contaminated soil, import of backfill materials, and installation of a passive sub-slab depressurization system (SSDS).

POLICY CONTEXT

The New York State Sea Level Rise Task Force was created to assess potential impacts on the state’s coastlines from rising seas and increased storm surge. The Task Force prepared a report of its findings and recommendations including protective and adaptive measures.¹ The recommendations are to: provide more protective standards for coastal development, wetlands protection, shoreline armoring, and post-storm recovery; implement adaptive measures for habitats; integrate climate change adaptation strategies into state environmental plans; and amend local and state regulations or statutes to respond to climate change. The Task Force also recommended the formal adoption of projections of sea-level rise.

The New York State Climate Action Plan Interim Report identified a number of policy options and actions that could increase the climate change resilience of natural systems, the built environment, and key economic sectors—focusing on agriculture, vulnerable coastal zones, ecosystems, water resources, energy infrastructure, public health, telecommunications and information infrastructure, and transportation.² New York State’s Community Risk and Resiliency Act (CRRA)³ requires that applicants for certain State programs demonstrate that they have taken into account future physical climate risks from storm surges,

¹ New York State Sea Level Rise Task Force. *Report to the Legislature*. December 2010.

² NYSERDA. New York State Climate Action Plan Interim Report. November 2010.

³ *Community Risk and Resiliency Act*. Chapter 355, NY Laws of 2014. April 9, 2013. Signed September 22, 2014.

sea-level rise and flooding, and required the NYSDEC to establish official State sea-level rise projections. In February 2017, DEC adopted a rule (6 NYCRR Part 490) defining the existing projections for use. These projections provide the basis for State adaptation decisions and are available for use by all decision makers. CRRRA applies to specific State permitting, funding and regulatory decisions, including: smart growth assessments; funding for wastewater treatment plants; siting of hazardous waste facilities; design and construction of petroleum and chemical bulk storage facilities; oil and gas drilling; and State acquisition of open space. As required under the CRRRA, DEC published implementation guidance and reference to climate change projections specific to New York State in August 2021.

In New York City, the Climate Change Adaptation Task Force is tasked with fostering collaboration and cooperation between public and private organizations working to build the resilience of the city's critical infrastructure against rising seas, higher temperatures, and changing precipitation patterns. The Task Force is composed of over 57 New York City and State agencies, public authorities, and companies that operate, regulate, or maintain critical infrastructure in New York City. Led by the Mayor's Office of Climate and Environmental Justice, the Task Force works together to assess risks, prioritize strategies, and examine how standards and regulations may need to be adjusted in response to a changing climate.

To assist the Task Force, the New York City Panel on Climate Change (NPCC) has prepared a set of climate change projections for the New York City region⁴, which was subsequently updated,^{5,6} and has suggested approaches to create an effective adaptation program for critical infrastructure. The NPCC includes leading climatologists, sea-level rise specialists, adaptation experts, and engineers, as well as representatives from the insurance and legal sectors. The climate change projections include a summary of baseline and projected climate conditions throughout the 21st century including heat waves and cold events, intense precipitation and droughts, sea-level rise, and coastal storm levels and frequency.

Temperature & Urban Heat Island

The probability that New York City would experience an increase in air temperatures and relative humidity (characterized as the heat index of a given location) is considered by NPCC to be "very likely." NPCC projected that temperatures are likely to increase by up to 7.1 degrees Fahrenheit by the 2050s and that New York City would experience up to 9 heat waves per year with an average duration up to 6 days. By the end of the century, temperatures are likely to increase by up to 13.5 degrees Fahrenheit with up to 10 heat waves per year with an average duration of 10 days.

Precipitation

NPCC projected that precipitation levels are likely to increase by up to 13 percent compared to the 1971–2000 base period by the 2050s and up to 25 percent by the end of the century with up to 5 rainfall events projected to result in 2 inches or more of precipitation.

Sea Level Rise

NPCC has projected that sea levels are likely to increase by up to 23 inches by the 2050s and up to 65 inches by the end of the century (more detailed ranges and timescales are available). In general, the probability of increased sea levels is characterized by NPCC as "extremely likely," but there is uncertainty regarding the probability the various levels projected and timescale. Intense hurricanes are characterized by NPCC as "more likely than not" to increase in intensity and/or frequency, and the likelihood of changes

⁴ New York City Panel on Climate Change. *Climate Change Adaptation in New York City: Building a Risk Management Response*. Annals of the New York Academy of Sciences, May 2010.

⁵ Braneon, C., Ortiz, L., Bader, D., Devineni, N., Orton, P., Rosenzweig, B., McPhearson, T., Smalls-Mantey, L., Gornitz, V., Mayo, T., Kadam, S., Sheerazi, H., Glenn, E., Yoon, L., Derras-Chouk, A., Towers, J., Leichenko, R., Balk, D., Marcotullio, P., & Horton, R. (2024). *NYC climate risk information 2022: Observations and projections*. Interim Report for Public Release <https://climateassessment.nyc>

⁶ Balk, D., Braneon, C., Leichenko, R., Moss, R., Towers, J. (2024). *Climate Risk and Equity: Advancing Knowledge Toward a Sustainable Future: Introduction*. New York City Panel on Climate Change. <https://climateassessment.nyc>

in other large storms (“Nor’easters”) are characterized by NPCC as unknown. Therefore, the projections for future 1-in-100 coastal storm surge levels for New York City include only sea-level rise at this time, and do not account for changes in storm frequency.

CLIMATE RISKS

Temperature & Urban Heat Island

Existing Conditions

The Site is identified as being vulnerable to extreme heat by the New York City Department of Health (DOH), with a Heat Vulnerability Index (HVI) of 2 out of 5—considered a high level of risk.⁷ The proposed future use of the Site includes new affordable senior housing building with a partial cellar subgrade level (due to elevation change/slope) and landscaped areas on the central and eastern portion of the lot (i.e., the current parking and landscaped areas). The Site is bound by Carroll Street, followed by residential and commercial buildings to the north; Bond Street, followed by residential and commercial buildings and Gowanus Canal to the east; First Street followed by residential buildings to the south and residential buildings to the west. The surrounding area consists primarily of commercial, residential, and industrial/manufacturing uses.

Carroll Park is located northwest of the Site. Several other public parks and greenspaces are located within walking distance from the Site, and numerous other natural resources are easily accessible from the Site via public transportation, including the Gowanus Canal, the Jamaica Bay, and the East River.

Future Conditions

According to projections for increases in annual mean temperatures, the Site is anticipated to experience increased temperatures between 4.2 degrees Fahrenheit and 13.5 degrees Fahrenheit by the end of the century.^{8, 9} Additionally, by the 2080s NPCC projects that the number of days with temperatures above 90 degrees Fahrenheit would increase by 91 days (or 69 days above 95 degrees Fahrenheit). By the end of the century, NPCC projects that New York City would likely experience up to 10 heat waves per year with an average duration of 10 days.

Climate Vulnerability of the Selected Remedy

The remedy would not be affected by the projected increase in temperature or urban heat island effect. Therefore, no further assessment of heat impacts is warranted.

Precipitation

Existing Conditions

Precipitation in New York City was observed to have increased by a rate of 0.76 inch per decade with an average storm rainfall intensity of approximately 2 inches in one hour and a 10 percent chance of occurrence per year. New York City Department of Environmental Protection (NYCDEP) has identified that the Site does not experience nuisance flooding (with flood levels greater than 4 inches) or deep and continuous flooding (with flood levels greater than 1 foot).

⁷ NYCDOH. *Interactive Heat Vulnerability Index*. <https://a816-dohbesp.nyc.gov/IndicatorPublic/beta/key-topics/climatehealth/hvi/>

⁸ NYSERDA. *Climate Change in New York State. Updating the 2011 ClimAID Climate Risk Information Supplement to NYSERDA Report 11-18 (Responding to Climate Change in New York State)*. September 2014.

⁹ Braneon, C., Ortiz, L., Bader, D., Devineni, N., Orton, P., Rosenzweig, B., McPhearson, T., Smalls-Mantey, L., Gornitz, V., Mayo, T., Kadam, S., Sheerazi, H., Glenn, E., Yoon, L., Derras-Chouk, A., Towers, J., Leichenko, R., Balk, D., Marcotullio, P., & Horton, R. (2024). *NYC climate risk information 2022: Observations and projections*. Interim Report for Public Release <https://climateassessment.nyc>

Future Conditions

Annual precipitation levels are anticipated to increase in New York City up to 14 percent (approximately 56.7 inches per year) by the 2050s and up to 30 percent (approximately 64.6 inches per year) by the end of the century.¹⁰

Climate Vulnerability of the Selected and Implemented Remedy

As described in the draft Remedial Action Work Plan (RAWP), erosion and sedimentation control measures will be implemented for the selected remedy during construction activities at the Site. The RAWP included requirements regarding stormwater management, erosion and sediment control, and construction practices to minimize stormwater contamination. Since remediation will be completed in approximately 18 months for Track 1 and 6 months for Track 4, these measures are resilient to the current rainfall levels of approximately 2 inches in one hour.

Following completion, the remedy is not likely to be affected by increased future projected precipitation levels. Therefore, no further assessment of stormwater flooding impacts is warranted.

Sea Level Rise

Existing Conditions

According to current flood hazard projections,¹¹ the Site is not within the current 1-in-100 coastal storm surge levels. The nearest 1-in-100 flood zone (with flood elevations of 32 feet NAVD88) is located east of the Site in the adjacent block. The eastern portion of the Site is within the current 1-in-500 coastal storm surge levels.

Note that these flood areas and elevations are likely conservatively high and may be revised in the future. On October 17, 2016, the Federal Emergency Management Agency (FEMA) and New York City Mayor de Blasio announced plans to revise the FEMA flood maps based on a 2015 New York City appeal of FEMA's flood risk calculations for New York City and the region. Therefore, it is possible that the revised FEMA current flood elevations would be lower, and the resulting future flood elevations, including sea-level rise, may also be lower than those presented here.

Future Conditions

According to NPCC data (under the NPCC high-end estimate), by the 2050s, the 1-in-100 flood levels could reach 23 inches higher due to sea-level rise. By the end of the century, the 1-in-100 flood levels could reach 65 inches higher.

Climate Vulnerability of the Selected Remedy

The completed remedy would not be affected by projected increases in sea level rise. Therefore, no further assessment of coastal flooding impacts is warranted.

CONCLUSIONS

Based on the review of potential flooding (from both sea level rise and increased precipitation) and heat impacts, the selected remedy is resilient to existing and future climate risks.

¹⁰ As noted by the NPCC, the greatest increases in precipitation are projected to occur during the winter months with smaller increases generally projected for the summer and fall seasons. However, NPCC projects that some reductions in mean precipitation is anticipated under the low-end scenario by 2100, with the greatest decreases projected for the summer and fall seasons.

¹¹ FEMA. *Preliminary Flood Insurance Rate Map*. Panel 3604970236G. Release Date: 12/05/2013.

If you have any questions or require additional information, please contact me at (646) 388-9846 or Ashutosh Sharma at (646) 388-9865.

Sincerely,
AKRF, Inc.

A handwritten signature in black ink, appearing to read "Kevin Edwards". The signature is fluid and cursive, with the first name "Kevin" and last name "Edwards" clearly distinguishable.

Kevin Edwards
Senior Technical Director

APPENDIX E
HEALTH AND SAFETY PLAN (HASP) & COMMUNITY AIR MONITORING PLAN (CAMP)

**JOHN TYNAN SENIOR RESIDENCE
41 FIRST STREET
BROOKLYN, NY**

**Health & Safety Plan and
Community Air Monitoring Plan**

**NYSDEC BCP Site Number: C224401
AKRF Project Number: 230346**

Prepared For:

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

Prepared On Behalf Of:

Catholic Charities Progress of Peoples Development Corporation
John Tynan Senior Residence LLC
191 Joralemon Street
Brooklyn, NY 11201

Prepared by:



AKRF, Inc.
440 Park Avenue South, 7th Floor
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JULY 2025

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- Attachment A – Potential Health Effects from On-site Contaminants
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1.0 INTRODUCTION

This Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) were prepared by AKRF, Inc. (AKRF) on behalf of Catholic Charities Progress of Peoples Development Corporation (CCPOPDC) and John Tynan Senior Residence LLC (collectively the “Participant”) for the John Tynan Senior Residence redevelopment site located at 41 First Street in Brooklyn, NY (hereafter referred to as the “Site”). The approximately 0.889-acre Site is identified on the New York City Tax Map as Brooklyn Borough Tax Block 451, portion of Lot 25. The Site is currently enrolled in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) (BCP Site No. C224401).

The Site is currently developed as a residential building with landscaped areas and asphalt-paved parking. The surrounding area consists primarily of commercial, residential, and industrial/manufacturing uses. The Site is bound by Carroll Street, followed by residential and commercial buildings to the north; Bond Street, followed by residential and commercial buildings and Gowanus Canal to the east; residential buildings followed by First Street to the south; and residential buildings to the west. The Site location is shown on Figure 1.

Based on an evaluation of the data and information from previous investigations, there is contaminated soil, groundwater, and soil vapor present at the Site that is principally attributable to historical industrial and manufacturing operations and historic fill at the Site. The primary contaminants of concern (COCs) at the Site include: polycyclic aromatic hydrocarbons (PAHs) [a class of semivolatile organic compounds (SVOCs)], polychlorinated biphenyls (PCBs), pesticides, per- and polyfluoroalkyl substances (PFAS), and metals in soil/fill above Restricted Residential Soil Cleanup Objectives (RRSCOs) and/or Unrestricted Use Soil Cleanup Objectives (UUSCOs); metals and PFAS in groundwater; and chlorinated solvent-related and petroleum-related VOCs in soil vapor. A soil vapor intrusion (SVI) testing program was completed for the existing residential building and no issues were noted.

2.0 HEALTH AND SAFETY GUIDELINES AND PROCEDURES

2.1 Hazard Evaluation

2.1.1 Hazards of Concern

Table 1
Hazards of Concern

X	Organic Chemicals	X	Inorganic Chemicals		Radiological
	Biological		Explosive/Flammable		Oxygen Deficient Atm.
X	Heat Stress	X	Cold Stress		Carbon Monoxide
Comment: No personnel without confined space entry permits may to enter confined spaces.					

2.1.2 Physical Characteristics

Table 2
Physical Characteristics

X	Liquid	X	Solid		Sludge
X	Vapors		Unknown		Other

2.1.3 Hazardous Materials

Table 3
Hazardous Materials

Chemicals		Solids		Solvents		Oils	
	Acids	X	Ash		Halogens		Transformer
	Caustics	X	Asbestos		Petroleum	X	Motor
X	Pesticides		Tailings	X	CVOCs	X	Hydraulic
X	Petroleum	X	Fill			X	Gasoline
	Inks					X	Fuel
X	PCBs					X	Waste
X	Metals						
X	SVOCs						
	Ammonia						

2.1.4 Chemicals of Concern

Table 4
Chemicals of Concern

Chemical	REL/PEL/STEL	Health Hazards
1,1,1-Trichloroethane	REL C: 350 ppm PEL: 350 ppm	Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage.
1,1-Dichloroethane	REL: 100 ppm PEL: 100 ppm	Irritation skin; central nervous system depression; liver, kidney, lung damage.
1,2-Dichloroethane	REL: 1 ppm N STEL: 2ppm PEL: 50 ppm PEL C: 100 ppm; 5-min max peak: 200 ppm	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen].
1,2-Dichloroethene	REL: 200 ppm PEL: 200 ppm	Irritation eyes, respiratory system; central nervous system depression.
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].
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].
Beryllium	REL C: 0.0005 mg/m ³ PEL: 0.002 mg/m ³ PEL C: 0.005 mg/m ³ ; max peak: 0.025 mg/m ³	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen].
Cadmium	PEL: 0.005 mg/m ³	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen].
Carbon Disulfide	REL: 1 ppm N STEL: 10 ppm PEL: 20 ppm PEL C: 30 ppm; 30-min max peak: 100 ppm	Dizziness, headache, poor sleep, lassitude (weakness, exhaustion), anxiety, anorexia, weight loss; psychosis; polyneuropathy; Parkinson-like syndrome; ocular changes; coronary heart disease; gastritis; kidney, liver injury; eye, skin burns; dermatitis; reproductive effects.

Chemical	REL/PEL/STEL	Health Hazards
Carbon Tetrachloride	N STEL: 2 ppm PEL: 10 ppm PEL C: 25 ppm; 5-min max peak 200 ppm	Irritation eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen].
Chloroform	N STEL: 2 ppm PEL C: 50 ppm	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [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].
Dichlorodifluoromethane	REL: 1,000 ppm PEL: 1,000 ppm	Dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite.
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.
Manganese	REL: 1 mg/m ³ N STEL: 3 mg/m ³ PEL C: 5 mg/m ³	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage.

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.
Methylene Chloride	PEL: 25 ppm O STEL: 125 ppm	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen].
Naphthalene	REL: 10 ppm N STEL: 15 ppm PEL: 10 ppm	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage.
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].
Phenol	REL: 5 ppm REL C: 15.6 ppm PEL: 5 ppm	Irritation eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine; cyanosis; liver, kidney damage; skin burns; dermatitis; ochronosis; tremor, convulsions, twitching.

Chemical	REL/PEL/STEL	Health Hazards
Selenium	REL: 0.2 mg/m ³ PEL: 0.2 mg/m ³	Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; In Animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage.
Silver	REL: 0.01 mg/m ³ PEL: 0.01 mg/m ³	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance.
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].
Vinyl Chloride	PEL: 1 ppm PEL C: 5 ppm	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen].
Xylene	REL: 100 ppm N STEL: 150 ppm PEL: 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Zinc	REL: 5 mg/m ³ REL C: 15 mg/m ³ N STEL: 10 mg/m ³ PEL: 5 mg/m ³ (ZnO fume); 15 mg/m ³ (ZnO dust)	Chills, elevated body temperature, myalgia, cough, fatigue, chest pain, stomach cramps, nausea, anemia, changes in cholesterol levels, and vomiting.
Notes: REL: Recommended exposure limit (NIOSH) PEL: Permissible exposure limits (OSHA) STEL: Short-term exposure limit N: NIOSH O: OSHA C: Ceiling		

2.2 Designated Personnel

AKRF will appoint one of its on-site personnel as the field team leader, field technician, and Site Safety Officer (SSO). This individual will be responsible for the implementation of this HASP.

The field team leader will work under the direction of a Qualified Environmental Professional (QEP), and will be experienced in the implementation of air monitoring and hazardous materials sampling programs.

2.3 Training

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

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

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

2.4 Medical Surveillance Program

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

2.5 Site Work Zones

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

The exclusion zone is defined as the area where exposure to contaminated 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, the fire extinguisher, and first aid supplies are located. The emergency staging area (part of the support zone) is the area where all workers on-site would assemble in the event of an emergency. A summary of these areas is provided below. These zones may be changed by the SSO, depending on that day's activities. All field personnel will be informed of the location of these zones before work begins.

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

Table 5
Site Work Zones

Task	Exclusion Zone	CRZ	Support Zone
Soil Excavation and Storage Tank Removal (if any) Areas	15 feet from excavation border and excavation equipment or vehicles	15 feet from excavation border and excavation equipment or vehicles	As Needed

2.6 Air Monitoring Program

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 of volatile organic compounds (VOCs) and particulates will be performed in the work zone during all intrusive Site activities. Work zone air monitoring for VOCs will be performed with a photoionization detector (PID) equipped with a 10.6 electron Volt (eV) lamp. The PID will be calibrated with 100 parts per million (ppm) isobutylene standard gas, in accordance with the manufacturer's specifications, at the start of each work day. Work zone air monitoring for particulates will be conducted using a TSI SidePak AM520™ or equivalent to measure the concentration of airborne respirable particulates less than 10 micrometers in size (PM₁₀).

The SSO shall set up the equipment and confirm that it is working properly. His/her designee may oversee the air measurements during the day. Measurements will be taken prior to commencement of work and continuously during the work. Measurements will be made as close to the workers as practicable and at the breathing height of the workers. The action levels and required responses are listed in the following table:

Table 6
Work Zone Air Monitoring Action Levels

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
Particulate Monitor (TSI SidePak AM520™ or equivalent)	Less than 5 mg/m ³ above background in breathing zone	Level D, D-Modified, or C (subject to PID reading)
	Between 5 mg/m ³ and 125 mg/m ³	Level C (requires half-face or full face respirator)
	More than 125 mg/m ³ above background in breathing zone	Stop work. Resume work when readings are less than 0.150 mg/m ³ .
Notes: 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 in compliance with the New York State Department of Health (NYSDOH) Generic CAMP. Real-time air monitoring for VOCs and particulates at the perimeter of the exclusion zone will be performed as described below.

Roving Air Monitoring

VOC Monitoring

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

Continuous monitoring for VOCs will be conducted during all ground intrusive activities, including excavation and tank removal (if any) activities. 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.

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 TSI SidePak AM520™ 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. Background readings and any readings that trigger response actions will be recorded in the field logbook, which will be available on-site for NYSDOH and/or NYSDEC review.

Fixed Air Monitoring Stations

Fixed air monitoring stations will be set up at the upwind and downwind perimeters of the exclusion zone (2 total) during all ground intrusive activities and will continuously log VOC and particulate levels. Each fixed monitoring station will be fully enclosed and equipped with the following:

- A PID equipped with a 10.6 eV lamp capable of calculating 15-minute running average VOC concentrations;
- A TSI 8530 DustTrak II or equivalent dust monitor capable of measuring the concentration of airborne respirable particulates less than 10 micrometers in size (PM₁₀) and calculating 15-minute running average particulate concentrations; and

- A Netronix™ Thiamus™ ICU-820 or equivalent Global System for Mobile Communication (GSM)/Global Positioning System (GPS) device capable of recording air monitoring and location data.

Each monitoring station will be capable of sending e-mail alerts to the SSO to indicate an exceedance of action levels. Additionally, the SSO will conduct an inspection of the monitoring stations on at least an hourly basis. Upon completion of Site activities, all air monitoring data will be available to download via the equipment provider's website. All air monitoring data recorded at the fixed monitoring stations will be available for NYSDOH and/or NYSDEC review and will be included in the Final Engineering Report (FER).

Community Air Monitoring Action Levels

VOC Action Levels

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

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

Particulate Action Levels

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

- If the downwind particulate concentrations are greater than 0.1 milligram per cubic meter (mg/m^3) above background (upwind concentrations), and no other obvious source is apparent, then it will be assumed that the elevated particulate concentrations are a result of Site activities. In such instances, particulate suppression measures will be implemented and monitoring will be continued. Work will be allowed to continue with dust suppression if downwind particulate levels do not exceed $0.150 \text{ mg}/\text{m}^3$ above the background (upwind concentration) and provided that no visible dust is migrating from the work area.
- If particulate levels persist at $0.150 \text{ mg}/\text{m}^3$ above the background, work must be stopped until dust suppression measures bring particulate levels to below $0.150 \text{ mg}/\text{m}^3$ above background.

Major Vapor Emission Response Plan

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

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

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

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

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

- NYSDEC, NYSDOH, and 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 SSO 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 (PPE)

The PPE 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 PPE. The protection will be based on the air monitoring described in this section.

Table 7
Personal Protection Equipment Requirements

LEVEL OF PROTECTION & PPE		All Tasks
Level D ☒ Steel Toe Shoes ☒ Hard Hat (within 25 ft. of excavator) ☒ Work Gloves	☒ Safety Glasses ☐ Face Shield ☒ Ear Plugs (within 25 ft. of excavator) ☒ Nitrile Gloves ☒ Tyvek for tank contractor if NAPL present	Yes
Level C (add to Level D) ☒ Half-Face Respirator ☒ Full Face Respirator ☐ Full-Face PAPR	☐ Particulate Cartridge ☐ Organic Cartridge ☒ Dual Organic/Particulate Cartridge	If PID > 10 ppm
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breath or any odors detected). PAPR = powered air purifying respirator		

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

3.1 Hospital Directions

Table 8
Hospital Directions

Hospital Name:	The Brooklyn Hospital Center
Phone Number:	718-250-8000
Address/Location:	121 Dekalb Ave, Brooklyn, NY 11201
Directions:	1. Head north on Bond Street and towards Union Street. 2. Turn right onto Union Street. 3. Turn left at the 2nd cross street onto 3rd Ave. 4. 3rd Ave turns right and becomes Lafayette Ave. 5. Turn left onto Ashland Place. 6. Hospital will be on the right.

3.2 Emergency Contacts

Table 9
Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF, Inc.	Axel Schwendt	Project Director / QA/QC Officer	(917) 596-8992 (cell)
	Ashutosh Sharma	Project Manager	646-388-9865 (office)
	Brian Quinn	SSO	201-314-8032 (cell)
Catholic Charities Progress of Peoples Development Corporation and John Tynan Senior Residence LLC	Jennifer Swift	BCP Participant Representative	718-722-6044 (office)
New York State Department of Environmental Conservation	Brittany Taranto	Project Manager	(518) 402-9791
New York State Department of Health	Christopher Budd	Project Manager	(518) 402-1769
Ambulance, Fire Department & Police Department	-	-	911

4.0 APPROVAL & ACKNOWLEDGMENTS OF HASP

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 field team leader.

AFFIDAVIT

I, _____ (name), of _____ (company name), have read the HASP for the Site located at John Tynan Senior Residence, 41 First Street in Brooklyn, New York. I agree to conduct all on-site work in accordance with the requirements set forth in this HASP and understand that failure to comply with this HASP could lead to my removal from the Site.

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

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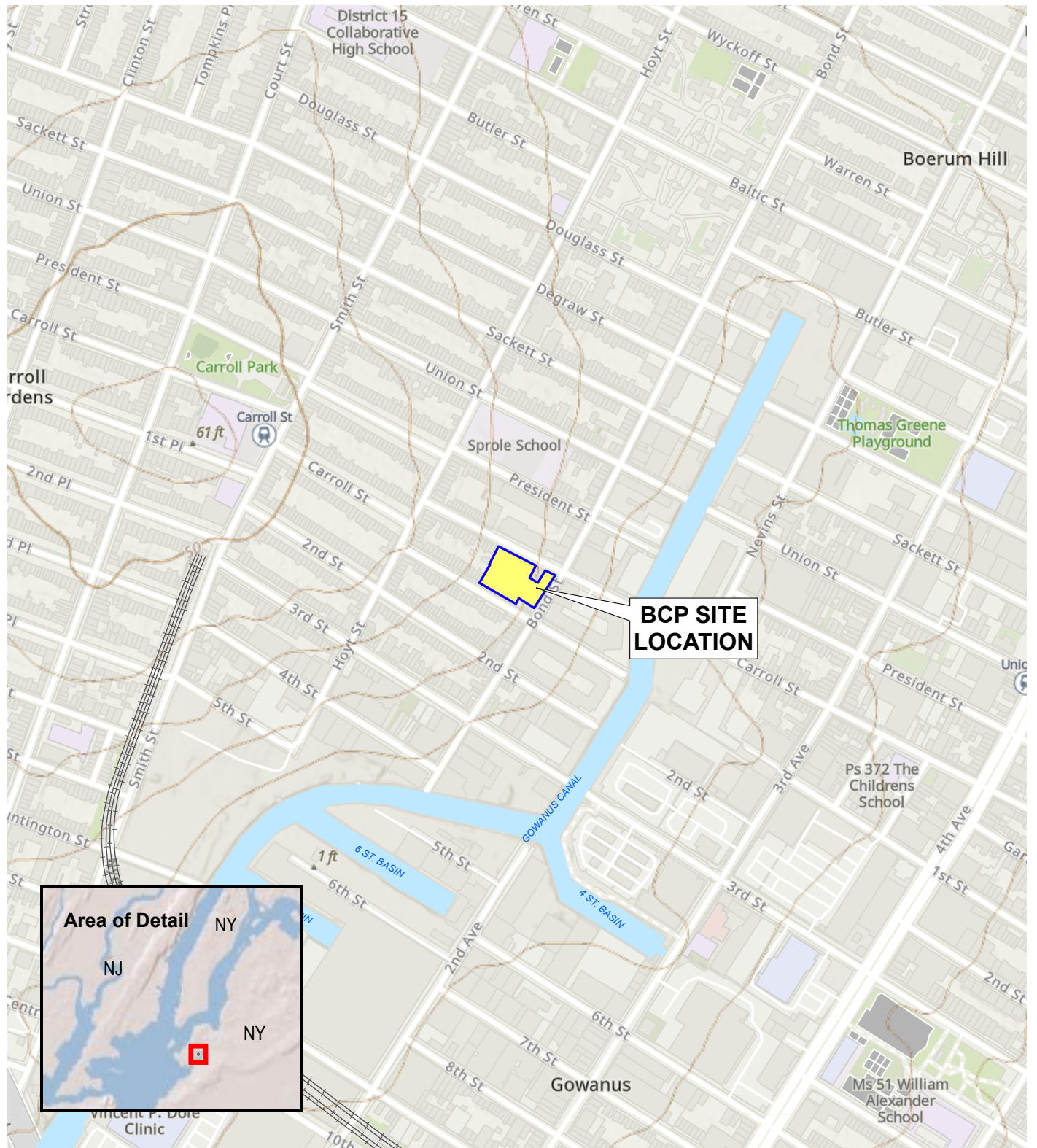
Signed: _____ Company: _____ Date: _____

Signed: _____ Company: _____ Date: _____

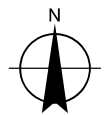
Signed: _____ Company: _____ Date: _____

FIGURES

AKRF O:\Projects\230346 - 41 FIRST ST, BROOKLYN\230346 BCP RWP Figures.aprx10/20/2023 1:07 PM\230346 Fig 1 site location\szalus



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



440 Park Avenue South, New York, NY 10016

John Tynan Senior Residence
41 First Street, Brooklyn, New York

BCP SITE LOCATION

DATE

4/1/2024

PROJECT NO.

230346

FIGURE

1

ATTACHMENT A
POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

This fact sheet answers the most frequently asked health questions (FAQs) about 1,1,1-trichloroethane. 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 1,1,1-trichloroethane usually occurs by breathing contaminated air. It is found in building materials, cleaning products, paints, and metal degreasing agents. You are not likely to be exposed to large enough amounts to cause adverse health effects. Inhaling high levels of 1,1,1-trichloroethane can cause you to become dizzy and lightheaded. Exposure to much higher levels can cause unconsciousness and other effects. This substance has been found in at least 823 of the 1,662 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is 1,1,1-trichloroethane?

1,1,1-Trichloroethane is a synthetic chemical that does not occur naturally in the environment. It also is known as methylchloroform, methyltrichloromethane, trichloromethylmethane, and α -trichloromethane. Its registered trade names are chloroethene NU® and Aerothene TT®.

No 1,1,1-trichloroethane is supposed to be manufactured for domestic use in the United States after January 1, 2002 because it affects the ozone layer. 1,1,1-Trichloroethane had many industrial and household uses, including use as a solvent to dissolve other substances, such as glues and paints; to remove oil or grease from manufactured metal parts; and as an ingredient of household products such as spot cleaners, glues, and aerosol sprays.

What happens to 1,1,1-trichloroethane when it enters the environment?

- ❑ Most of the 1,1,1-trichloroethane released into the environment enters the air, where it lasts for about 6 years.
- ❑ Once in the air, it can travel to the ozone layer where sunlight can break it down into chemicals that may reduce the ozone layer.
- ❑ Contaminated water from landfills and hazardous waste sites can contaminate surrounding soil and nearby surface water or groundwater.
- ❑ From lakes and rivers, most of the 1,1,1-trichloroethane evaporates quickly into the air.

❑ Water can carry 1,1,1-trichloroethane through the soil and into the groundwater where it can evaporate and pass through the soil as a gas, then be released to the air.

❑ Organisms living in soil or water may also break down 1,1,1-trichloroethane.

❑ It will not build up in plants or animals.

How might I be exposed to 1,1,1-trichloroethane?

❑ Breathing 1,1,1-trichloroethane in contaminated outdoor and indoor air. Because 1,1,1-trichloroethane was used so frequently in home and office products, you are likely to be exposed to higher levels indoors than outdoors or near hazardous waste sites. However, since 2002, 1,1,1-trichloroethane is not expected to be commonly used, and therefore, the likelihood of being exposed to it is remote.

❑ In the workplace, you could have been exposed to 1,1,1-trichloroethane while using some metal degreasing agents, paints, glues, and cleaning products.

❑ Ingesting contaminated drinking water and food.

How can 1,1,1-trichloroethane affect my health?

If you breathe air containing high levels of 1,1,1-trichloroethane for a short time, you may become dizzy and lightheaded and possibly lose your coordination. These effects rapidly disappear after you stop breathing contaminated air. If you breathe in much higher levels, you may become unconscious, your blood pressure may decrease, and your heart may stop beating. Whether breathing low levels of 1,1,1-trichloroethane for a long

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

time causes harmful effects is not known. Studies in animals show that breathing air that contains very high levels of 1,1,1-trichloroethane damages the breathing passages and causes mild effects in the liver, in addition to affecting the nervous system. There are no studies in humans that determine whether eating food or drinking water contaminated with 1,1,1-trichloroethane could harm health. Placing large amounts of 1,1,1-trichloroethane in the stomachs of animals has caused effects on the nervous system, mild liver damage, unconsciousness, and even death. If your skin contacts 1,1,1-trichloroethane, you might feel some irritation. Studies in animals suggest that repeated exposure of the skin might affect the liver and that very large amounts may cause death. These effects occurred only when evaporation was prevented.

How likely is 1,1,1-trichloroethane to cause cancer?

Available information does not indicate that 1,1,1-trichloroethane causes cancer. The International Agency for Research on Cancer (IARC) and the EPA have determined that 1,1,1-trichloroethane is not classifiable as to its carcinogenicity in humans.

How can 1,1,1-trichloroethane affect children?

Children exposed to large amounts of 1,1,1-trichloroethane probably would be affected in the same manner as adults. In animals, it has been shown that 1,1,1-trichloroethane can pass from the mother's blood into a fetus. When pregnant mice were exposed to high levels of 1,1,1-trichloroethane in air, their babies developed more slowly than normal and had some behavioral problems. However, whether similar effects occur in humans has not been demonstrated.

How can families reduce the risk of exposure to 1,1,1-trichloroethane?

Children can be exposed to 1,1,1-trichloroethane in household products, such as adhesives and cleaners. Parents should store household chemicals out of reach of young children to prevent accidental poisonings or skin irritation. Always store household chemicals in their original labeled containers. Never store household chemicals in containers that children would find attractive to eat or drink from, such as old soda bottles. Keep your Poison Control Center's number near the phone.

Sometimes older children sniff household chemicals in an attempt to get high. Your children may be exposed to 1,1,1-trichloroethane by inhaling products containing it. Talk with your children about the dangers of sniffing chemicals.

Is there a medical test to show whether I've been exposed to 1,1,1-trichloroethane?

Samples of your breath, blood, and urine can be tested to determine if you have recently been exposed to 1,1,1-trichloroethane. In some cases, these tests can estimate how much 1,1,1-trichloroethane has entered your body. To be of any value, samples of your breath or blood have to be taken within hours after exposure, and samples of urine have to be taken within 2 days after exposure. However, these tests will not tell you whether your health will be affected by exposure to 1,1,1-trichloroethane. The exposure tests are not routinely available in hospitals and clinics because they require special analytical equipment.

Has the federal government made recommendations to protect human health?

EPA regulates the levels of 1,1,1-trichloroethane that are allowable in drinking water. The highest level of 1,1,1-trichloroethane allowed in drinking water is 0.2 parts 1,1,1-trichloroethane per 1 million parts of water (0.2 ppm).

The Occupational Safety and Health Administration (OSHA) has set a limit of 350 parts 1,1,1-trichloroethane per 1 million parts of air (350 ppm) in the workplace.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for 1,1,1-Trichloroethane (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 and Environmental Medicine, 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.



1,1-Dichloroethane - ToxFAQs™

CAS # 75-34-3

This fact sheet answers the most frequently asked health questions (FAQs) about 1,1-dichloroethane. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It'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 1,1-dichloroethane occurs mainly from eating contaminated food, but may also occur from skin contact, breathing contaminated air, or drinking contaminated water. 1,1-Dichloroethane affects the function of the nervous system. 1,1-Dichloroethane has been found in at least 673 of the 1,699 National Priorities List sites identified by the Environmental Protection Agency (EPA)..

What is 1,1-dichloroethane?

1,1-Dichloroethane is a colorless, oily liquid with a sweet odor. It evaporates easily at room temperature and burns easily. It does not occur naturally in the environment.

1,1-Dichloroethane is used mostly as an intermediate in the manufacture of 1,1,1-trichloroethane (1,1,1-TCE). It is also used in limited amount as a solvent for cleaning and degreasing, and in the manufacture of plastic wrap, adhesives, and synthetic fiber.

What happens to 1,1-dichloroethane when they enter the environment?

- 1,1-Dichloroethane breaks down slowly in air and has the potential for long-range transport.
- 1,1-Dichloroethane does not dissolve easily in water.
- 1,1-Dichloroethane does not degrade rapidly in water. It can evaporate from the water into the air.
- 1,1-Dichloroethane does not bind strongly to soil particles, unless the organic content of the soil is high.
- Small amounts of 1,1-dichloroethane released to soil can evaporate into the air or move into ground water.
- 1,1-Dichloroethane is not expected to build up in the body tissues of animals.

How might I be exposed to 1,1-dichloroethane?

- Breathing air containing 1,1-dichloroethane from industrial releases or hazardous waste sites.
- Drinking contaminated water if you live near industrial facilities or hazardous waste sites.
- Touching contaminated soil, but little will enter the body due to 1,1-dichloroethane's high volatility.

How can 1,1-dichloroethane affect my health?

High levels of 1,1-dichloroethane that cause anesthesia can cause irregular heartbeats, which is why its use as a surgical anesthetic was discontinued.

Kidney effects have been observed in cats exposed to 1,1 dichloroethane in air for long periods. However, kidney effects have not been observed in other animal species following long-term inhalation or oral exposure.

How likely is 1,1-dichloroethane to cause cancer?

A study in rats and mice found suggestive evidence that 1,1-dichloroethane may cause cancer. However, the study had several flaws and the results are not conclusive. Another long-term study in mice drinking water containing 1,1-dichloroethane did not find cancer.

1,1-Dichloroethane

CAS # 75-34-3

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC) have not evaluated the carcinogenic potential of 1,1-dichloroethane. The EPA has determined that 1,1-dichloroethane is a possible human carcinogen.

How can 1,1-dichloroethane affect children?

There are no data that describe the effects of exposure to 1,1-dichloroethane on children or young animals. Although it is likely that children would show the same health effects as adults, we don't know whether children are more susceptible than are adults to 1,1-dichloroethane effects.

We do not know whether 1,1-dichloroethane can produce birth defects in humans. Minor skeletal problems were observed in the fetuses of rats breathing 1,1-dichloro-ethane; decreases in body weight were also observed in the mothers.

How can families reduce the risk of exposure to 1,1-dichloroethane?

- Prevent children from playing in soil contaminated with 1,1-dichloroethane, as it may occur near a hazardous waste site that contains this substance.
- If you use drinking well water and live near a hazardous site, it may be a good idea to have the water tested for 1,1-dichloroethane and other contaminants.
- If you use bottled water, you should contact the bottler with specific questions on potential contaminants. Bottled water may be less subject to 1,1-dichloroethane contamination than tap water.

Is there a medical test to show whether I've been exposed to 1,1-dichloroethane?

1,1-Dichloroethane and its breakdown products (metabolites) can be measured in blood and urine. But the detection of 1,1-dichloroethane or its metabolites cannot predict the kind of health effects that might develop from that exposure. Because 1,1-dichloroethane and its metabolites leave the body fairly rapidly, the tests need to be conducted within days after exposure. These tests are not available at most doctors' offices, but can be done at a special laboratory.

Has the federal government made recommendations to protect human health?

The EPA has included 1,1-dichloroethane as a priority contaminant in the drinking water program.

The Occupational Safety and Health Administration (OSHA) set a legal limit of 100 ppm 1,1-dichloroethane in workplace air averaged over an 8-hour workday.

The National Institute for Occupational Safety and Health (NIOSH) recommends a limit of 100 ppm 1,1-dichloro-ethane in workplace air averaged over a 10-hour work day.

References

This ToxFaqS™ information is taken from the 2015 Toxicological Profile for 1,1 Dichloroethane produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFaqS™ on the web: www.atsdr.cdc.gov/toxFAQs

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

1,2-Dichloroethane - ToxFAQs™

What is 1,2-dichloroethane?

1,2-Dichloroethane is a colorless, oily liquid not found naturally in the environment. It is mainly used to help make vinyl products, such as polyvinyl chloride (PVC) pipes and other construction materials. 1,2-Dichloroethane is also used as a solvent or degreaser in industrial settings.



What happens to 1,2-dichloroethane in the environment?

1,2-Dichloroethane is released into the air during its production or use, where it eventually breaks down when exposed to sunlight.

1,2-Dichloroethane is released into rivers and lakes in industrial waste, but it can evaporate into the air quickly. Once in the air, 1,2-dichloroethane can travel long distances and can stay in the air for over 5 months.

When released into the ground, 1,2-dichloroethane is expected to evaporate into the air or drain into groundwater.

1,2-Dichloroethane is not expected to naturally build up in the animal- or plant-sourced foods we eat.

How can I be exposed to 1,2-dichloroethane?

You might breathe in 1,2-dichloroethane from contaminated air. You might eat, drink, or swallow 1,2-dichloroethane from contaminated drinking water. Skin contact to 1,2-dichloroethane is possible from contaminated water. There is a very small chance that it could also get on your skin from using old and discontinued household cleaning products, such as carpet and textile cleaners, that contain the chemical.

People living near hazardous waste sites containing 1,2-dichloroethane may be exposed to higher levels of it when compared to the general public.

In the past, 1,2-dichloroethane was been detected in breast milk of mothers exposed to contaminated air, water, or food. Therefore, it is possible for nursing infants to be exposed to 1,2-dichloroethane. However, use of 1,2-dichloroethane is less than in the past and there is no new information about levels in breast milk. Therefore, it is unclear how much 1,2-dichloroethane infants could be exposed to from breast milk. In animals, 1,2-dichloroethane has crossed the placenta to the fetus of exposed mothers.

How can 1,2-dichloroethane affect my health?

If a large amounts are breathed in, eaten, or swallowed, 1,2-dichloroethane can cause nausea, vomiting, blurred vision, difficulty breathing, liver or kidney problems, or death.

In animals, 1,2-dichloroethane causes effects similar to those seen in humans. Additionally, tumors have been found in the lungs, reproductive system, and liver of animals. Studies in animals have also shown that 1,2-dichloroethane can damage the immune system.

1,2-Dichloroethane is not expected to cause developmental effects in children. In animals, 1,2-dichloroethane may cause reproductive problems in males.

1,2-Dichloroethane

Can 1,2-dichloroethane cause cancer?

The [U.S. Department of Health and Human Services \(HHS\)](#) has determined that 1,2-dichloroethane may reasonably be anticipated to be a human carcinogen (causing cancer).

The [U.S. Environmental Protection Agency \(EPA\)](#) has classified 1,2-dichloroethane as a probable human carcinogen.

The [International Agency for Research on Cancer \(IARC\)](#) has determined that 1,2-dichloroethane is possibly carcinogenic to humans.

Can I get a medical test to check for 1,2-dichloroethane?

There are tests to measure 1,2-dichloroethane in breath, blood, and urine. These tests may be used to show that exposure to this chemical has occurred. However, these tests would have to be done soon after a suspected exposure (within a couple of days) because the chemical leaves the body quickly. These tests would only show if a person has been exposed and do not predict health problems. If you think you or anyone in your family has been exposed to 1,2-dichloroethane, contact your doctor, nurse, or poison control center.

How can I protect my family from 1,2-dichloroethane exposure?

- Avoid exposure to air, water, or dirt contaminated with high amounts of 1,2-dichloroethane.
- Do not let children play in the dirt near hazardous waste sites where 1,2-dichloroethane may have been discarded.
- If you work with or handle 1,2-dichloroethane, wear [personal protective equipment](#) to minimize breathing in or touching the chemical.
- Do not let the chemical stay on your skin or get in your eyes.
- To lower exposure in your house, follow the directions to safely throw away older cleaning products that might contain 1,2-dichloroethane.

For more information:

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

Go to ATSDR's Toxicological Profile for 1,2-Dichloroethane: <https://wwwn.cdc.gov/TSP/substances/ToxSubstance.aspx?toxid=110>

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

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



This fact sheet answers the most frequently asked health questions (FAQs) about 1,2-dichloroethene. 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: Exposure to 1,2-dichloroethene occurs mainly in workplaces where it is made or used. Breathing high levels of 1,2-dichloroethene can make you feel nauseous, drowsy, and tired. *cis*-1,2-Dichloroethene has been found in at least 146 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA). *trans*-1,2-Dichloroethene was found in at least 563 NPL sites. 1,2-Dichloroethene was found at 336 sites, but the isomer (*cis*- or *trans*-) was not specified.

What is 1,2-dichloroethene?

(Pronounced 1,2-dī-klôr' ô-ěth'ēn)

1,2-Dichloroethene, also called 1,2-dichloroethylene, is a highly flammable, colorless liquid with a sharp, harsh odor. It is used to produce solvents and in chemical mixtures. You can smell very small amounts of 1,2-dichloroethene in air (about 17 parts of 1,2-dichloroethene per million parts of air [17 ppm]).

There are two forms of 1,2-dichloroethene; one is called *cis*-1,2-dichloroethene and the other is called *trans*-1,2-dichloroethene. Sometimes both forms are present as a mixture.

What happens to 1,2-dichloroethene when it enters the environment?

- ☐ 1,2-Dichloroethene evaporates rapidly into air.
- ☐ In the air, it takes about 5-12 days for half of it to break down.
- ☐ Most 1,2-dichloroethene in the soil surface or bodies of water will evaporate into air.
- ☐ 1,2-Dichloroethene can travel through soil or dissolve in water in the soil. It is possible that it can contaminate groundwater.
- ☐ In groundwater, it takes about 13-48 weeks to break down.

- ☐ There is a slight chance that 1,2-dichloroethene will break down into vinyl chloride, a different chemical which is believed to be more toxic than 1,2-dichloroethene.

How might I be exposed to 1,2-dichloroethene?

- ☐ Breathing 1,2-dichloroethene that has leaked from hazardous waste sites and landfills.
- ☐ Drinking contaminated tap water or breathing vapors from contaminated water while cooking, bathing, or washing dishes.
- ☐ Breathing 1,2-dichloroethene, touching it, or touching contaminated materials in the workplace.

How can 1,2-dichloroethene affect my health?

Breathing high levels of 1,2-dichloroethene can make you feel nauseous, drowsy, and tired; breathing very high levels can kill you.

When animals breathed high levels of *trans*-1,2-dichloroethene for short or longer periods of time, their livers and lungs were damaged and the effects were more severe with longer exposure times. Animals that breathed very high

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levels of *trans*-1,2-dichloroethene had damaged hearts.

Animals that ingested extremely high doses of *cis*- or *trans*-1,2-dichloroethene died.

Lower doses of *cis*-1,2-dichloroethene caused effects on the blood, such as decreased numbers of red blood cells, and also effects on the liver.

The long-term (365 days or longer) human health effects after exposure to low concentrations of 1,2-dichloroethene aren't known. One animal study suggested that an exposed fetus may not grow as quickly as one that hasn't been exposed.

Exposure to 1,2-dichloroethene hasn't been shown to affect fertility in people or animals.

How likely is 1,2-dichloroethene to cause cancer?

The EPA has determined that *cis*-1,2-dichloroethene is not classifiable as to its human carcinogenicity.

No EPA cancer classification is available for *trans*-1,2-dichloroethene.

Is there a medical test to show whether I've been exposed to 1,2-dichloroethene?

Tests are available to measure concentrations of the breakdown products of 1,2-dichloroethene in blood, urine, and tissues. However, these tests aren't used routinely to determine whether a person has been exposed to this compound. This is because after you are exposed to 1,2-dichloroethene, the breakdown products in your body that are detected with these tests may be the same as those that come from exposure to other chemicals. These tests aren't available in 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 the maximum allowable level of *cis*-1,2-dichloroethene in drinking water at 0.07 milligrams per liter of water (0.07 mg/L) and *trans*-1,2-dichloroethene at 0.1 mg/L.

The EPA requires that any spills or accidental release of 1,000 pounds or more of 1,2-dichloroethene must be reported to the EPA.

The Occupational Health Safety and Health Administration (OSHA) has set the maximum allowable amount of 1,2-dichloroethene in workroom air during an 8-hour workday in a 40-hour workweek at 200 parts of 1,2-dichloroethene per million parts of air (200 ppm).

Glossary

Carcinogenicity: Ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Fertility: Ability to reproduce.

Ingest: To eat or drink something.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Solvent: A chemical that can dissolve other substances.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for 1,2-Dichloroethene 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 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

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

HIGHLIGHTS: 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 1,000 of the 1,684 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is benzene?

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 other synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include emissions from 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.
- Vapors (or gases) from products that contain benzene, such as glues, paints, furniture wax, and detergents, can also be a source of exposure.
- Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- Working in industries that make or use benzene.

How can benzene affect my health?

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

The major effect of benzene from long-term 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, but we do not know for certain that benzene caused the effects. It is not known whether benzene will affect fertility in men.

Benzene

CAS # 71-43-2

How likely is benzene to cause cancer?

Long-term exposure to high levels of benzene in the air can cause leukemia, particularly acute myelogenous leukemia, often referred to as AML. This is a cancer of the bloodforming organs. The Department of Health and Human Services (DHHS) has determined that benzene is a known carcinogen. The International Agency for Research on Cancer (IARC) and the EPA have determined that benzene is carcinogenic to humans.

How can benzene affect children?

Children can be affected by benzene exposure in the same ways as adults. It is not known if children are more susceptible to benzene poisoning than adults.

Benzene can pass from the mother's blood to a fetus. Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

How can families reduce the risks of exposure to benzene?

Benzene exposure can be reduced by limiting contact with gasoline and cigarette smoke. Families are encouraged not to smoke in their house, in enclosed environments, or near their children.

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

Several tests can show if you have been exposed to benzene. There is a 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, this test is only useful for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. The metabolite S-phenylmercapturic acid in urine is a sensitive indicator of benzene exposure. 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 5 parts benzene per billion parts of water (5 ppb).

The Occupational Safety and Health Administration (OSHA) has set limits of 1 part benzene per million parts of workplace air (1 ppm) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR) 2007. Toxicological Profile for Benzene (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 Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaqs/index.asp>.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

This fact sheet answers the most frequently asked health questions (FAQs) about beryllium. 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: People working or living near beryllium industries have the greatest potential for exposure to beryllium. Lung damage has been observed in people exposed to high levels of beryllium in the air. About 1-15% of all people occupationally-exposed to beryllium in air become sensitive to beryllium and may develop chronic beryllium disease (CBD), an irreversible and sometimes fatal scarring of the lungs. CBD may be completely asymptomatic or begin with coughing, chest pain, shortness of breath, weakness, and/or fatigue. Beryllium has been found in at least 535 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is beryllium?

Beryllium is a hard, grayish metal naturally found in mineral rocks, coal, soil, and volcanic dust. Beryllium ore is mined, and the beryllium is purified for use in nuclear weapons and reactors, aircraft and space vehicle structures, instruments, x-ray machines, and mirrors. Beryllium oxide is used to make specialty ceramics for electrical and high-technology applications. Beryllium alloys are used in automobiles, computers, sports equipment (golf clubs), and dental bridges.

What happens to beryllium when it enters the environment?

- ☐ Beryllium dust enters the air from burning coal and oil. This beryllium dust will eventually settle over the land and water.
- ☐ It enters water from erosion of rocks and soil, and from industrial waste. Some beryllium compounds will dissolve in water, but most stick to particles and settle to the bottom.
- ☐ Most beryllium in soil does not dissolve in water and remains bound to soil.
- ☐ Beryllium does not accumulate in the food chain.

How might I be exposed to beryllium?

- ☐ The general population is normally exposed to low levels

of beryllium in air, food, and water.

- ☐ People working in industries where beryllium is mined, processed, machined, or converted into metal, alloys, and other chemicals may be exposed to high levels of beryllium. People living near these industries may also be exposed to higher than normal levels of beryllium in air.
- ☐ People living near uncontrolled hazardous waste sites may be exposed to higher than normal levels of beryllium.

How can beryllium affect my health?

Beryllium can be harmful if you breathe it. The effects depend on how much you are exposed to, for how long, and individual susceptibility. If beryllium air levels are high enough (greater than 1000 $\mu\text{g}/\text{m}^3$), an acute condition can result. This condition resembles pneumonia and is called acute beryllium disease. Occupational and community air standards are effective in preventing acute lung damage.

Some exposed workers (1-15%) become sensitive to beryllium. These individuals may develop an inflammatory reaction in the respiratory system. This condition is called chronic beryllium disease (CBD), and can occur years after exposure to higher than normal levels of beryllium (greater than 0.2 $\mu\text{g}/\text{m}^3$). This disease can make you feel weak and tired, and can cause difficulty in breathing. It can also result in anorexia, weight loss, and may also lead to right side heart

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enlargement and heart disease in advanced cases. Some people who are sensitized to beryllium may not have any symptoms. The general population is unlikely to develop chronic beryllium disease because ambient air levels of beryllium are normally very low (0.00003-0.0002 ug/m³).

Swallowing beryllium has not been reported to cause effects in humans because very little beryllium is absorbed from the stomach and intestines. Ulcers have been seen in dogs ingesting beryllium in the diet. Beryllium contact with skin that has been scraped or cut may cause rashes or ulcers.

How likely is beryllium to cause cancer?

Long term exposure to beryllium can increase the risk of developing lung cancer in people.

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have determined that beryllium is a human carcinogen. The EPA has determined that beryllium is a probable human carcinogen. EPA has estimated that lifetime exposure to 0.04 ug/m³ beryllium can result in a one in a thousand chance of developing cancer.

How can beryllium affect children?

It is likely that the health effects seen in children exposed to beryllium will be similar to the effects seen in adults. We do not know whether children differ from adults in their susceptibility to beryllium.

We do not know if exposure to beryllium will result in birth defects or other developmental effects in people. The studies on developmental effects in animals are not conclusive.

How can families reduce the risk of exposure to beryllium?

❑ Individuals working at facilities that use beryllium should make sure that contaminated clothing and objects are not brought home.

❑ Children should avoid playing in soils near uncontrolled hazardous waste sites where beryllium may have been discarded.

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

Beryllium can be measured in samples from your blood, urine, skin, or lungs. These tests are rarely done because they are not reliable measures of your exposure over time. Also, these tests do not show if you have become sensitized to beryllium.

Another test, the beryllium lymphocyte proliferation test (BeLPT), can help your doctor decide if you are sensitized to beryllium. This test is only done in a few specialized laboratories, but doctors familiar with the test can collect blood samples and send them for testing by overnight carrier. The BeLPT is most often done for people who work with beryllium. It is also useful for separating chronic beryllium disease from diagnoses that resemble it (for example, sarcoidosis). Depending on your exposure history, clinical findings, and test results, your doctor may also recommend additional specialized testing.

Has the federal government made recommendations to protect human health?

The EPA restricts the amount of beryllium that industries may release into the air to 0.01 ug/m³, averaged over a 30-day period.

The Occupational Safety and Health Administration (OSHA) sets a limit of 2 ug/m³ for an 8-hour work shift measured as a personal sample.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Beryllium. 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 cadmium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to cadmium happens mostly in the workplace where cadmium products are made. The general population is exposed from breathing cigarette smoke or eating cadmium contaminated foods. Cadmium damages the kidneys, lungs, and bones. Cadmium has been found in at least 1,014 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is cadmium?

Cadmium is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), or sulfur (cadmium sulfate, cadmium sulfide).

All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals like zinc, lead, and copper. Cadmium does not corrode easily and has many uses, including batteries, pigments, metal coatings, and plastics.

What happens to cadmium when it enters the environment?

- Cadmium enters soil, water, and air from mining, industry, and burning coal and household wastes.
- Cadmium does not break down in the environment, but can change forms.
- Cadmium particles in air can travel long distances before falling to the ground or water.
- Some forms of cadmium dissolve in water.
- Cadmium binds strongly to soil particles.
- Fish, plants, and animals take up cadmium from the environment.

How might I be exposed to cadmium?

- Eating foods containing cadmium; low levels are found in all foods (highest levels are found in leafy vegetables, grains, legumes, and kidney meat).
- Smoking cigarettes or breathing cigarette smoke.
- Breathing contaminated workplace air.
- Drinking contaminated water.
- Living near industrial facilities which release cadmium into the air.

How can cadmium affect my health?

Breathing high levels of cadmium can severely damage the lungs. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea.

Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones.

How likely is cadmium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have determined that cadmium and cadmium compounds are human carcinogens. The EPA determined that cadmium is a probable human carcinogen (group B1).

Cadmium

CAS # 7440-43-9

How can cadmium affect children?

The health effects in children are expected to be similar to the effects seen in adults (kidney and lung damage depending on the route of exposure).

A few studies in animals indicate that younger animals absorb more cadmium than adults. Animal studies also indicate that the young are more susceptible than adults to a loss of bone and decreased bone strength from exposure to cadmium.

We don't know if cadmium causes birth defects in people. Studies in animals exposed to high levels of cadmium during pregnancy have resulted in harmful effects to the young. Young animals exposed to cadmium before birth have shown effects on behavior and learning. There is also some information from animal studies that high enough exposures to cadmium before birth can reduce body weights and affect the skeleton in the developing young.

How can families reduce the risk of exposure to cadmium?

- Do not allow children to play with batteries. Dispose of nickel-cadmium batteries properly.
- Cadmium is a component of tobacco smoke. Avoid smoking and smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- If you work with cadmium, use all safety precautions to avoid carrying cadmium-containing dust home from work on your clothing, skin, hair, or tools.
- A balanced diet can reduce the amount of cadmium taken into the body from food and drink.

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

Cadmium can be measured in blood, urine, hair, or nails. Urinary cadmium has been shown to accurately reflect the amount of cadmium in the body.

The amount of cadmium in your blood shows your recent exposure to cadmium. The amount of cadmium in your urine shows both your recent and your past exposure.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to cadmium in drinking water at concentrations of 0.04 milligrams per liter (0.04 mg/L) for up to 10 days is not expected to cause any adverse effects in a child.

The EPA has determined that lifetime exposure to 0.005 mg/L cadmium is not expected to cause any adverse effects.

The Food and Drug Administration (FDA) has determined that the cadmium concentration in bottled drinking water should not exceed 0.005 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 5 µg/m³ for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Cadmium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaqs/index.asp>.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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

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

What is carbon disulfide?

(Pronounced kär'bən dī-sŭl'fid')

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

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

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

What happens to carbon disulfide when it enters the environment?

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

- ☐ Carbon disulfide evaporates rapidly when released to the environment.
- ☐ Most carbon disulfide in the air and surface water is from manufacturing and processing activities.
- ☐ It is found naturally in coastal and ocean waters.
- ☐ Carbon disulfide does not stay dissolved in water very long, and it also moves through soils fairly quickly.
- ☐ Carbon disulfide does not appear to be taken up in significant amounts by the organisms living in water.

How might I be exposed to carbon disulfide?

- ☐ The people most often exposed to carbon disulfide are workers in plants that use carbon disulfide in their manufacturing processes.
- ☐ People may be exposed by breathing air, drinking water, or eating foods that contain it.
- ☐ People may also be exposed through skin contact with soil, water, or other substances that contain carbon disulfide.

How can carbon disulfide affect my health?

At very high levels, carbon disulfide may be life-threatening because of its effects on the nervous system. People who

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breathed carbon disulfide near an accident involving a railroad car showed changes in breathing and some chest pains.

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

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

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

How likely is carbon disulfide to cause cancer?

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

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

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

Glossary

Carcinogenicity: Ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Dissolve: To disappear gradually.

Evaporate: To change into vapor or a gas.

References

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

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



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

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

What is carbon tetrachloride?

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

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

What happens to carbon tetrachloride when it enters the environment?

- ☐ It moves very quickly into the air upon release, so most of it is in the air.
- ☐ It evaporates quickly surface water.
- ☐ Only a small amount sticks to soil particles; the rest evaporates or moves into the groundwater.
- ☐ It is very stable in air (lifetime 30-100 years).
- ☐ It can be broken down or transformed in soil and water within several days.
- ☐ When it does break down, it forms chemicals that can destroy ozone in the upper atmosphere.
- ☐ It does not build up in animals. We do not know if it build up in plants.

How might I be exposed to carbon tetrachloride?

- ☐ Breathing contaminated air near manufacturing plants or waste sites.
- ☐ Breathing workplace air when it is used.
- ☐ Drinking contaminated water near manufacturing plants and waste sites.
- ☐ Breathing contaminated air and skin contact with water while showering or cooking with contaminated water.
- ☐ Swimming or bathing in contaminated water.
- ☐ Contact with or eating contaminated soil (pica child) at waste sites.

How can carbon tetrachloride affect my health?

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

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

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

How likely is carbon tetrachloride to cause cancer?

Studies in humans have not been able to determine whether or not carbon tetrachloride can cause cancer because usually there has been exposure to other chemicals at the same time. Swallowing or breathing carbon tetrachloride for years caused liver tumors in animals. Mice that breathed carbon tetrachloride also developed tumors of the adrenal gland. The Department of Health and Human Services (DHHS) has determined that carbon tetrachloride may reasonably be anticipated to be a carcinogen. The International Agency for Research on Cancer (IARC) has determined that carbon tetrachloride is possibly carcinogenic to humans, whereas the EPA determined that carbon tetrachloride is a probable human carcinogen.

How can carbon tetrachloride affect children?

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

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

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

- ☐ Discard any product that contains carbon tetrachloride that you may have at home and may have used in the past.
- ☐ Household chemicals should be stored out of the reach of children in their original containers.

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

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

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

Has the federal government made recommendations to protect human health?

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

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

References

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

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



Chloroform - ToxFAQs™

What is chloroform?

Chloroform is a colorless liquid with a pleasant, nonirritating odor and a slightly sweet taste. It occurs naturally in the environment mainly in wet environments (tropical oceans, forest soil, rice fields, swamplands, and peat moorlands) but also can be found in dry grasslands and is released during volcanic eruptions and when organic matter is burned. It can also be formed in small amounts when chlorine is added to water. Chloroform is also man-made.



In the past, chloroform was used as an inhaled anesthetic during surgery, but it is no longer used during surgery due to availability of safer alternatives. Currently, chloroform is used as a solvent and to make other chemicals.

What happens to chloroform in the environment?

Chloroform can enter the environment from manufacturing facilities or from treating water with chlorine. Since chloroform is made naturally in various environments and gets into the environment from human activities, it is likely found almost everywhere.

Chloroform evaporates quickly into the air from water and soil. In the air, it breaks down slowly, so it may travel long distances. Since chloroform dissolves easily in water, it can come back to the ground with the rain. Chloroform does not stick very well to soil and can therefore travel through the soil into the groundwater. Chloroform does not build up in large amounts in plants or animals.

How can I be exposed to chloroform?

Most people are exposed to very low levels of chloroform in indoor and outdoor air, food, and drinking water. If your home water supply is treated with chlorine, household activities such as showering, bathing, washing clothes or dishes, or preparing food may expose you to chloroform.

General population exposure to chloroform is expected to be low. Individuals who live near hazardous waste sites, or work with chloroform or chlorinated water may be exposed to higher levels.

People who work in industries that use or manufacture chloroform may have increased risk for exposure. People who live near places that chlorinate water or near contaminated hazardous waste sites may also have increased risk of exposure. Increased exposure may also occur for individuals who spend a lot of time around chlorinated water, such as swimmers, lifeguards, or cleaners.

How can chloroform affect my health?

Breathing low levels of chloroform for a short amount of time can cause you to become dizzy, tired, or give you a headache. At high levels, you may also have trouble breathing and may pass out. Breathing or drinking a large amount of chloroform can cause severe liver and kidney damage, and at very high exposure levels, can cause death.

Studies in animals showed that breathing chloroform caused damage to their nose that worsened with longer exposure periods. Lung damage also occurred in animals that breathed and/or drank chloroform. There is not clear evidence of developmental effects in pups born to animals exposed during pregnancy.

Chloroform

Can chloroform cause cancer?

The ability of chloroform to cause cancer in people has not been well studied.

Tumors in the kidneys were seen in mice that breathed chloroform for a long time. Animals that drank chloroform for a long time developed cancer of the liver and kidneys.

The [U.S. Department of Health and Human Services \(DHHS\)](#) determined that chloroform is reasonably anticipated to be a human carcinogen based on sufficient evidence of carcinogenicity in experimental animals.

The [U.S. Environmental Protection Agency \(EPA\)](#) classified chloroform as likely to be carcinogenic to human by all routes of exposure at high dose levels that result in cell damage; it is not likely to be carcinogenic by any route at lower dose levels that do not cause cell damage.

The [International Agency for Research on Cancer \(IARC\)](#) determined that chloroform is possibly carcinogenic to humans based on inadequate evidence in humans and sufficient evidence in experimental animals.

Can I get a medical test to check for chloroform?

There are tests to measure chloroform in your breath, blood, urine, breast milk, and body tissues. Chloroform does not stay in your body long, so these tests need to be done soon after you were exposed. These tests cannot predict whether you will have health problems from the exposure. Doctor's offices do not routinely offer these tests. If you think you have been exposed to this or any other chemical, talk to your doctor or nurse or call poison control.

How can I protect myself and my family from chloroform?

If your drinking water is supplied by a public water system, you can contact them for information on chloroform levels in the water. If you have a private well for water, your local health department may be able to tell you if this chemical has been found in water in your area. You may also want to get your water tested by a certified laboratory.

If you work at a place that uses chloroform, make sure you are following all safety guidelines. Do not let your children play near facilities manufacturing chloroform or hazardous waste sites.

For more information:

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

Go to ATSDR's Toxicological Profile for Chloroform: <https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=53&tid=16>

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

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



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).

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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.



DDT, DDE, and DDD - ToxFAQs™

What are DDT, DDE, and DDD?

DDT (dichlorodiphenyltrichloroethane) is a man-made chemical that does not occur naturally in the environment. It is a white, crystalline solid with no odor or taste. DDE (dichlorodiphenyldichloroethylene) and DDD (dichlorodiphenyldichloroethane) are chemicals similar to DDT that can form when DDT breaks down.



DDT is a pesticide that was once widely used to control insects in agriculture and insects that carry diseases such as malaria. Its use was banned in 1972 because of damage to wildlife but is still used in a limited number of countries where diseases such as malaria are a major health problem. 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 to treat cancer of the adrenal gland.

What happens to DDT, DDE, and DDD in the environment?

DDT can get into the environment when it is used as a pesticide. DDE and DDD form when DDT breaks down. These chemicals can evaporate into the air from water and moist soil and may then be carried to locations very far from the original source. They can be removed from the air by rain and snow or be broken down by sunlight. DDT, DDE, and DDD stick strongly to the soil and are not likely to move into the groundwater. Microorganisms in the soil slowly break down DDT (it can take anywhere from 2 to 15 years to break down half of the DDT). DDT does not dissolve easily in water and is mostly found in the sediment on the bottom of bodies of water. DDT, DDE, and DDD can build up in plants and animals.

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

Most people are not likely to be exposed to DDT, DDE, or DDD. The most common way to be exposed to small amounts of these chemicals is from eating contaminated food such as meat, fish, poultry, and dairy products. If you live near a hazardous waste site, you might be exposed to DDT, DDE, and DDD from contaminated air, dirt, or water.

Since DDT was banned in 1972, exposure to DDT, DDE, and DDD has decreased dramatically. Small amounts may still be found in some food.

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

People who accidentally swallowed large amounts of DDT had tremors, headaches, nausea, and seizures. These effects went away after the exposure stopped. No effects were seen in volunteers who took a small daily dose of DDT by capsule for 18 months. Studies have shown that women with high amounts of DDE in their blood were more likely to have a premature baby or a baby with a wheeze. Exposure to DDT may also increase chances of developing Type II diabetes mellitus in some groups of people.

Animal studies generally used higher amounts of DDT, DDE, and DDD than you would likely be exposed to in the United States. In studies where animals were fed DDT, DDE, or DDD, harmful effects were seen on their nervous system, liver, and reproductive system (including decreased fertility).

DDT, DDE, and DDD

Can DDT, DDE, and DDD cause cancer?

Studies have shown that people with higher levels of DDT in their blood have an increased risk of developing liver cancer. Liver cancer was also seen in animals that were fed DDT over a long period of time.

The [U.S. Department of Health and Human Services \(DHHS\)](#) has determined that DDT may reasonably be anticipated to be a human carcinogen (causing cancer in people).

The [U.S. Environmental Protection Agency \(EPA\)](#) has classified DDT, DDE, and DDD as probable human carcinogens.

The [International Agency for Research on Cancer \(IARC\)](#) determined DDT may possibly cause cancer in humans.

Can I get a medical test to check for DDT, DDE, and DDD?

Tests are available to measure levels of DDT, DDE, and DDD in the blood, hair, and breast milk.

These tests cannot predict whether you will have health problems from the exposure to DDT, DDE, and DDD. Doctor's offices do not routinely offer these tests.

How can I protect myself and my family from DDT, DDE, and DDD?

Most people don't need to take any special steps to avoid DDT, DDE, and DDD in their daily lives. Washing fruits and vegetable that come from foreign countries will remove most DDT if any is present. Children should avoid playing in dirt or water near hazardous waste sites to avoid coming in contact with these chemicals.

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

For more information:

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

Go to ATSDR's Toxicological Profile for DDT, DDE, and DDD: <https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=81&tid=20>

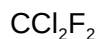
Go to ATSDR's Toxic Substances Portal: <https://wwwn.cdc.gov/TSP/index.aspx>

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



DICHLORODIFLUOROMETHANE

1018



MW: 120.91

CAS: 75-71-8

RTECS: PA8200000

METHOD: 1018, Issue 2

EVALUATION: FULL

Issue 1: 15 August 1987

Issue 2: 15 August 1994

OSHA : 1000 ppm
NIOSH: 1000 ppm
ACGIH: 1000 ppm
(1 ppm = 4.95 mg/m³ @ NTP)

PROPERTIES: gas; BP -29.8 °C; MP -158 °C;
d 1.35 @ 21.1 °C; nonflammable

SYNONYMS: difluorodichloromethane; Refrigerant 12

SAMPLING		MEASUREMENT	
SAMPLER: SOLID SORBENT TUBES (two coconut shell charcoal tubes in series, 400/200 mg and 100/50 mg) FLOW RATE: 0.01 to 0.05 L/min VOL-MIN: 1 L @ 1000 ppm -MAX: 4 L SHIPMENT: refrigerated SAMPLE STABILITY: at least 7 days @ -10 °C BLANKS: 2 to 10 field blanks per set		TECHNIQUE:	GAS CHROMATOGRAPHY, FID
		ANALYTE:	dichlorodifluoromethane
		DESORPTION:	20 mL methylene chloride
		INJECTION VOLUME:	1 µL
		TEMPERATURE-INJECTOR:	200 °C
		-DETECTOR:	260 °C
		-COLUMN:	35 °C for 3 min, 15 °C/min to 75 °C, hold 6 min
		CARRIER GAS:	He, 1.5 mL/min
		COLUMN:	DB-1 fused silica capillary, 30 m x 0.32-mm ID, 1-µm film thickness or equivalent
		CALIBRATION:	standard solutions of analyte in methylene chloride
ACCURACY		RANGE:	5 to 30 mg per sample [1]
RANGE STUDIED:	2940 to 10,500 mg/m ³ [1]	ESTIMATED LOD:	0.03 mg per sample [1]
BIAS:	- 1.8%	PRECISION ($\hat{S}_p$):	0.035 @ 7.4-30 mg per sample [1]
OVERALL PRECISION ($\hat{S}_{p,T}$):	0.063 [1]		
ACCURACY:	± 12.8%		

APPLICABILITY: The working ranges are 1000 to 6000 ppm dichlorodifluoromethane (5000 to 30,000 mg/m³); 700 to 5700 ppm 1,2-dichlorotetrafluoromethane (5000 to 40,000 mg/m³); and 300 to 4000 ppm chlorodifluoromethane (1000 to 14,000 mg/m³) for a 1-L air sample. This method was first evaluated for dichlorodifluoromethane and 1,2-dichlorotetrafluoroethane with packed column gas chromatography [1]. The method was recently evaluated specifically for chlorodifluoromethane using capillary chromatography [3]. Capillary GC conditions for the separation of the three compounds were established.

INTERFERENCES: None identified.

OTHER METHODS: This combines and revises Methods S111 and S108 [2].

REAGENTS:

1. Chlorodifluoromethane, 99%
2. Dichlorodifluoromethane, 99%
3. 1,2-Dichlorotetrafluoroethane, 99%
4. Methylene chloride*, distilled in glass.
5. Nitrogen, purified.
6. Hydrogen, prepurified
7. Air, filtered, compressed.
8. Helium, purified

* See Special Precautions

EQUIPMENT:

1. Sampler: two glass tubes (9 cm long, 8-mm OD, 6-mm ID, followed by 7 cm long, 6-mm OD, 4-mm ID) connected in series with a short piece of tubing, flame-sealed ends with plastic caps, containing two sections of activated (600 °C) coconut shell charcoal (1st 400 mg/200 mg; 2nd 100 mg/50 mg), front and back sections separated by a 2-mm urethane foam plug. A silylated glass wool plug precedes the front section and a 3-mm urethane foam plug follows the back section. Pressure drop across the tube at 1 L/min airflow must be less than 25 mm/Hg. Tubes are commercially available.
2. Personal sampling pump, 0.01 to 0.05 mL/min, with flexible connecting tubing.
3. Gas chromatograph with a FID detector, recorder, integrator and column (page 1018-1).
4. Bottles, 22-mL, PTFE-lined septum screw caps.
5. Syringes, gas-tight, 10-mL and other sizes as needed.
6. Pipet, TD, 20-mL, with pipet bulbs.
7. DE apparatus. Glass or plastic T equipped with septum in one arm to allow introduction of analyte to a flowing stream of nitrogen.

SPECIAL PRECAUTIONS: Methylene chloride is an irritant, can be absorbed through the skin, and is a suspect carcinogen [4]. Prepare samples in a hood.

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Break the ends of the sampler immediately before sampling. Attach sampler to personal sampling pump with flexible tubing.
3. Sample at an accurately known flow rate between 0.01 and 0.5 L/min for a total sample size of 1 to 4 L.
4. Separate and cap the tubes. Pack securely for shipment in an insulated container with bagged refrigerant.

SAMPLE PREPARATION:

NOTE: Refrigerate samples at -10 °C if not analyzed immediately.

5. Pipet 20.0 mL methylene chloride into a series of bottles.
6. Place both sections of the front sampler tube into a bottle containing solvent, discarding the glass wool and foam plugs. Immediately cap and gently shake the bottle. Analyze within 6 hrs.
7. Perform step 6 for the back sampler tube.

CALIBRATION AND QUALITY CONTROL:

8. Calibrate daily with at least six working standards.
 - a. Pipet 20.0 mL methylene chloride into each of a series of bottles. Cap the bottles.
 - b. Using a gas-tight syringe, add known amounts of analyte, e.g., 0.01 to 6 mL (0.034 to 21.2 mg @ NTP) chlorodifluoromethane, or 0.01 to 6 mL (0.094 to 29.6 mg @ NTP) dichlorodifluoromethane, or 0.01 to 6 mL (0.0699 to 41.9 mg @ NTP) 1,2-dichlorotetrafluoroethane by bubbling the gas slowly through the methylene chloride. Gently shake the bottles.
 - c. Analyze with samples and blanks (steps 11 and 12).
 - d. Prepare calibration graph (area vs. mg analyte).
9. Determine desorption efficiency (DE) at least once for each lot of sorbent used for sampling in the range of interest (step 8). Prepare three tubes at each of five levels plus three media blanks.
 - a. Using a gas-tight syringe, inject a known amount of analyte (0.01 to 6 mL) through the septum of the DE apparatus unto a stream of nitrogen (ca. 20 mL/min) which carries the analyte into a large (400/200 mg) sorbent tube. Allow the nitrogen to flow an additional 30.
 - b. Cap the tube. Allow to stand overnight.
 - c. Desorb (steps 5 through 7) and analyze with working standards (steps 11 and 12)
 - d. Prepare a graph of DE vs. mg analyte recovered.
10. Analyze three quality control blind spikes and three analyst spikes to ensure that the calibration graph and DE graph are in control.

MEASUREMENT:

11. Set gas chromatograph according to manufacturer's recommendations and to conditions given on page 1018-1. Inject sample aliquot manually using solvent flush technique or with autosampler.
NOTE: If peak area is above the linear range of the working standards, dilute an aliquot of the desorbed liquid with methylene chloride, reanalyze and apply the appropriate dilution factor in calculations.
12. Measure peak area.
NOTE: The order of elution is chlorodifluoromethane, dichlorodifluoromethane, 1,2-tetrafluoroethane. If analyzing for two or more of the compounds, a temperature rate of 5 °C/min is required.

CALCULATIONS:

13. Determine the mass, mg (corrected for DE), of analyte found in the sample front (W_f) and back (W_b) sorbent sections, and in the average media blank front (B_f) and back (B_b) sorbent sections.
NOTE: If $W_b > W_f/10$, report breakthrough and possible sample loss.
14. Calculate concentration, C, of analyte in the air volume sampled, V (L):

$$C = \frac{(W_f + W_b - B_f - B_b) \cdot 10^3}{V}, \text{ mg/m}^3.$$

EVALUATION OF METHOD:

Validation this method for dichlorodifluoromethane and 1,2-dichlorotetrafluoroethane was done using packed column gas chromatographic techniques. The column was stainless steel 1.2 m x 6-mm OD, packed with 80/100 mesh Chromosorb 102. Chlorodifluoromethane was evaluated using the capillary chromatographic conditions listed on p.1018-1. The use of capillary gas chromatographic analysis was

determined to be appropriate for all three compounds.

Dichlorodifluoromethane: Method S111 was issued September 30, 1976 [2], and validated using test atmospheres generated in air and monitored with a calibrated total hydrocarbon analyzer [1,5]. Average recovery for 18 samples was 98.2%. In breakthrough tests at 12 and 94% relative humidity (RH), the capacity of the sampler was 61 and 44 mg of dichlorodifluoromethane, respectively, when sampling at ca. 0.045 L/min from atmospheres containing ca. 10,000 mg/m³. Desorption efficiency averaged 0.97 in the range 7.4 to 30 mg per sample.

Dichlorotetrafluoroethane: Method S108 was issued October 29, 1976 [2], and validated using test atmospheres generated in air and monitored with a calibrated total hydrocarbon analyzer [1,4]. The average recovery for 18 samples was 99.8%. Breakthrough (effluent concentration = 5% of test concentration) occurred after 158 min when sampling 14,600 mg/m³ at 90% RH at 0.046 L/min. Desorption efficiency averaged 0.99 in the range 10.7 to 42.8 mg per sample.

The precision and accuracy of the method for chlorodifluoromethane were determined using test gas bag atmospheres generated and monitored with a halide meter. Average recovery for 18 samples over the range of 1780 to 6970 mg/ m³ was 100 %. In breakthrough tests at 80% relative humidity, the sampler retained 15.4 mg of chlorodifluoromethane when sampling at 0.025 L/min from atmospheres containing 7000 mg/m³. The desorption efficiency of chlorodifluoromethane from activated charcoal averaged 0.96 in the range of 0.53 to 10.4 mg per sample.

REFERENCES:

- [1] Backup Data Reports S111 (Dichlorodifluoromethane) and S108 (Dichlorotetrafluoroethane), prepared under NIOSH Contract 210-76-0123, available as "Ten NIOSH Analytical Methods, Set 1," Order No. PB 271-712, from NTIS, Springfield, VA 22161.
- [2] NIOSH Manual of Analytical Methods, 2nd ed., Vol. 2, S111 and S108, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-B (1977).
- [3] Seymour, M.J., M.F. Lucas. Evaluation of Sampling and Analytical Methods for the Determination of Chlorodifluoromethane in Air, Am. Ind. Hyg. Assoc. J., (accepted for publication July 1992)
- [4] NIOSH Current Intelligence Bulletin 46, U.S. Department of Health and Human Services, Publ. (NIOSH) 86-114 (1986).
- [5] NIOSH Research Report-Development and Validation of Methods for Sampling and Analysis of Workplace Toxic Substances, U.S. Department of Health and Human Services, Publ. (NIOSH) 80-133 (1980).

METHOD REVISED BY:

M.J. Seymour, NIOSH/DPSE.

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.

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

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.



Lead - ToxFAQs™

What is lead?

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



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

What happens to lead in the environment?

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

How can I be exposed to lead?

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

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

How can lead affect my health?

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

Lead

How can lead affect children?

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

Can lead cause cancer?

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

- The Department of Health and Human Services (HHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens (causing cancer in people).
- The U.S. Environmental Protection Agency (EPA) has classified lead as a probable human carcinogen.
- The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans, and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

Can I get a medical test to check for lead?

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

How can I protect my family from lead exposure?

- Avoid exposure to sources of lead.
- Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.
- If your home contains lead-based paint (built before 1978), or if you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house to remove lead dust and lead tracked in soil.
- Certain water pipes may contain lead, so if you know that pipes have lead solder, you should avoid drinking from that source.
- Check for lead in some products such as toys and jewelry and avoid such products.
- Lead is sometimes in candies imported from other countries or traditional home remedies; find out if yours has any lead and avoid using these products or giving them to children.
- You can learn more about preventing lead poisoning here: <https://www.cdc.gov/nceh/lead/faqs/lead-faqs.htm>

Want more information?

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

Go to ATSDR's [Toxicological Profile for Lead](#)

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

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

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

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



This fact sheet answers the most frequently asked health questions (FAQs) about manganese. 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: Manganese is a trace element and eating a small amount from food or water is needed to stay healthy. Exposure to excess levels of manganese may occur from breathing air, particularly where manganese is used in manufacturing, and from drinking water and eating food. At high levels, it can cause damage to the brain. Manganese has been found in at least 869 of the 1,669 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is manganese?

Manganese is a naturally occurring metal that is found in many types of rocks. Pure manganese is silver-colored, but does not occur naturally. It combines with other substances such as oxygen, sulfur, or chlorine. Manganese occurs naturally in most foods and may be added to some foods.

Manganese is used principally in steel production to improve hardness, stiffness, and strength. It may also be used as an additive in gasoline to improve the octane rating of the gas.

What happens to manganese when it enters the environment?

- ☐ Manganese can be released to the air, soil, and water from the manufacture, use, and disposal of manganese-based products.
- ☐ Manganese cannot break down in the environment. It can only change its form or become attached to or separated from particles.
- ☐ In water, manganese tends to attach to particles in the water or settle into the sediment.
- ☐ The chemical state of manganese and the type of soil determine how fast it moves through the soil and how much is retained in the soil.
- ☐ The manganese-containing gasoline additive may degrade in the environment quickly when exposed to sunlight, releasing manganese.

How might I be exposed to manganese?

- ☐ The primary way you can be exposed to manganese is by eating food or manganese-containing nutritional supplements. Vegetarians who consume foods rich in manganese such as grains, beans and nuts, as well as heavy tea drinkers, may have a higher intake of manganese than the average person.
- ☐ Certain occupations like welding or working in a factory where steel is made may increase your chances of being exposed to high levels of manganese.
- ☐ Manganese is routinely contained in groundwater, drinking water, and soil at low levels. Drinking water containing manganese or swimming or bathing in water containing manganese may expose you to low levels of this chemical.

How can manganese affect my health?

Manganese is an essential nutrient, and eating a small amount of it each day is important to stay healthy.

The most common health problems in workers exposed to high levels of manganese involve the nervous system. These health effects include behavioral changes and other nervous system effects, which include movements that may become slow and clumsy. This combination of symptoms when sufficiently severe is referred to as "manganism". Other less severe nervous system effects such as slowed hand movements have been observed in

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some workers exposed to lower concentrations in the work place.

Nervous system and reproductive effects have been observed in animals after high oral doses of manganese.

How likely is manganese to cause cancer?

The EPA concluded that existing scientific information cannot determine whether or not excess manganese can cause cancer.

How can manganese affect children?

Studies in children have suggested that extremely high levels of manganese exposure may produce undesirable effects on brain development, including changes in behavior and decreases in the ability to learn and remember. We do not know for certain that these changes were caused by manganese alone. We do not know if these changes are temporary or permanent. We do not know whether children are more sensitive than adults to the effects of manganese, but there is some indication from experiments in laboratory animals that they may be.

Studies of manganese workers have not found increases in birth defects or low birth weight in their offspring. No birth defects were observed in animals exposed to manganese.

How can families reduce the risks of exposure to manganese?

- ☐ Children are not likely to be exposed to harmful amounts of manganese in the diet. However, higher-than-usual amounts of manganese may be absorbed if their diet is low in iron. It is important to provide your child with a well-balanced diet.
- ☐ Workers exposed to high levels of airborne manganese in certain occupational settings may accumulate manganese dust on their work clothes. Manganese-contaminated work

clothing should be removed before getting into your car or entering your home to help reduce the exposure hazard for yourself and your family.

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

Several tests are available to measure manganese in blood, urine, hair, or feces. Because manganese is normally present in our body, some is always found in tissues or fluids.

Because excess manganese is usually removed from the body within a few days, past exposures are difficult to measure with common laboratory tests.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to manganese 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 EPA has established that lifetime exposure to 0.3 mg/L manganese is not expected to cause any adverse effects.

The FDA has determined that the manganese concentration in bottled drinking water should not exceed 0.05 mg/L.

The Occupational Health and Safety Administration (OSHA) has established a ceiling limit (concentration that should not be exceeded at any time during exposure) of 5 mg/m³ for manganese in workplace air.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Manganese (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.



Mercury - ToxFAQs™

What is mercury?

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



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

What happens to mercury in the environment?

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

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

How can I be exposed to mercury?

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

How can mercury affect my health?

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

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

Mercury

Can mercury cause cancer?

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

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

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

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

Can I get a medical test to check for mercury?

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

How can I protect myself and my family from mercury?

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

For more information:



Call **CDC-INFO** at 1-800-232-4636, or submit your question online at

<https://wwwn.cdc.gov/dcs/ContactUs/Form>

Go to ATSDR's Toxicological Profile for mercury:

<https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=115&tid=24>

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

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

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

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

What is methylene chloride?

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

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

What happens to methylene chloride when it enters the environment?

- ☐ Methylene chloride is mainly released to the environment in air. About half of the methylene chloride in air disappears in 53 to 127 days.
- ☐ Methylene chloride does not easily dissolve in water, but small amounts may be found in drinking water.
- ☐ We do not expect methylene chloride to build up in plants or animals.

How might I be exposed to methylene chloride?

- ☐ The most likely way to be exposed to methylene chloride is by breathing contaminated air.
- ☐ Breathing the vapors given off by products containing methylene chloride. Exposure to high levels of methylene chloride is likely if methylene chloride or a product containing it is used in a room with inadequate ventilation.

How can methylene chloride affect my health?

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

How likely is methylene chloride to cause cancer?

We do not know if methylene chloride can cause cancer in humans. An increased cancer risk was seen in mice

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breathing large amounts of methylene chloride for a long time.

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

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

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

How can methylene chloride affect children?

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

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

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

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

- ☐ Several tests can measure exposure to methylene chloride.

These tests are not routinely available in your doctor's office.

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

Has the federal government made recommendations to protect human health?

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

References

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

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



This fact sheet answers the most frequently asked health questions (FAQs) about naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene. 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 these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene happens mostly from breathing air contaminated from the burning of wood, tobacco, or fossil fuels, industrial discharges, or moth repellents. Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. Naphthalene has caused cancer in animals. Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene have been found in at least 687, 36, and 412, respectively, of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What are naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Naphthalene is a white solid that evaporates easily. Fuels such as petroleum and coal contain naphthalene. It is also called white tar, and tar camphor, and has been used in mothballs and moth flakes. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell. The major commercial use of naphthalene is in the manufacture of polyvinyl chloride (PVC) plastics. Its major consumer use is in moth repellents and toilet deodorant blocks.

1-Methylnaphthalene and 2-methylnaphthalene are naphthalene-related compounds. 1-Methylnaphthalene is a clear liquid and 2-methylnaphthalene is a solid; both can be smelled in air and in water at very low concentrations.

1-Methylnaphthalene and 2-methylnaphthalene are used to make other chemicals such as dyes and resins. 2-Methylnaphthalene is also used to make vitamin K.

What happens to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene when they enter the environment?

- ☐ Naphthalene enters the environment from industrial and domestic sources, and from accidental spills.
- ☐ Naphthalene can dissolve in water to a limited degree and may be present in drinking water from wells close to hazardous waste sites and landfills.
- ☐ Naphthalene can become weakly attached to soil or pass through soil into underground water.
- ☐ In air, moisture and sunlight break it down within 1 day. In water, bacteria break it down or it evaporates into the air.
- ☐ Naphthalene does not accumulate in the flesh of animals or fish that you might eat.

- ☐ 1-Methylnaphthalene and 2-methylnaphthalene are expected to act like naphthalene in air, water, or soil because they have similar chemical and physical properties.

How might I be exposed to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

- ☐ Breathing low levels in outdoor air.
- ☐ Breathing air contaminated from industrial discharges or smoke from burning wood, tobacco, or fossil fuels.
- ☐ Using or making moth repellents, coal tar products, dyes or inks could expose you to these chemicals in the air.
- ☐ Drinking water from contaminated wells.
- ☐ Touching fabrics that are treated with moth repellents containing naphthalene.
- ☐ Exposure to naphthalene, 1-methylnaphthalene and 2-methylnaphthalene from eating foods or drinking beverages is unlikely.

How can naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene affect my health?

Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. This could cause you to have too few red blood cells until your body replaces the destroyed cells. This condition is called hemolytic anemia. Some symptoms of hemolytic anemia are fatigue, lack of appetite, restlessness, and pale skin. Exposure to large amounts of naphthalene may also cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin. Animals sometimes develop cloudiness in their eyes after swallowing high amounts of naphthalene. It is not clear whether this also develops in people. Rats and mice that breathed naphthalene vapors daily for a lifetime developed irritation and inflammation of their nose and lungs. It is unclear if naphthalene

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causes reproductive effects in animals; most evidence says it does not.

There are no studies of humans exposed to 1-methylnaphthalene or 2-methylnaphthalene.

Mice fed food containing 1-methylnaphthalene and 2-methylnaphthalene for most of their lives had part of their lungs filled with an abnormal material.

How likely are naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene to cause cancer?

There is no direct evidence in humans that naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene cause cancer. However, cancer from naphthalene exposure has been seen in animal studies. Some female mice that breathed naphthalene vapors daily for a lifetime developed lung tumors. Some male and female rats exposed to naphthalene in a similar manner also developed nose tumors.

Based on the results from animal studies, the Department of Health and Human Services (DHHS) concluded that naphthalene is reasonably anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) concluded that naphthalene is possibly carcinogenic to humans. The EPA determined that naphthalene is a possible human carcinogen (Group C) and that the data are inadequate to assess the human carcinogenic potential of 2-methylnaphthalene.

How can naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene affect children?

Hospitals have reported many cases of hemolytic anemia in children, including newborns and infants, who either ate naphthalene mothballs or deodorants cakes or who were in close contact with clothing or blankets stored in naphthalene mothballs. Naphthalene can move from a pregnant woman's blood to the unborn baby's blood. Naphthalene has been detected in some samples of breast milk from the general U.S. population, but not at levels that are expected to be of concern.

There is no information on whether naphthalene has affected development in humans. No developmental abnormalities were observed in the offspring from rats, mice, and rabbits fed naphthalene during pregnancy.

We do not have any information on possible health effects of 1-methylnaphthalene or 2-methylnaphthalene on children.

How can families reduce the risks of exposure to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

❑ Families can reduce the risks of exposure to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene by avoiding smoking tobacco, generating smoke during cooking, or using

fireplaces or heating appliances in their homes.

❑ If families use naphthalene-containing moth repellents, the material should be enclosed in containers that prevent vapors from escaping, and kept out of the reach from children.

❑ Blankets and clothing stored with naphthalene moth repellents should be aired outdoors to remove naphthalene odors and washed before they are used.

❑ Families should inform themselves of the contents of air deodorizers that are used in their homes and refrain from using deodorizers with naphthalene.

Is there a medical test to determine whether I've been exposed to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Tests are available that measure levels of these chemicals and their breakdown products in samples of urine, feces, blood, maternal milk, or body fat. These tests are not routinely available in a doctor's office because they require special equipment, but samples can be sent to special testing laboratories. These tests cannot determine exactly how much naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene you were exposed to or predict whether harmful effects will occur. If the samples are collected within a day or two of exposure, then the tests can show if you were exposed to a large or small amount of naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene.

Has the federal government made recommendations to protect human health?

The EPA recommends that children not drink water with over 0.5 parts per million (0.5 ppm) naphthalene for more than 10 days or over 0.4 ppm for any longer than 7 years. Adults should not drink water with more than 1 ppm for more than 7 years. For water consumed over a lifetime (70 years), the EPA suggests that it contain no more than 0.1 ppm naphthalene.

The Occupational Safety and Health Administration (OSHA) set a limit of 10 ppm for the level of naphthalene in workplace air during an 8-hour workday, 40-hour workweek. The National Institute for Occupational Safety and Health (NIOSH) considers more than 500 ppm of naphthalene in air to be immediately dangerous to life or health. This is the exposure level of a chemical that is likely to impair a worker's ability to leave a contaminate area and therefore, results in permanent health problems or death.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene (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 phenol. 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: Phenol is both a manufactured chemical and a natural substance. Phenol is used as a disinfectant and is found in a number of consumer products. Skin exposure to high amounts can produce skin burns, liver damage, dark urine, irregular heart beat, and even death. Ingestion of concentrated phenol can produce internal burns. Phenol has been found in at least 595 of the 1,678 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is phenol?

Phenol is both a manufactured chemical and a natural substance. It is a colorless-to-white solid when pure. The commercial product is a liquid. Phenol has a distinct odor that is sickeningly sweet and tarry.

You can taste and smell phenol at levels lower than those that are associated with harmful effects. Phenol evaporates more slowly than water, and a moderate amount can form a solution with water. Phenol can catch fire.

Phenol is used primarily in the production of phenolic resins and in the manufacture of nylon and other synthetic fibers. It is also used in slimicides (chemicals that kill bacteria and fungi in slimes), as a disinfectant and antiseptic, and in medicinal preparations such as mouthwash and sore throat lozenges.

What happens to phenol when it enters the environment?

- ☐ Following small, single releases, phenol is rapidly removed from the air (generally, half is removed in less than a day).
- ☐ Phenol generally remains in the soil only about 2 to 5 days.
- ☐ Phenol can remain in water for a week or more.
- ☐ Larger or repeated releases of phenol can remain in the air, water, and soil for much longer periods of time.

- ☐ Small amounts of phenol may be found in organisms that live in contaminated water.
- ☐ Phenol does not build up in fish, other animals, or plants.

How might I be exposed to phenol?

- ☐ You may be exposed to phenol if you live near landfills or hazardous waste sites that contain phenol or near facilities manufacturing phenol.
- ☐ You may be exposed to very low levels in your home because it is found in a number of consumer products, including mouthwashes, gargles, and throat lozenges.
- ☐ You may be exposed to phenol if you undergo "chemical peels" to remove skin lesions with phenol-containing products or are treated for chronic pain or spasticity with injections of phenol.
- ☐ Low levels of phenol are found in some foods, including smoked summer sausage, fried chicken, mountain cheese, and some species of fish.
- ☐ Smoking or inhaling second hand smoke will expose you to phenol.
- ☐ Low levels of phenol can be present in air and drinking water.

How can phenol affect my health?

Short-term exposure to phenol in the air can cause respiratory irritation, headaches, and burning eyes. People who had skin exposure to high amounts of phenol had skin burns, liver damage, dark urine, irregular heart beat, and

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some died. Ingestion of high concentrations of phenol has resulted in internal burns and death. The effects of prolonged exposure to low levels of phenol in air or of ingestion of low levels of phenol are uncertain because almost always there has been simultaneous exposure to other chemicals.

In animals, breathing air with high levels of phenol resulted in irritation of the lungs. Repeated exposures induced muscle tremors and loss of coordination. Exposure to high concentrations of phenol in the air for several weeks caused paralysis and severe injury to the heart, liver, kidneys, and lungs, and in some cases, death. Some animals that drank water with very high concentrations of phenol suffered muscle tremors and loss of coordination.

Phenol can have beneficial effects when used medically as an antiseptic or anesthetic.

How likely is phenol to cause cancer?

It is not known if phenol causes cancer in humans. Cancer developed in mice when phenol was applied to the skin several times per week for the lifetime of the animal. Phenol did not cause cancer in mice or rats that drank water containing it for 2 years. The International Agency for Research on Cancer (IARC) and the EPA have determined that phenol is not classifiable as to its carcinogenicity to humans.

How can phenol affect children?

Children are exposed to phenol in the same way adults are, except for exposures of adults at work. However, children are at greater risk of accidentally ingesting or spilling on their skin home products that contain phenol. Vomiting and lethargy were the most frequent signs of toxicity observed in children who accidentally ingested phenol and were treated at a poison control center.

Phenol has caused minor birth defects and low birth weight in animals generally at exposure levels that also were toxic to the pregnant mothers.

How can families reduce the risks of exposure to phenol?

- ☐ Avoiding environmental tobacco smoke, which contains phenol, will reduce phenol exposures.
- ☐ Always store household products and over-the-counter medications that contain phenol in their original labeled containers out of the reach of children.

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

There is a urine test that can tell if you have been exposed to phenol recently (within 1 or 2 days). However, the test cannot tell if you were exposed only to phenol because many substances are converted to phenol in the body. The test also cannot tell whether adverse health effects might result from the exposure. The test for phenol is not routinely performed at your doctor's office, but your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA lifetime health advisory for phenol in water is 2 milligrams per liter (2 mg/L). EPA requires that spills of 1,000 pounds or more of phenol to the environment be reported to the Agency.

The Occupational Safety and Health Administration (OSHA) has set a limit of 5 parts per million (ppm) in air to protect workers during 8-hour work shifts.

The National Institute for Occupational Safety and Health (NIOSH) recommends a limit of 5 ppm for phenol in workroom air over a 10-hour workday and that the concentration of phenol should not exceed 16 ppm during a 15-minute period.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Phenol (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.



Polychlorinated Biphenyls - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It'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 (NPL) 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

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several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. PCBs have been classified as probably carcinogenic, and carcinogenic to humans (group 1) by the Environmental Protection Agency (EPA) and International Agency for Research on Cancer (IARC), respectively.

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 risks 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 and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaqs/index.asp>.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Polycyclic Aromatic Hydrocarbons (PAHs) - ToxFAQs™

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

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

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl'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; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.
- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

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How can PAHs affect my health?

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

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

How likely are PAHs to cause cancer?

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

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

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

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

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

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

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

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

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaqs/index.asp>.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

This fact sheet answers the most frequently asked health questions (FAQs) about selenium. 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: People may be exposed to low levels of selenium daily through food and water. Selenium is a trace mineral needed in small amounts for good health, but exposure to much higher levels can result in neurological effects and brittle hair and deformed nails. Occupational inhalation exposure to selenium vapors may cause dizziness, fatigue, irritation of mucous membranes, and respiratory effects. This substance has been found in at least 508 of the 1,636 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is selenium?

Selenium is a naturally occurring mineral element that is distributed widely in nature in most rocks and soils. In its pure form, it exists as metallic gray to black hexagonal crystals, but in nature it is usually combined with sulfide or with silver, copper, lead, and nickel minerals. Most processed selenium is used in the electronics industry, but it is also used: as a nutritional supplement; in the glass industry; as a component of pigments in plastics, paints, enamels, inks, and rubber; in the preparation of pharmaceuticals; as a nutritional feed additive for poultry and livestock; in pesticide formulations; in rubber production; as an ingredient in antidandruff shampoos; and as a constituent of fungicides. Radioactive selenium is used in diagnostic medicine.

What happens to selenium when it enters the environment?

- ☐ Selenium occurs naturally in the environment and can be released by both natural and manufacturing processes.
- ☐ Selenium dust can enter the air from burning coal and oil. This selenium dust will eventually settle over the land and water.
- ☐ It also enters water from rocks and soil, and from agricultural and industrial waste. Some selenium compounds will dissolve in water, and some will settle to the bottom as particles.

☐ Insoluble forms of selenium will remain in soil, but soluble forms are very mobile and may enter surface water from soils.

☐ Selenium may accumulate up the food chain.

How might I be exposed to selenium?

- ☐ The general population is exposed to very low levels of selenium in air, food, and water. The majority of the daily intake comes from food.
- ☐ People working in or living near industries where selenium is produced, processed, or converted into commercial products may be exposed to higher levels of selenium in the air.
- ☐ People living in the vicinity of hazardous waste sites or coal burning plants may also be exposed to higher levels of selenium.

How can selenium affect my health?

Selenium has both beneficial and harmful effects. Low doses of selenium are needed to maintain good health. However, exposure to high levels can cause adverse health effects. Short-term oral exposure to high concentrations of selenium may cause nausea, vomiting, and diarrhea. Chronic oral exposure to high concentrations of selenium compounds can produce a disease called selenosis. The major signs of selenosis are hair loss, nail brittleness, and neurological abnormalities (such as numbness and other odd sensations).

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in the extremities).

Brief exposures to high levels of elemental selenium or selenium dioxide in air can result in respiratory tract irritation, bronchitis, difficulty breathing, and stomach pains. Longer-term exposure to either of these air-borne forms can cause respiratory irritation, bronchial spasms, and coughing. Levels of these forms of selenium that would be necessary to produce such effects are normally not seen outside of the workplace.

Animal studies have shown that very high amounts of selenium can affect sperm production and the female reproductive cycle. We do not know if similar effects would occur in humans.

How likely is selenium to cause cancer?

Studies of laboratory animals and people show that most selenium compounds probably do not cause cancer. In fact, studies in humans suggest that lower-than-normal selenium levels in the diet might increase the risk of cancer.

The International Agency for Research on Cancer (IARC) has determined that selenium and selenium compounds are not classifiable as to their carcinogenicity to humans.

The EPA has determined that one specific form of selenium, selenium sulfide, is a probable human carcinogen. Selenium sulfide is not present in foods and is a very different chemical from the organic and inorganic selenium compounds found in foods and in the environment.

How can selenium affect children?

It is likely that the health effects seen in children exposed to selenium will be similar to the effects seen in adults.

However, one study found that children may be less susceptible to the health effects of selenium than adults. Selenium compounds have not been shown to cause birth defects in humans or in other mammals.

How can families reduce the risk of exposure to selenium?

☐ Certain dietary supplements and shampoos contain selenium; these should be used according to the

manufacturer's directions.

☐ Children living near waste sites that contain selenium or coal burning plants should be encouraged to wash their hands before eating and to avoid putting their unwashed hands in their mouths.

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

Low levels of selenium are normally found in body tissues and urine. Blood and urine tests for selenium are most useful for people who have recently been exposed to high levels. Toenail clippings can be used to determine longer-term exposure. These tests are not usually available at your doctor's office, but your doctor can send the samples to a laboratory that can perform the tests. None of these tests, however, can predict whether you will experience any health effects.

Has the federal government made recommendations to protect human health?

The EPA restricts the amount of selenium allowed in public water supplies to 50 parts total selenium per billion parts of water (50 ppb).

The Occupational Safety and Health Administration (OSHA) sets a limit of 0.2 mg selenium/m³ of workroom air for an 8-hour work shift.

ATSDR and the EPA have determined that 5 micrograms of selenium per kilogram of body weight taken daily would not be expected to cause any adverse health effects over a lifetime of such intake.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2003. Toxicological Profile for Selenium (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 silver. 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: Silver is an element found naturally in the environment. At very high levels, it may cause argyria, a blue-gray discoloration of the skin and other organs. This chemical has been found in at least 27 of the 1,177 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is silver?

(Pronounced sĭl'vər)

Silver is a naturally occurring element. It is found in the environment combined with other elements such as sulfide, chloride, and nitrate. Pure silver is "silver" colored, but silver nitrate and silver chloride are powdery white and silver sulfide and silver oxide are dark-gray to black. Silver is often found as a by-product during the retrieval of copper, lead, zinc, and gold ores.

Silver is used to make jewelry, silverware, electronic equipment, and dental fillings. It is also used to make photographs, in brazing alloys and solders, to disinfect drinking water and water in swimming pools, and as an antibacterial agent. Silver has also been used in lozenges and chewing gum to help people stop smoking.

What happens to silver when it enters the environment?

- ☐ Silver may be released into the air and water through natural processes such as the weathering of rocks.
- ☐ Human activities such as the processing of ores, cement manufacture, and the burning of fossil fuel may release silver into the air.

- ☐ It may be released into water from photographic processing.
- ☐ Rain may wash silver out of soil into the groundwater.
- ☐ Silver does not appear to concentrate to a significant extent in aquatic animals.

How might I be exposed to silver?

- ☐ Breathing low levels in air.
- ☐ Swallowing it in food or drinking water.
- ☐ Carrying out activities such as jewelry-making, soldering, and photography.
- ☐ Using anti-smoking lozenges or other medicines containing it.

How can silver affect my health?

Exposure to high levels of silver for a long period of time may result in a condition called argyria, a blue-gray discoloration of the skin and other body tissues. Lower-level exposures to silver may also cause silver to be deposited in the skin and other parts of the body; however, this is not known to be harmful. Argyria is a permanent effect, but it appears to be a cosmetic problem that may not be otherwise harmful to health.

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Exposure to high levels of silver in the air has resulted in breathing problems, lung and throat irritation, and stomach pains. Skin contact with silver can cause mild allergic reactions such as rash, swelling, and inflammation in some people.

Animal studies have shown that swallowing silver results in the deposit of silver in the skin. One study in mice found that the animals exposed to silver in drinking water were less active than unexposed animals.

No studies are available on whether silver affects reproduction or causes developmental problems in people.

How likely is silver to cause cancer?

No studies are available on whether silver may cause cancer in people. The only available animal studies showed both positive and negative results when silver was implanted under the skin.

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

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

Silver can be measured in the blood, urine, feces, and body tissues of exposed people. Silver builds up in the body, and the best way to learn if past exposure has occurred is to look for silver in samples of skin. Tests for silver are not commonly done at a doctor's office because they require special equipment. Although doctors can find out if a person has been exposed to silver by doing these tests, they cannot tell whether any health effects will occur.

Has the federal government made recommendations to protect human health?

The EPA recommends that the concentration of silver in

drinking water not exceed 0.10 milligrams per liter of water (0.10 mg/L) because of the skin discoloration that may occur.

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

The Occupational Safety and Health Administration (OSHA) limits silver in workplace air to 0.01 milligrams per cubic meter (0.01 mg/m³) for an 8-hour workday, 40-hour workweek. The National Institute of Occupational Safety and Health (NIOSH) also recommends that workplace air contain no more than 0.01 mg/m³ silver.

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends that workplace air contain no more than 0.1 mg/m³ silver metal and 0.01 mg/m³ soluble silver compounds.

The federal recommendations have been updated as of July 1999.

Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

National Priorities List: A list of the nation's worst hazardous waste sites.

Soluble: Capable of being dissolved in water.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. Toxicological profile for silver. 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.



Tetrachloroethylene - ToxFAQs™

CAS # 127-18-4

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

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

What is tetrachloroethylene?

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

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

What happens to tetrachloroethylene when it enters the environment?

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

How might I be exposed to tetrachloroethylene?

- When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- When you drink water containing tetrachloroethylene, you are exposed to it. You might also be exposed to tetrachloroethylene that is released into the air during showering and bathing.
- People residing near contaminated sites or dry cleaning locations may be exposed to higher levels than the general population.
- People working in the dry cleaning industries or using metal degreasing products may be exposed to elevated levels of tetrachloroethylene.

How can tetrachloroethylene affect my health?

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

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

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

Tetrachloroethylene

CAS # 127-18-4

How likely is tetrachloroethylene to cause cancer?

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

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

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

How can tetrachloroethylene affect children?

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

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

How can families reduce the risk of exposure to tetrachloroethylene?

- Tetrachloroethylene has been found in low levels in some food. You can minimize the risk of your family's exposure by peeling and thoroughly washing fruits and vegetables before cooking.
- Use bottled water if you have concerns about the presence of tetrachloroethylene in your tap water. You may also contact local drinking water authorities and follow their advice.

- Prevent children from playing in dirt or eating dirt if you live near a waste site that has tetrachloroethylene.
- Tetrachloroethylene is widely used as a scouring solvent that removes oils from fabrics, as a carrier solvent, as a fabric finish or water repellent, and as a metal degreaser/cleaner. Follow instructions on product labels to minimize exposure to tetrachloroethylene.

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

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

Has the federal government made recommendations to protect human health?

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

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

Reference

This ToxFAQs™ information is taken from the 2019 Toxicological Profile for Tetrachloroethylene produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

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

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Toluene - ToxFAQs™

What is toluene?

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



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

What happens to toluene in the environment?

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

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

How can I be exposed to toluene?

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

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

How can toluene affect my health?

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

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

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

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

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

Toluene

Can toluene cause cancer?

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

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

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

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

Can I get a medical test to check for toluene?

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

How can I protect myself and my family from toluene?

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

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

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

For more information:



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

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

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

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

Trichloroethylene - ToxFAQs™

CAS # 79-01-6

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

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

What is trichloroethylene?

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

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

What happens to trichloroethylene when it enters the environment?

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

How might I be exposed to trichloroethylene?

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

How can trichloroethylene affect my health?

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

How likely is trichloroethylene to cause cancer?

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

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

Trichloroethylene

CAS # 79-01-6

How can trichloroethylene affect children?

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

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

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

How can families reduce the risk of exposure to trichloroethylene?

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

Reference

This ToxFaqTM information is taken from the 2019 Toxicological Profile for Trichloroethylene produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFaqTM on the web: www.atsdr.cdc.gov/ToxFaq

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.

Vinyl Chloride - ToxFAQs™

What is vinyl chloride?

Vinyl chloride is a colorless gas with a mild, sweet odor. It burns easily and it is not stable at high temperatures. Vinyl chloride is a manufactured substance that does not occur naturally. It can be formed when other substances such as trichloroethane, trichloroethylene, and tetrachloroethylene are broken down.

Vinyl chloride is used to make polyvinyl chloride (PVC). PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and packaging materials.



What happens to vinyl chloride in the environment?

Liquid vinyl chloride evaporates easily. Vinyl chloride in water or soil evaporates rapidly if it is near the surface. Vinyl chloride in the air breaks down in a few days to other substances, some of which can be harmful. Small amounts of vinyl chloride can dissolve in water. Vinyl chloride is unlikely to build up in plants or animals that you might eat.

How can I be exposed to vinyl chloride?

You can be exposed by breathing vinyl chloride that has been released from plastic manufacturing facilities, hazardous waste sites, and landfills. You can also be exposed from cigarette and cigar smoke. It is possible to be exposed to very low levels of vinyl chloride in drinking water; however, the majority of the general population is not expected to be exposed through ingestion of drinking water. Vinyl chloride vapor can get into the indoor air of a home or business if built on contaminated ground.

Workers can be exposed by breathing vinyl chloride in air or during contact with skin or eyes in the workplace.

The levels of vinyl chloride typically found in the environment are lower than levels known to cause health problems.

How can vinyl chloride affect my health?

Breathing high levels of vinyl chloride can cause you to feel dizzy or sleepy. Breathing very high levels can cause you to pass out, and breathing extremely high levels can cause death. Some people who have breathed vinyl chloride for several years have changes in the structure of their livers. People are more likely to develop these changes if they breathe high levels of vinyl chloride. Some people who work with vinyl chloride have nerve damage and develop alterations in immunity. The lowest levels that produce liver changes, nerve damage, and alterations in immunity in people are not known. Some workers exposed to very high levels of vinyl chloride have problems with the blood flow in their hands. Their fingers turn white and hurt when they go into the cold. Highly exposed workers have also developed a specific type of cancer known as angiosarcoma of the liver. The effects of drinking high levels of vinyl chloride are unknown. If you spill vinyl chloride on your skin, it will cause numbness, redness, and blisters.

Animal studies have shown that exposure to vinyl chloride during pregnancy can affect the growth and development of the fetus.

Vinyl Chloride

Can vinyl chloride cause cancer?

The [U.S. Department of Health and Human Services \(DHHS\)](#) has classified vinyl chloride as known to be a human carcinogen (causes cancer).

The [U.S. Environmental Protection Agency \(EPA\)](#) has classified vinyl chloride as a known human carcinogen by the inhalation route of exposure. It has also classified it as carcinogenic by the oral route and highly likely to be carcinogenic by the dermal route.

The [International Agency for Research on Cancer \(IARC\)](#) determined that vinyl chloride is carcinogenic to humans.

Can I get a medical test to check for vinyl chloride?

The results of several tests can sometimes show if you have been exposed to vinyl chloride. Vinyl chloride can be measured in your breath, but the test must be done shortly after exposure. Very low levels of vinyl chloride cannot be measured from your breath so this test may not be helpful.

The amount of the major breakdown product of vinyl chloride, thiodiglycolic acid, in the urine may give some information about exposure. However, this test must be done shortly after exposure and may also indicate exposure to other chemicals in addition to or besides vinyl chloride.

How can I protect myself and my family from vinyl chloride?

Tobacco smoke contains low levels of vinyl chloride, so limiting your family's exposure to cigarette or cigar smoke may help reduce their exposure to vinyl chloride.

Workers using or making vinyl chloride should wear protective eye wear, clothing, gloves, and when needed, respiratory protection.

For more information:

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at

<https://wwwn.cdc.gov/dcs/ContactUs/Form>

Go to ATSDR's Toxicological Profile for Vinyl Chloride:

<https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=282&tid=51>

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

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



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

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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
WEST NILE VIRUS/ST. LOUIS ENCEPHALITIS PREVENTION

WEST NILE VIRUS/ST. LOUIS ENCEPHALITIS PREVENTION

The following section is based upon information provided by the Center for Disease Control (CDC) Division of Vector-Borne Infectious Diseases. Symptoms of West Nile Virus include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands, with most infections being mild. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death. Most infections of St. Louis encephalitis are mild without apparent symptoms other than fever with headache. More severe infection is marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, occasional convulsions (especially infants) and spastic (but rarely flaccid) paralysis. The only way to avoid infection of West Nile Virus and St. Louis Encephalitis is to avoid mosquito bites. To reduce the chance of mosquito contact:

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET (N, N-diethyl-meta-toluamide), since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET. DEET in high concentrations (greater than 35%) provides no additional protection.
- Repellents may irritate the eyes and mouth.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's directions for use, as printed on the product.

ATTACHMENT C
REPORT FORMS

WEEKLY SAFETY REPORT FORM

John Tynan Senior Residence; BCP Site

Week Ending: _____

Project Name/Number: No. C224401

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: John Tynan Senior Residence; BCP

Site No. C224401

Site Location: 41 First Street, Brooklyn, NY

Report Prepared By: _____
Signature Title

ACCIDENT/INCIDENT CATEGORY (check all that applies)

☐ Injury	☐ Illness	☐ Near Miss
☐ Property Damage	☐ Fire	☐ Chemical Exposure
☐ On-site Equipment	☐ Motor Vehicle	☐ Electrical
☐ Mechanical	☐ Spill	☐ Other

DATE AND TIME OF ACCIDENT/INCIDENT: Narrative report of accident/incident: Identify: 1) actions leading to or contributing to the accident/incident; 2) the accident/incident occurrence; and 3) actions following the accident/incident.

WITNESS TO ACCIDENT/INCIDENT:

Name: _____	Company: _____
Address: _____	Address: _____
Phone No.: _____	Phone No.: _____
Name: _____	Company: _____
Address: _____	Address: _____
Phone No.: _____	Phone No.: _____

INJURED - ILL:

Name: _____ SSN: _____

Address: _____ Age: _____

Length of Service: _____ Time on Present Job: _____

Time/Classification: _____

SEVERITY OF INJURY OR ILLNESS:

___ Disabling ___ Non-disabling ___ Fatality

___ Medical Treatment ___ First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: _____**NATURE OF INJURY OR ILLNESS:** __________
_____**CLASSIFICATION OF INJURY:**

___ Abrasions	___ Dislocations	___ Punctures
___ Bites	___ Faint/Dizziness	___ Radiation Burns
___ Blisters	___ Fractures	___ Respiratory Allergy
___ Bruises	___ Frostbite	___ Sprains
___ Chemical Burns	___ Heat Burns	___ Toxic Resp. Exposure
___ Cold Exposure	___ Heat Exhaustion	___ Toxic Ingestion
___ Concussion	___ Heat Stroke	___ Dermal Allergy
___ Lacerations		

Part of Body Affected: _____

Degree of Disability: _____

Date Medical Care was Received: _____

Where Medical Care was Received: _____

Address (if off-site): _____

(If two or more injuries, record on separate sheets)

PROPERTY DAMAGE:

Description of Damage: _____

Cost of Damage: \$ _____

ACCIDENT/INCIDENT LOCATION: _____

ACCIDENT/INCIDENT ANALYSIS: Causative agent most directly related to accident/incident
(Object, substance, material, machinery, equipment, conditions)

Was weather a factor?: _____

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

Modifications:

Was injured using required equipment?:

If not, how did actual equipment use differ from plan?:

ACTION TAKEN TO PREVENT RECURRENCE: (Be specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)

ACCIDENT/INCIDENT REPORT REVIEWED BY:

SSO Name Printed

SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature

Title

Signature

Title

Signature

Title

ACCIDENT/INCIDENT FOLLOW-UP: Date:

Outcome of accident/incident:

Physician's recommendations:

Date injured returned to work:

Follow-up performed by:

Signature

Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

ATTACHMENT D
EMERGENCY HAND SIGNALS

EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communications is not available, the following air-horn and/or hand signals will be used:

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATHE!



Hand gripping throat

**LEAVE AREA IMMEDIATELY,
NO DEBATE!**

**(No Picture) Grip partner's wrist or place
both hands around waist**

NEED ASSISTANCE!



Hands on top of head

**OKAY! – I'M ALL RIGHT!
- I UNDERSTAND!**



Thumbs up

NO! - NEGATIVE!



Thumbs down

APPENDIX F
QUALITY ASSURANCE PROJECT PLAN (QAPP)

**JOHN TYNAN SENIOR RESIDENCE
41 FIRST STREET
BROOKLYN, NY**

Quality Assurance Project Plan

**NYSDEC BCP Site Number: C224401
AKRF Project Number: 230346**

Prepared For:

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

Prepared On Behalf Of:

Catholic Charities Progress of Peoples Development Corporation
John Tynan Senior Residence LLC
191 Joralemon Street
Brooklyn, NY 11201

Prepared by:



AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
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JULY 2025

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Table 4 –	Waste Classification/Tank Excavation Sample Nomenclature
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ATTACHMENTS

Attachment A –	Resumes for Remedial Engineer, QA/QC Officer, Project Manager, and Field Team Leader
Attachment B –	Sample Chain of Custody

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the protocols and procedures that will be followed during implementation of all environmental sampling to implement the Remedial Action Work Plan (RAWP) at the John Tynan Senior Residence project site located at 41 First Street, Brooklyn, NY, hereafter referred to as “the Site”. The approximately 0.889-acre Site is located in the Gowanus neighborhood of Brooklyn, New York. The Site is identified as Brooklyn Borough Tax Block 451, portion of Lot 25.

The objective of this QAPP is to provide for Quality Assurance (QA) and maintain Quality Control (QC) of environmental investigative, sampling, and remedial activities conducted under the New York State Department of Environmental Conservation (NYSDEC) oversight in the Brownfield Cleanup Program (BCP) (BCP Site No. C224401). Adherence to the QAPP will ensure that defensible data will be obtained during all environmental work at the Site.

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 Remedial Engineer

Rebecca A. Kinal, P.E will serve as the remedial engineer and will be responsible for directing and overseeing all elements of the RAWP. The remedial engineer will review reports and participate in meetings with the Site owner/Volunteer, and/or the NYSDEC. Ms. Kinal's resume is included in Attachment A.

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

Axel Schwendt will serve as the QA/QC officer and will be responsible for adherence to the QAPP. The QA/QC officer will review the procedures with all personnel prior to commencing any fieldwork and will conduct periodic Site visits to assess implementation of the procedures. The QA/QC officer will also be responsible for reviewing Data Usability Summary Reports (DUSRs) for soil analytical results. Mr. Schwendt's resume is included in Attachment A.

2.3 Project Manager

The project manager will be responsible for directing and coordinating all elements of the RAWP. The project manager will prepare reports and participate in meetings with the Site owner/Volunteer, and/or the NYSDEC. The project manager will be responsible for all appropriate communication with NYSDEC and NYSDOH. Ashutosh Sharma will serve as the project manager for the RAWP. Mr. Sharma's resume is included in Attachment A.

2.4 Field Team Leader, Field Technician, and Site Safety Officer

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 Construction Health and Safety Plan (CHASP), included in Appendix H of the RAWP. The field team leader will also act as the field technician and Site safety officer (SSO), and will report to the project manager or project manager alternate on a regular basis regarding daily progress and any deviations from the work plan. The field team leader will be a qualified and responsible person able to act professionally and promptly during environmental work at the Site. Brian Quinn will be the field team leader. Mr. Quinn's resume is included in Attachment A.

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

The laboratory QA/QC officer will be responsible for quality control procedures and checks in the laboratory and ensuring adherence to laboratory protocols. The QA/QC officer will track the movement of samples from the time they are checked in at the laboratory to the time that analytical results are issued, and will conduct a final check on the analytical calculations and sign off on the laboratory reports. The laboratory QA/QC officer will be Melissa Haas of Eurofins Environmental Testing Northeast (Eurofins), the New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP)-certified laboratory being employed for all environmental sampling at the Site.

2.6 Laboratory Data Validator

The laboratory data validator will be responsible for third party data validation and preparation of Data Usability Summary Reports (DUSRs). The third-party laboratory data validator will be Lori Beyer of L.A.B. Validation Corp.

3.0 STANDARD OPERATING PROCEDURES (SOPS)

The following sections describe the standard operating procedures (SOPs) for the remedial activities performed under the RAWP. 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 Tank Removal

In the event that tanks are 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 RAWP. 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, sheen 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 excavation 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 4.6.1 of this QAPP and place in an ice-filled cooler.
- Decontaminate any soil sampling equipment between sample locations as described in Section 3.1 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. All imported soils will meet NYSDEC-approved backfill or cover soil quality objectives for this Site. These NYSDEC-approved backfill or cover soil quality objectives are the lower of the protection of groundwater or the protection of public health SCOs, as set forth in Table 375-6.8(b) of 6 NYCRR Part 375. 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.

The following material may be imported, without chemical testing, to be used as backfill beneath pavement, buildings or as part of the final site cover, provided that it contains less than 10% by weight material which would pass through a size 100 sieve and consists of: gravel, rock or stone, consisting of virgin material from a permitted mine or quarry. All other imported material will be tested via collection of discreet grab and composite samples in accordance with the sampling

frequency noted in DER-10 Table 5.4(e)10.. Samples will be analyzed for volatile organic compounds (VOCs) by EPA Method 8260, semivolatile organic compounds (SVOCs) by EPA Method 8270, target analyte list (TAL) metals by EPA Method 6000/7000 series, polychlorinated biphenyls (PCBs) by EPA Method 8082, pesticides by EPA Method 8081, 1,4-dioxane by EPA Method 8270, and the standard list of per- and polyfluoroalkyl substances (PFAS) compounds by EPA Method 1633.

3.4 Materials Reuse On-Site

If required, 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. Organic matter (wood, roots, stumps, etc.) or other solid is prohibited for reuse on-site. 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 PFAS compounds by EPA Method 1633. Samples will be shipped to the laboratory with appropriate chain of custody documentation. The samples will be analyzed in a laboratory following New York State Department of Health (NYSDOH) Analytical Services Protocol (ASP) Category B deliverables

The following sections describe the SOPs for the remedial activities included in the RAWP. During these operations, safety monitoring will be performed as described in the CAMP, included as Appendix F of the RAWP.

3.5 Decontamination of Sampling Equipment

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

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

3.6 Management of Investigation Derived Waste (IDW)

IDW will be containerized in New York State Department of Transportation (NYSDOT)-approved 55-gallon drums or disposed of via tri-axel trucks during excavation activities. The drums will be sealed at the end of each work day and labeled with the date, the excavation grid(s), the type of waste (i.e., drill cuttings), and the name and phone number of an AKRF point-of-contact. All IDW exhibiting field evidence of contamination will be disposed of or treated according to applicable local, state, and federal regulations.

4.0 SAMPLING AND LABORATORY PROCEDURES

4.1 Soil Sampling

Soil sampling will be conducted according to the following procedures:

- Characterize the sample according to the modified Burmister soil classification system.
- Field screen the sample for evidence of contamination (e.g., odors, staining) using visual and olfactory methods and screen for volatile organic compounds (VOCs) using a PID equipped with a 10.6 electron Volt (eV) lamp, which has been calibrated to the manufacturer's specifications.
- Record sample location, sample depth, and sample observations (evidence of contamination, PID readings, soil classification, etc.) in the field logbook and boring log data sheet, if applicable.
- Collect an aliquot of soil from each proposed sample location, place into the required laboratory-supplied sample containers as described in Section 4.4 of this QAPP, label the sample in accordance with Section 4.6.1 of this QAPP, and place in an ice-filled cooler for shipment to the laboratory.
- Conduct soil sampling for per- and polyfluoroalkyl substances (PFAS) in accordance with the April 2023 NYSDEC Sampling, Analysis and Assessment Of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs.
- Complete the chain of custody (COC) paperwork and seal the cooler.
- Decontaminate non-dedicated sampling equipment between sample locations in accordance with Section 3.5 of this QAPP and properly dispose of dedicated sampling equipment.

4.2 Groundwater Sampling

Groundwater sampling (if needed) will be conducted in accordance with the United States Environmental Protection Agency (EPA) low-flow methodology. Groundwater sampling will be conducted according to the following procedures:

- Remove the well plug and immediately measure the vapor concentrations in the well headspace with a PID equipped with a 10.6 eV lamp, which has been calibrated to the manufacturer's specifications.
- Measure the depth to water and total well depth, and check for the presence of non-aqueous phase liquid (NAPL) using an electronic oil/water interface probe. Measure the thickness of NAPL, if any, and record in the field logbook and field data sheet, if applicable. If present, collect a sample of NAPL using a disposable plastic weighted bailer or similar collection device. Groundwater samples will not be collected from wells containing measurable NAPL.
- Connect dedicated tubing to either a submersible or bladder pump and lower the pump such that the intake of the pump is set at the midpoint of the water column within the screened interval of the well. Connect the discharge end of the tubing to the flow-through cell of a multi-parameter meter (Horiba or equivalent). Connect tubing to the output of the cell and place the discharge end of the tubing in a 5-gallon bucket.
- Activate the pump at the lowest flow rate setting.
- Measure the depth to water within the well once pump is activated. The pump flow rate may be increased such that the water level measurements do not change by more than 0.3 foot as

compared to the initial static reading. The well-purging rate should be adjusted to produce a smooth, constant (laminar) flow rate and eliminate excessive turbulence in the well. The expected targeted purge rate will be approximately 0.5 liters per minute and will be no greater than 3.8 liters per minute.

- Transfer discharged water from the 5-gallon buckets to 55-gallon drums designated for well-purge water.
- During purging, collect periodic samples and analyze for water quality indicators (e.g., turbidity, pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity) with measurements collected approximately every five minutes.
- Continue purging the well until turbidity is less than 50 nephelometric turbidity units (NTUs) and water quality indicators have stabilized to the extent practicable. The criteria for stabilization will be three successive readings for the following parameters and criteria:
 - Dissolved Oxygen: +/- 0.3 milligram per Liter (mg/L)
 - Turbidity: <50 NTU
 - ORP/Eh: +/- 10 millivolts (mV)
 - Specific Conductance: +/- 3% millisievert per centimeter (mS/cm)
 - PH: +/- 0.1 pH units
- If the water quality parameters do not stabilize and/or turbidity is greater than 50 NTUs within two hours, purging may be discontinued. Efforts to stabilize the water quality for the well must be recorded in the field logbook, and samples may then be collected as described herein.
- After purging, disconnect the tubing to the inlet of the flow-through cell. Collect groundwater samples directly from the discharge end of the tubing, place into the required laboratory-supplied sample containers as described in Section 4.4 of this QAPP, label the sample in accordance with Section 4.6.1 of this QAPP, and place in an ice-filled cooler for shipment to the laboratory.
- Collect one final field sample and analyze for turbidity and water quality parameters (pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity).
- Record all measurements (depth to water, depth to NAPL, water quality parameters, turbidity), calculations (well volume), and observations in the field logbook and field data sheet, if applicable.
- Complete the COC paperwork and seal the cooler.
- Once sampling is complete, remove the pump and tubing from the well. Decontaminate non-dedicated sampling equipment between sample locations in accordance with Section 3.1 of this QAPP and properly dispose of dedicated sampling equipment.

4.3 Soil Vapor/Indoor Air/Ambient Air Sampling

Soil vapor/indoor air/ambient air sampling, if necessary, will be conducted in accordance with NYSDOH Final Guidance on Soil Vapor Intrusion, October 2006. Samples will be collected in either Tedlar[®] bags or SUMMA[®] canisters. Soil vapor sampling will be conducted as follows:

- Install a shroud over the vapor sampling point tubing and seal to the surface along the perimeter using duct tape or non-VOC putty, as appropriate.

- Puncture the shroud and pull the vapor sampling point tubing through the shroud to allow for sample collection. Seal the puncture as necessary with duct tape or modeling clay.
- Pierce a second hole in the shroud, and insert new, dedicated silicone tubing through the hole, connecting the other end of the tubing to a helium tank/canister to allow introduction of helium tracer gas. Seal the puncture as necessary with duct tape/modeling clay.
- Connect the vapor sampling point tubing to the inlet port of a low-flow air pump (Gilian GilAir Plus or equivalent). Connect the low-flow air pump discharge port to a Tedlar™ bag.
- Calculate and purge the soil gas sampler of approximately three sampling point volumes using the low-flow air pump and Tedlar bag. The air withdrawal flow rate will be maintained to the extent practicable at less than 0.2 liter per minute to better control the physical extent from which soil vapor is being drawn from.
- Field screen the sample within the Tedlar™ bag using a calibrated PID and a helium detector (MGD 2002 or equivalent). If elevated concentrations (greater than 1% or 10,000 parts per million) of helium are detected, inspect the surface seal and add hydrated bentonite/modeling clay or make other necessary modifications to reinforce the seal.
- After purging the vapor sampling point, disconnect the sampling point tubing from the low-flow air pump and plug/cap the tubing prior to conducting the vapor sampling.

Following successful testing of the surface seal, the following procedures shall be implemented to collect each soil vapor sample:

- Connect sampling point tubing to the inlet of the SUMMA® canister flow controller/vacuum gauge assembly, which is calibrated for sample collection over a specified sampling period.
- Open the canister valve and record the initial reading from the vacuum gauge on the assembled canister. Record the corresponding time in the field logbook and field data sheet.
- Begin routine sampling measurement collection, including time, sample canister vacuum, and ambient PID reading in vicinity of sample location. Record the routine measurements in the field logbook and field data sheet.
- At the end of the sampling period and always prior to the canister reaching 0 vacuum, close the canister valves, remove the flow controller/vacuum gauge assemblies, cap canisters with threaded caps, label the sample in accordance with Section 4.6.1 of this QAPP, and complete the COC paperwork.

Indoor air and ambient air sampling will be conducted as follows:

- Identify sample locations and establish a method of elevating the SUMMA® canisters to approximately 4 feet above grade (approximate breathing level).
- Remove the threaded cap from the inlet port of the canister and install the flow controller/vacuum gauge assembly.
- Open the canister valve and record the initial reading from the vacuum gauge on the assembled canister. Record the corresponding time in the field logbook and field data sheet.
- Begin routine sampling measurement collection, including time, sample canister vacuum, and ambient PID reading in vicinity of sample location. Record the routine measurements in the field logbook and field data sheet.

- At the end of the sampling period and always prior to the canister reaching 0 vacuum, close the canister valves, remove the flow controller/vacuum gauge assemblies, cap canisters with threaded caps, label the sample in accordance with Section 4.6.1 of this QAPP, and complete the COC paperwork

4.4 Laboratory Methods

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

Table 1
Laboratory Analytical Methods for Analysis Groups

Matrix	Analysis	EPA Method	Bottle Type	Preservative	Hold Time
Soil	Target Compound List (TCL) Volatile Organic Compounds (VOCs)	8260C	EnCore or Terracore samplers (3) and 2 oz. plastic jar	$\leq 6^{\circ}\text{C}$	48 hours to extract; 14 days to analyze
	TCL Semivolatile Organic Compounds (SVOCs)	8270D	8 oz. Glass Jar	$\leq 6^{\circ}\text{C}$	14 days to extract; 40 days to analyze
	Target Analyte List (TAL) Metals, RCRA 8 Metals, and Hexavalent Chromium	6000/7000 Series, 6010C, and 7196A	8 oz. Glass Jar	$\leq 6^{\circ}\text{C}$	6 months holding time; Mercury 28 days holding time; Hexavalent chromium 30 days to extract, 7 days to analyze
	Pesticides	8081B	8 oz. Glass Jar	$\leq 6^{\circ}\text{C}$	14 days to extract; 40 days to analyze
	Polychlorinated Biphenyls (PCBs)	8082A	8 oz. Glass Jar	$\leq 6^{\circ}\text{C}$	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	1633	4 oz. HDPE Plastic Container	$\leq 6^{\circ}\text{C}$,	14 days to extract; 40 days to analyze
Groundwater	VOCs	8260C	3 40 mL Glass Vials	HCl to pH < 2 and $\leq 6^{\circ}\text{C}$	48 hours to extract; 14 days to analyze
	SVOCs and 1,4-dioxane	8270D plus Selective Ion Monitoring (SIM); 0.35 $\mu\text{g/L}$ RL	2, 1L Amber Glass	4°C	7 days to extract; 40 days to analyze
	TAL Metals	6000/7000 Series, 6010C, and 7196A	2,000 mL Amber Jar	HNO_3 to pH < 2	6 months for metals; 28 days for mercury
	Pesticides	8081B	2,000 mL Amber Jar	$\leq 6^{\circ}\text{C}$	7 days to extract; 40 days to analyze
	PCBs	8082A	2,000 mL Amber Jar	$\leq 6^{\circ}\text{C}$	7 days to extract; 40 days to analyze
	PFAS	1633	3, 250mL HDPE Bottles	$\leq 6^{\circ}\text{C}$, Trizma	14 days to analyze
Soil Vapor/Indoor Air/Ambient Air	VOCs	TO-15	6L SUMMA Canister or Tedlar Bag	None	14 days to analyze
Notes: EPA - Environmental Protection Agency RCRA – Resource Conservation and Recovery Act HDPE – High-Density Polyethylene QA/QC samples will be submitted for laboratory analysis at a frequency of at least 1 QA/QC sample set per 20 samples per media per sample delivery group (SDG). Sample frequency will be determined based on the field activity being conducted, as described in the RAWP.					

4.5 Quality Control (QC) Sampling

In addition to the laboratory analysis of the soil samples, additional analysis will be included for QC measures, as required by the Category B sampling techniques. These samples will include field blank, trip blank, matrix spike/matrix spike duplicate (MS/MSD), and blind duplicate samples at a frequency of one sample per 20 field samples collected or per sample digestion group (SDG). QC samples will be analyzed for the same parameters as the accompanying samples, with the exception of any trip blanks, which will be analyzed for the VOC list only. In addition, an equipment blank (one sample per day) will also be collected on days when groundwater samples are collected for PFAS analysis.

4.6 Sample Handling

4.6.1 Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody (COC) documents, and laboratory reports. All samples will be amended with the collection date at the end of the sample name in a year, month, day (YYYYMMDD) format. Blind duplicate sample nomenclature will consist of the sample type, followed by an "X"; MS/MSD samples will be the same as the parent sample name, but will be indicated as MS/MSD on the chain of custody; and trip and field blanks will consist of "TB-" and "FB-", respectively, followed by a sequential number of the trip/field blanks collected within the sample digestion group (SDG). Special characters, including primes/apostrophes ('), will not be used for sample nomenclature.

Import Soil Sampling

In addition to the nomenclature detailed in Section 4.4.1, soil import samples will be identified with "ISP-" and the import sample number in sequential order that the import sample was collected. Table 2 provides examples of the sampling identification scheme for import soil samples.

Table 2
Import Sample Nomenclature

Sample Description	Sample Designation
Import soil sample ISP-1 collected on July 1, 2025	ISP-1 20250701
Blind duplicate of import soil sample ISP-1 collected on July 1, 2025	ISP-X 20250701

Endpoint Soil Sampling

In addition to the nomenclature detailed in Section 4.4.1, soil endpoint samples will be identified with "EP-" and the endpoint sample number in sequential order that the endpoint sample was collected, and the depth below grade the sample was collected from in parentheses. Table 3 provides examples of the sampling identification scheme for the 18 proposed post-excavation endpoint samples.

Table 3
Endpoint Sample Nomenclature

Sample Description	Sample Designation
Excavation endpoint soil sample EP-1 collected from two feet below grade on July 1, 2025	EP-1_2_20250701
Blind duplicate of excavation endpoint soil sample EP-1 collected from two feet below grade on July 1, 2025	EP-X_2_20250701
(Second) Blind duplicate of excavation endpoint soil sample EP-15 collected from 12 feet below grade on July 1, 2025	EP-X2_12_20250701

Waste Classification/Tank Excavation Soil Sampling

In addition to the nomenclature detailed in Section 4.4.1, any confirmatory endpoint samples collected from a previously unknown tank excavation will be identified by the excavation grid area and the cardinal direction of the sidewalls. The sample(s) collected from the bottom of the excavation will be amended with a “B-”, followed by the number of bottom samples collected from the excavation in sequential order. Waste classification samples will be amended with “WC-” and the alphanumeric grid identification. Five-point composite samples will be amended with “C-” and grab samples to be analyzed for VOCs will be amended with “G-”. Additionally, samples will be amended with the depth the sample was collected in feet below grade in parentheses. The alphanumeric grid is presented on Figure 8 of the RAWP. Table 4 provides examples of the sampling identification scheme for proposed waste classification samples and any hotspot or tank excavation samples.

Table 4
Waste Classification/Tank Excavation Sample Nomenclature

Sample Description	Sample Designation
Waste classification composite sample collected between grade and 5 feet below grade in Grid A1 on ____	WC-A1-C_0-5_20251101
Waste classification grab sample collected between grade and 5 feet below grade in Grid A1 on ____	WC-A1-G_0-5_20251101
Soil sample collected from the northern sidewall of the second tank grave encountered at 4 feet below grade on March 1, 2025	UST-2N_4_20250301
Soil sample collected from the bottom of the second tank grave at 15 feet below grade on March 1, 2025	UST-2B_15_20250301

Soil Vapor, Indoor Air, and Ambient Air Sampling

In addition to the nomenclature detailed in Section 4.6.1, soil vapor samples will be identified with “SV-”, indoor air samples will be identified with “IA-”, and ambient air samples will be identified with “AA-” followed by the import sample number in sequential order that it was collected. Table 5 provides examples of the sampling identification scheme for import soil samples.

Table 5
Soil Vapor/Indoor Air/Ambient Air Nomenclature

Sample Description	Sample Designation
Indoor Air sample IA-01 collected on July 15, 2025	IA-01_20250715
Soil Vapor Air sample SV-01 collected on July 15, 2025	SV-01_20250715
Ambient Air sample AA-01 collected on July 15, 2025	AA-01_20250715

Sample Labeling and Shipping

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

- Project identification, including Site name, BCP Site number, Site address
- 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 in a secured area to await shipment to the laboratory. All samples will be shipped to the laboratory within 48 hours of sampling. At the start and end of each workday, field personnel will add ice to the cooler(s) as needed to confirm that all sample/cooler temperatures are maintained at <6° Celsius.

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

Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured location until they are picked up and/or sent to the laboratory. The record of possession of samples from the time they are obtained in the field to the time they are delivered to the laboratory or shipped off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; 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. A sample chain-of-custody is included in Attachment B.

4.7 Field Instrumentation

Field personnel will be trained in the proper operation of all field instruments at the start of the field program. Instruction manuals for the equipment will be on file at the Site for referencing proper operation, maintenance, and calibration procedures. The equipment will be calibrated

according to manufacturer specifications at the start of each day of fieldwork. If an instrument fails calibration, the project manager or QA/QC officer will be contacted immediately to obtain a replacement instrument. A calibration log will be maintained to record the date of each calibration, any failure to calibrate and corrective actions taken. The PID will be equipped with a 10.6 electron volt (eV) lamp and will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas in accordance with the manufacturer's standards.

4.8 Quality Assurance (QA)

All laboratory analytical data (i.e. soil, groundwater, and soil vapor) will be reviewed by a third-party validator and a Data Usability Summary Report (DUSR) will be prepared to document the usability and validity of the data. The Final Engineering Report (FER) will include a detailed description of endpoint sampling activities, data summary tables, concentration map showing endpoint sample locations and concentrations, DUSR, and laboratory reports.

ATTACHMENT A
RESUMES FOR REMEDIAL ENGINEER, QA/QC OFFICER, PROJECT MANAGER, AND FIELD TEAM
LEADER

BACKGROUND

Education

MS, Hydrogeology, Rensselaer Polytechnic Institute

BS, Civil Engineering, Lafayette College

Licenses/Certifications

Professional Engineer, NY - 082046-1

OSHA 40 Hour HAZWOPER

OSHA 8 Hour Refresher

REBECCA KINAL, PE

Senior Vice President

Rebecca Kinal, PE has extensive experience in the assessment and remediation of soil and groundwater contamination and other hazardous/non-hazardous waste problems. Her 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. Rebecca 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, Rebecca's 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.

RELEVANT EXPERIENCE

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

Rebecca has served as the Project Manager for AKRF's on-call hazardous materials consulting contract with NYCSCA for over 10 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 plans, contract specifications, and design drawings. The work has also included conducting indoor air quality testing, vapor intrusion assessments, preparation of specifications and construction management for petroleum 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. Under the contract, Rebecca has managed several major efforts, including emergency remediation work related to flooding from Superstorm Sandy, expedited due diligence for large portfolios of proposed Universal Pre-Kindergarten (UPK and 3K) sites, and large Phase II investigations of sites with NYC Office of Environmental Remediation (OER) E-designations and/or contamination warranting potential NYSDEC involvement.

Montefiore Medical Center, Various Locations, NY

Rebecca provides environmental 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, indoor air quality surveys/vapor intrusion assessments, and remediation cost estimates. She also assists MMC in making decisions with respect to environmental risk issues. Projects have ranged from small, single-lot properties to large hospital campuses.

Transaction Support, Confidential Client, Various Locations

Rebecca provided transaction support related to the proposed sale of a large construction equipment supply company. She managed inspections of 12 of the company's storage and maintenance yards located in New York, New Jersey, Connecticut, Rhode Island and Massachusetts to assess environmental concerns, and advise the client regarding environmental liabilities related to the proposed sale. The work was completed on an expedited turnaround to comply with the due diligence time-frame.

Brooklyn Technical High School Athletic Field Improvements, Brooklyn, NY

Rebecca provided environmental support services to the selected contractor for improvements to the Brooklyn Tech H.S. athletic field facilities. These services included: preparation of an in situ sampling plan for waste characterization and disposal; supervision of waste characterization sampling activities; development and implementation of a community air monitoring program during all soil disturbance; and coordination for removal of a petroleum storage tank discovered construction.

Street-Works Development, Hamilton Green (200 Hamilton Avenue), White Plains, NY

AKRF prepared the EIS under the New York State Environmental Quality Review Act (SEQRA) and provided site planning and environmental services for the development of Hamilton Green—a new vibrant, mixed-use community in downtown White Plains, NY. Rebecca 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 and acceptance to the NYSDEC Brownfield Cleanup Program (BCP).

Redevelopment at Polychrome R&D and Manufacturing Sites, AvalonBay, Yonkers, NY

Rebecca served as the Engineer of Record for remediation of the former Polychrome research and development (R&D) site, a NYSDEC Brownfield redevelopment project along the Hudson River. The remediation included hot spot excavation, LNAPL collection, in-situ soil stabilization (ISS), soil management, groundwater treatment, dewatering, shoreline permitting, groundwater discharge permitting, and a site-wide engineered cover systems, including a vapor barrier and sub-slab depressurization system (SSDS). Rebecca reviewed the design documents, supervised field inspections, provided support to the project team regarding contractor submittals and field changes, and certified the Final Engineering Report and Site Management Plan. The Site received its Certificate of Completion in December 2019.

NYCDDC, East Side Coastal Resiliency (ESCR), New York, NY

AKRF was retained by the NYCDDC to provide a multi-disciplinary design for the protection of Lower Manhattan against another catastrophic hurricane. The main components of the design include levees, berms, retaining walls, cut-off walls, and increasing the ground elevation to mitigate and limit surging flood waters from entering Lower Manhattan. A large portion of the project's subsurface has

been impacted by manufactured gas plant (MGP)-related contamination. Rebecca serves as the Engineer of Record for MGP mitigation design components of the project. Her work includes certification of the Mitigation Work Plan submitted to NYSDEC and review of contract specifications and drawings.

United States Tennis Association, USTA NTC Master Plan Support, 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. Rebecca prepared the specifications and design drawings for the vapor mitigation and provided construction support to review contractor submittals and inspect the vapor barrier and sub-slab depressurization system installations.

NYCEDC, Yankee Stadium, Bronx, NY

Rebecca 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. Remedial Action Plans (RAPs) and Construction Health and Safety Plans (CHASPs) were developed to specify environmental monitoring, soil management protocols, and health and safety requirements during construction of the new stadium and redevelopment of the old stadium site. Rebecca also managed an extensive community air monitoring program during demolition of the old Yankee Stadium and construction of the New York City Department of Parks and Recreation's Heritage Field, which included short-term and long-term monitoring for airborne particulates and lead.

Roosevelt Union Free School District, Roosevelt UFSD

Rebecca 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, Rebecca 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, allowing the new school to open on schedule.

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

Lori A. Beyer

SUMMARY:

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

EXPERIENCE:

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

President

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

1998-Present American Analytical Laboratories, LLC. 56 Toledo Street, Farmingdale, NY

Laboratory Director/Technical Director

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

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

General Manager

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

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

Technical Project Manager

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

1995-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York

Corporate QA/QC Officer

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

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

Data Review Manager

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

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

Data Review Specialist

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

1986-1987 Nytest Environmental, Inc (NEI) Port Washington, New York

GC/MS VOA Analyst

EDUCATION:

1982-1985 State University of New York at Stony Brook, New York; BS Biology/Biochemistry

1981-1982 University of Delaware; Biology/Chemistry

5/91 Rutgers University; Mass Spectral Data Interpretation Course, GC/MS Training

8/92 Westchester Community College; Organic Data Validation Course

9/93 Westchester Community College; Inorganic Data Validation Course

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

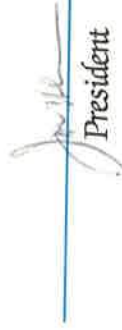
ORGANIC DATA VALIDATION COURSE (35 HOURS)

Dr. John Samuelian

Date AUGUST 1992



Assistant Dean
Professional Development Center



President



The Professional
Development Center



SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

INORGANIC DATA VALIDATION

Instructor: Dale Boshart

Date MARCH 1993

Robert A. West

Assistant Dean
Professional Development Center

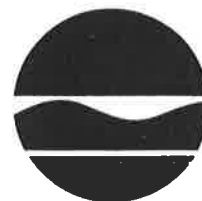
J. M. Gill

President



The Professional
Development Center

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



Thomas C. Jorling
Commissioner

July 8, 1992

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

Dear Elaine,

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

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

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

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

Sincerely,

Maureen P. Serafini

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

22



October 2, 1992

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

Dear Ms. Beyer:

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

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

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

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

Very truly yours,

Passing Grade is 70%
Your Grade is 99%

Elaine Sall
Program Coordinator

ES/bf





June 21, 1993

Dear Ms. Beyer:

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

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

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

Very truly yours,

Elaine Sall
Program Coordinator

ES/bf

Enclosures



Carl Armbruster
QA Manager

Qualifications Summary

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

Professional Experience

Quality Assurance Manager – TestAmerica Edison - 2005 to Present

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

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

Laboratory Director – STL Whippany – 1998 to 2000

Account Manager – Clean Harbors Environmental Services – 1997 to 1998

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

Environmental Scientist – ICF Technology – 1987 to 1988

Analytical Chemist – IT Corporation – 1985 to 1987

Analytical Chemist – Hess Environmental Laboratories – 1983 to 1985

Education

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

BACKGROUND

Education

*BA, Environmental
Studies, Bucknell University*

Licenses/Certifications

*OSHA 10 Hour Construction
Safety & Health Course*

OSHA 40 Hour HAZWOPER

BRIAN QUINN

Environmental Scientist

Brian Quinn is an Environmental Scientist at AKRF. He has experience in remedial investigations and construction oversight on project sites across the tri-state area. Brian also performs soil, groundwater, soil vapor, and air sampling.

RELEVANT EXPERIENCE

New York City Public Health Laboratory, New York, NY

Brian conducts remedial oversight and air monitoring during building construction as part of AKRF's assessment/remediation services for a new Public Health Laboratory at the Harlem Hospital campus in Manhattan.

Hudson Piers, Yonkers, NY

AKRF is providing site assessment/remediation services for the southern half of the Hudson Piers site along the Yonkers waterfront. Brian is conducting construction oversight, air monitoring, and in-situ stabilization and solidification drilling oversight during building construction.

NYCSCA On-Call Environmental Consulting, Multiple Contracts, New York, NY

AKRF provides environmental consulting, environmental site assessment and remediation services under these contracts. Assignments have included environmental assessment, remedial design, plumbing disinfection, and potable water (lead) sampling consulting tasks. For sites undergoing design and development, assignments include preparation of remediation plans, design of sub-slab depressurization systems and contract specifications, and construction oversight. Brian has conducted Phase II investigations, remedial oversight, interior and exterior disinfection oversight, air monitoring and lead sampling during the construction of multiple school sites.

1100 Myrtle Avenue, Brooklyn, NY

AKRF prepared a Remedial Investigation Work Plan for the OER and performed the associated Remedial Investigation for a new 11-story mixed-use building. Following, the site was accepted into the NYSDEC Brownfield Cleanup Program, for which AKRF prepared the application. AKRF also prepared the BCP RIWP. Brian conducted remedial oversight and air monitoring during building construction.

1475 Macombs Road Zeta Charter School, Bronx, NY

Brian conducted remedial oversight, air monitoring, and performed sub-slab depressurization system sampling during building construction as part of AKRF's civil engineering and site assessment/remediation services for this 8-story building.

1559 Boone Avenue, Bronx, NY

Brian is conducting remedial oversight and air monitoring during building construction as part of AKRF's environmental planning, site assessment/remediation consulting, and geotechnical engineering for a new eight-story, 66-unit supportive housing building.

BACKGROUND

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BA, Earth Science and Environmental Studies, Tulane University

AXEL SCHWENDT

Vice President

Axel Schwendt is a Vice President for AKRF with extensive experience in the environmental consulting field. He specializes in Phase I Environmental Site Assessments and Phase II investigations 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. 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 Voluntary Cleanup Program and Brownfield Cleanup Program, New York State's Spill Response Program, the Mayor's Office of Environmental Remediation E-Designation Program, New Jersey's Industrial Site Recovery Act, and Pennsylvania's Land Recycling program.

RELEVANT EXPERIENCE

975 Nostrand Avenue, Brooklyn, NY

AKRF assisted the client with enrolling the 1.2-acre site in the New York State Department of Environmental Conservation's Brownfield Cleanup Program. Axel directed an extensive remedial investigation, prepared the necessary remedial action plans, managed the citizen participation tasks, and is in the process of conducting the remediation in conjunction with NYSDEC oversight. A Certificate of Completion from the NYSDEC is anticipated at the end of 2023.

CUNY City Tech Academic Building, Brooklyn, NY

Axel assisted CUNY and DASNY in addressing the E-Designation assigned to the City Tech project site in Brooklyn. He conducted the required Phase I Environmental Site Assessment and Phase II testing to the satisfaction of the OER and assisted CUNY with entering the project site in the City's Voluntary Cleanup Program. The work included preparing the required RAP and CHASP, assisting CUNY with soil disposal testing and management, and providing contractor bid specification support and review. Axel prepared the closure documentation required for CUNY to receive the Notice of Satisfaction necessary to obtain occupancy permits from the NYCDOB.

Yeshiva University Albert Einstein College of Medicine Environmental Investigation, Bronx, NY

Axel managed a Phase II subsurface 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 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.

Weill Cornell Medicine Belfer Research Building Phase II Investigation, New York, NY

Axel managed a Phase II Subsurface Investigation for the Belfer Research Building on behalf of Weill Cornell Medicine. Located on East 69th Street

between York and First Avenues, the 18-story building supports bench-based researchers in both clinical and basic science departments in fields such as metabolic, cardiovascular and neuro-psychiatric disorders, infectious diseases, children's health, genetics, nano-biotechnology, and stem cell biology.

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Axel oversaw site assessment and remediation services performed for a proposed 10-story, 100,000-square-foot academic building at the Fashion Institute of Technology on West 28th Street in Manhattan. The facility will include academic and student-life spaces, including classrooms, studios, laboratories, and display and exhibition spaces.

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Axel provided site assessment/remediation services during environmental review for NYU Langone's Science Building at the southeast corner of the campus superblock. A variance from the Board of Standards and Appeals was approved, and the 365,000-gross-square-foot building was completed in 2017.

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Axel 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 New York City Mayor's Office of Environmental Remediation (OER), which included strategies for mitigating on-site environmental conditions and plans for incorporating environmental engineering controls into proposed construction projects. Axel's clients promptly receive the Notice of Satisfaction necessary to acquire building permits from the New York City Department of Buildings (NYCDOB). He has also managed over 100 projects enrolled in the New York City Voluntary Cleanup Program.

BACKGROUND

Education

MS, Environmental Science, New Jersey Institute of Technology

BA, Dr. B.R., Ambedkar National Institute of Technology, India

ASHUTOSH SHARMA

Vice President

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.

RELEVANT EXPERIENCE

Lambert Houses Redevelopment, Bronx, NY

Ashutosh oversaw field personnel implementing the construction oversight during site redevelopment, and coordinated with the client and their subcontractors. He prepared the spill investigation work plan, coordinated spill cleanup and prepared the spill closure report to address the petroleum spill encountered during site redevelopment.

1 North 4th Place (1N4th), Williamsburg, Brooklyn, NY

Ashutosh provided construction oversight during soil handling activities and running the Community Air Monitoring Plan (CAMP).

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AKRF was contracted by EDC to conduct perform environmental services at an approximately 255,000-square foot project area located at 530 to 590 Zerega Avenue, Bronx, New York. The work included a Phase I Environmental Site Assessment (ESA), and Phase II Environmental Site Investigation which included preparation of a site-specific health and safety plan, a geophysical survey and utility mark-outs, and the collection and analysis of soil, groundwater, soil vapor, indoor air and ambient air samples. Ashutosh assisted the subsurface soil, groundwater and soil gas investigation as part of the Phase II investigation of the project site.

475 Clermont Avenue (810 Fulton Street), Brooklyn, NY

Ashutosh acted as Project Manager, overseeing field personnel implementing the requirements of the NYC Office of Environmental Remediation (OER)-approved Remedial Action Plan (RAP). He coordinated with the OER on behalf of the client on the day-to-day activities during the remedial action. Ashutosh also completed reports for delivery to the client and OER.

555TEN, New York, NY

Ashutosh 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.

West 61st Street Rezoning/Residential Development, New York, NY

Ashutosh Sharma assisted the 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.

CUNY City Tech Academic Building, Brooklyn, NY

Ashutosh conducted sub-surface soil and groundwater investigation work and coordinated with the driller and the property owner for successful completion of the work. He prepared the remedial closure report for delivery to the client.

NYU Langone Kimmel Pavilion & Energy Building, New York, NY

Ashutosh oversaw field personnel implementing the construction oversight during site redevelopment, and coordinated with the client and their subcontractors.

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Ashutosh managed and prepared the Remedial Investigation Work Plan (RIWP), the Remedial Investigation Report (RIR), the Interim Remedial Measure Work Plan (IRMWP), the Remedial Action Work Plan (RAWP), the Interim Remedial Measures Construction Completion Report and the Site Management Plan (SMP) for the BCP site. He managed the field implementation of the remedial investigation and site cleanup activities during the development, and maintained constant communication with the NYS Department of Environmental Conservation (NYSDEC) project manager and the client during the site redevelopment.

Whitney Museum of American Art, New York, NY

Ashutosh assisted with the subsurface soil and groundwater investigation, construction oversight and soil disposal management during the remediation phase of the project.

ATTACHMENT B
SAMPLE CHAIN OF CUSTODY

#N/A
#N/A
#N/A
#N/A

 eurofins | Environment Testing
TestAmerica

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Form No. CA-C-WI-002, Rev. 4.33, dated 5/4/2020

APPENDIX G
RESUMES OF KEY PERSONNEL

BACKGROUND

Education

MS, Hydrogeology, Rensselaer Polytechnic Institute

BS, Civil Engineering, Lafayette College

Licenses/Certifications

*Professional Engineer, NY
- 082046-1*

OSHA 40 Hour HAZWOPER

OSHA 8 Hour Refresher

REBECCA KINAL, PE

Senior Vice President

Rebecca Kinal, PE has extensive experience in the assessment and remediation of soil and groundwater contamination and other hazardous/non-hazardous waste problems. Her 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. Rebecca 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, Rebecca's 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.

RELEVANT EXPERIENCE

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

Rebecca has served as the Project Manager for AKRF's on-call hazardous materials consulting contract with NYCSCA for over 10 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 plans, contract specifications, and design drawings. The work has also included conducting indoor air quality testing, vapor intrusion assessments, preparation of specifications and construction management for petroleum 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. Under the contract, Rebecca has managed several major efforts, including emergency remediation work related to flooding from Superstorm Sandy, expedited due diligence for large portfolios of proposed Universal Pre-Kindergarten (UPK and 3K) sites, and large Phase II investigations of sites with NYC Office of Environmental Remediation (OER) E-designations and/or contamination warranting potential NYSDEC involvement.

Montefiore Medical Center, Various Locations, NY

Rebecca provides environmental 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, indoor air quality surveys/vapor intrusion assessments, and remediation cost estimates. She also assists MMC in making decisions with respect to environmental risk issues. Projects have ranged from small, single-lot properties to large hospital campuses.

Transaction Support, Confidential Client, Various Locations

Rebecca provided transaction support related to the proposed sale of a large construction equipment supply company. She managed inspections of 12 of the company's storage and maintenance yards located in New York, New Jersey, Connecticut, Rhode Island and Massachusetts to assess environmental concerns, and advise the client regarding environmental liabilities related to the proposed sale. The work was completed on an expedited turnaround to comply with the due diligence time-frame.

Brooklyn Technical High School Athletic Field Improvements, Brooklyn, NY

Rebecca provided environmental support services to the selected contractor for improvements to the Brooklyn Tech H.S. athletic field facilities. These services included: preparation of an in situ sampling plan for waste characterization and disposal; supervision of waste characterization sampling activities; development and implementation of a community air monitoring program during all soil disturbance; and coordination for removal of a petroleum storage tank discovered construction.

Street-Works Development, Hamilton Green (200 Hamilton Avenue), White Plains, NY

AKRF prepared the EIS under the New York State Environmental Quality Review Act (SEQRA) and provided site planning and environmental services for the development of Hamilton Green—a new vibrant, mixed-use community in downtown White Plains, NY. Rebecca 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 and acceptance to the NYSDEC Brownfield Cleanup Program (BCP).

Redevelopment at Polychrome R&D and Manufacturing Sites, AvalonBay, Yonkers, NY

Rebecca served as the Engineer of Record for remediation of the former Polychrome research and development (R&D) site, a NYSDEC Brownfield redevelopment project along the Hudson River. The remediation included hot spot excavation, LNAPL collection, in-situ soil stabilization (ISS), soil management, groundwater treatment, dewatering, shoreline permitting, groundwater discharge permitting, and a site-wide engineered cover systems, including a vapor barrier and sub-slab depressurization system (SSDS). Rebecca reviewed the design documents, supervised field inspections, provided support to the project team regarding contractor submittals and field changes, and certified the Final Engineering Report and Site Management Plan. The Site received its Certificate of Completion in December 2019.

NYCDDC, East Side Coastal Resiliency (ESCR), New York, NY

AKRF was retained by the NYCDDC to provide a multi-disciplinary design for the protection of Lower Manhattan against another catastrophic hurricane. The main components of the design include levees, berms, retaining walls, cut-off walls, and increasing the ground elevation to mitigate and limit surging flood waters from entering Lower Manhattan. A large portion of the project's subsurface has

been impacted by manufactured gas plant (MGP)-related contamination. Rebecca serves as the Engineer of Record for MGP mitigation design components of the project. Her work includes certification of the Mitigation Work Plan submitted to NYSDEC and review of contract specifications and drawings.

United States Tennis Association, USTA NTC Master Plan Support, 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. Rebecca prepared the specifications and design drawings for the vapor mitigation and provided construction support to review contractor submittals and inspect the vapor barrier and sub-slab depressurization system installations.

NYCEDC, Yankee Stadium, Bronx, NY

Rebecca 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. Remedial Action Plans (RAPs) and Construction Health and Safety Plans (CHASPs) were developed to specify environmental monitoring, soil management protocols, and health and safety requirements during construction of the new stadium and redevelopment of the old stadium site. Rebecca also managed an extensive community air monitoring program during demolition of the old Yankee Stadium and construction of the New York City Department of Parks and Recreation's Heritage Field, which included short-term and long-term monitoring for airborne particulates and lead.

Roosevelt Union Free School District, Roosevelt UFSD

Rebecca 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, Rebecca 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, allowing the new school to open on schedule.

BACKGROUND

Education

MS, Geology, University of Delaware

BA, Earth Science and Environmental Studies, Tulane University

AXEL SCHWENDT

Vice President

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RELEVANT EXPERIENCE

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BACKGROUND

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ASHUTOSH SHARMA

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RELEVANT EXPERIENCE

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Whitney Museum of American Art, New York, NY

Ashutosh assisted with the subsurface soil and groundwater investigation, construction oversight and soil disposal management during the remediation phase of the project.

BACKGROUND

Education

*BA, Environmental
Studies, Bucknell University*

Licenses/Certifications

*OSHA 10 Hour Construction
Safety & Health Course*

OSHA 40 Hour HAZWOPER

BRIAN QUINN

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

Lori A. Beyer

SUMMARY:

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

EXPERIENCE:

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

President

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

1998-Present American Analytical Laboratories, LLC. 56 Toledo Street, Farmingdale, NY

Laboratory Director/Technical Director

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

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

General Manager

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

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

Technical Project Manager

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

1995-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York

Corporate QA/QC Officer

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

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

Data Review Manager

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

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

Data Review Specialist

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

1986-1987 Nytest Environmental, Inc (NEI) Port Washington, New York

GC/MS VOA Analyst

EDUCATION:

1982-1985 State University of New York at Stony Brook, New York; BS Biology/Biochemistry

1981-1982 University of Delaware; Biology/Chemistry

5/91 Rutgers University; Mass Spectral Data Interpretation Course, GC/MS Training

8/92 Westchester Community College; Organic Data Validation Course

9/93 Westchester Community College; Inorganic Data Validation Course

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

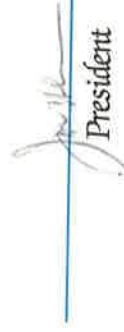
ORGANIC DATA VALIDATION COURSE (35 HOURS)

Dr. John Samuelian

Date AUGUST 1992



Assistant Dean
Professional Development Center



President



The Professional
Development Center



SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

INORGANIC DATA VALIDATION

Instructor: Dale Boshart

Date MARCH 1993

Paul A. West

Assistant Dean
Professional Development Center

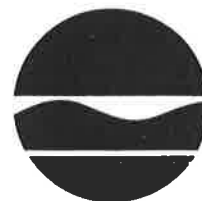
Jill

President



The Professional
Development Center

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



Thomas C. Jorling
Commissioner

July 8, 1992

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

Dear Elaine,

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

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

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

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

Sincerely,

Maureen P. Serafini

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

22



The Professional
Development Center
AT
WESTCHESTER COMMUNITY COLLEGE

914 285-6619

October 2, 1992

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

Dear Ms. Beyer:

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

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

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

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

Very truly yours,

Passing Grade is 70%
Your Grade is 99%

Elaine Sall
Program Coordinator

ES/bf



SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595



June 21, 1993

Dear Ms. Beyer:

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

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

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

Very truly yours,

Elaine Sall
Program Coordinator

ES/bf

Enclosures



Carl Armbruster
QA Manager

Qualifications Summary

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

Professional Experience

Quality Assurance Manager – TestAmerica Edison - 2005 to Present

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

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

Laboratory Director – STL Whippany – 1998 to 2000

Account Manager – Clean Harbors Environmental Services – 1997 to 1998

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

Environmental Scientist – ICF Technology – 1987 to 1988

Analytical Chemist – IT Corporation – 1985 to 1987

Analytical Chemist – Hess Environmental Laboratories – 1983 to 1985

Education

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

APPENDIX H
CONSTRUCTION QUALITY ASSURANCE PLAN (CQAP)

**JOHN TYNAN SENIOR RESIDENCE
41 FIRST STREET
BROOKLYN, NY**

Construction Quality Assurance Plan

**NYSDEC BCP Site Number: C224401
AKRF Project Number: 230346**

Prepared For:

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

Prepared On Behalf Of:

Catholic Charities Progress of Peoples Development Corporation
John Tynan Senior Residence LLC
191 Joralemon Street
Brooklyn, NY 11201

Prepared by:

akrf

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

JULY 2025

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1.0 INTRODUCTION

This Construction Quality Assurance Plan (CQAP) describes the protocols and procedures that will be followed during implementation of the Remedial Action Work Plan (RAWP) at the site located at 41 First Street in Brooklyn, New York, hereafter referred to as the “Site”. The Site comprises an area of 0.889-acres and is also identified as Block 451, portion of Lot 25 on the New York City Tax Map. The Site is currently enrolled in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) (BCP Site No. C224401).

This CQAP supplements the NYSDEC-approved RAWP and provides monitoring, inspection, testing, and documentation protocols and procedures.

The following information is provided:

1. Responsibility, Authority, and Qualifications – The responsibility, authority, and qualifications of the key personnel involved in the project.
2. Inspection and Testing Activities – Inspections and tests that will be used to verify that construction activities meet or exceed all design criteria and federal, state, and local regulations and requirements.
3. Meetings – The requirements for project coordination meetings between all involved parties.
4. Documentation and Reporting – Field documentation and reporting requirements.

2.0 RESPONSIBILITY AND AUTHORITY

Measures will be implemented to ensure that a functional quality control (QC) organization is active during the project and to provide support for the construction QC system in conducting inspections, tests and retesting (in the event of failure of any item of work). This includes oversight of subcontractors and compliance with contract provisions. Construction QC includes, but is not limited to, the inspections and tests required in the RAWP and approved submittals and will cover all project operations. A consultant hired by the BCP Participant will manage field activities and coordinate the contractor's activities.

2.1 Volunteers

Catholic Charities Progress of Peoples Development Corporation (CCPOPDC) and John Tynan Senior Residence LLC (collectively the "Participant") are responsible for coordinating the project, including activities of the Site consultant(s), contractor(s) and subcontractor(s), in order to comply with the requirements of the RAWP and regulatory agencies. The Participant is also responsible for completing and submitting documentation required by the RAWP, the CQAP, and the Quality Assurance Project Plan (QAPP) and have the authority to accept or reject the materials and workmanship of any subcontractors at the Site.

2.2 Construction Quality Assurance (QA) Officer (Consultant)

The construction QA officer will perform activities that are necessary to assure the quality of construction. They will be on-site as required during construction activities and will have the authority to take any action necessary to maintain compliance with the RAWP and approved submittals and to monitor construction quality.

Specific responsibilities of the construction QA officer include:

- Supporting the Participant and the consultant's field staff;
- Evaluating construction activities and activities of the field staff;
- Verifying that remedial activities are performed in accordance with the RAWP, approved submittals, and federal, state, and local regulations and requirements;
- Verifying that data are properly recorded, validated, reduced, summarized, and inspected;
- Evaluating sampling and monitoring activities;
- Educating the field staff on construction QC requirements and procedures; and
- Scheduling and coordinating inspections.

2.3 Field Team Leader, Field Technician, and Site Safety Officer (Environmental Consultant)

The field team leader will be an employee of AKRF, Inc. (AKRF) and will be on-site during construction activities. They will have authority to take any action necessary to maintain compliance with the RAWP and approved submittals and to maintain construction quality. The field team leader will also act as the field technician and Site Safety Office (SSO).

Specific responsibilities of the field team leader include:

- Reviewing the RAWP for clarity and completeness so that the construction activities can be effectively implemented;
- Verifying that the contractor's work is in accordance with the RAWP, approved submittals, and this CQAP;

- Performing on-site inspection of the work in progress to assess compliance with the RAWP, approved submittals, and this CQAP;
- Calibration, operation, and maintenance of air monitoring instrumentation in accordance with the RAWP and approved submittals;
- Collecting, packaging, and shipping of environmental samples in accordance with the RAWP and QAPP;
- Documenting sample collection in the field logbook and identifying all sample locations in the field logbook and on a site drawing;
- Preparing and logging manifests for transportation of any non-hazardous and hazardous materials;
- Informing the designated Site personnel and/or AKRF project manager (who will inform the NYSDEC project manager) when/if the concentrations of air contaminants exceed action levels specified in the RAWP;
- Scheduling and coordinating inspections;
- Reporting the results of all observations and tests as the work progresses and modifying materials and work to comply with the RAWP and approved submittals as noted below:
 1. Providing daily reports on field construction, material shipments, and inspection results.
 2. Review and interpretation of all data, drawings, and reports.
 3. Identification of all work that should be accepted, rejected, or uncovered for observation, or that may require special testing, inspection, or approval.
 4. Rejection of defective work and verification that corrective measures are implemented.
 5. Making observations and records that will aid in the preparation of a report on remedial activities.
- Inspecting each delivery of materials and/or equipment;
- Reporting to the Construction QA Officer the results of all inspections, including work that is not of acceptable quality or that fails to meet the requirements of the RAWP, approved submittals, and this CQAP;
- Maintaining and organizing the field equipment and supply storage area;
- Verifying that testing equipment meets established requirements that the tests are conducted according to the proper standardized procedures;
- Confirming that testing equipment, personnel, and procedures do not change over time, or making sure that any changes do not adversely impact the inspection process; and
- Confirming that waste treatment or disposal is performed in accordance with applicable federal, state, and local laws and regulations.

3.0 FIELD QUALITY CONTROL (QC) INSPECTIONS, TESTING, AND SAMPLING

The definable features of work are described in the RAWP. This section describes the anticipated inspection, testing, and sampling requirements associated with these definable features of work.

3.1 Mobilization

Inspections will be performed to assure that Site laydown areas, support facilities, surface water controls, and air monitoring systems are established in accordance with the RAWP and approved submittals. In addition, the stakeout of existing utilities in work areas and the maintenance of site security will be verified. There are no testing and sampling requirements associated with mobilization of the contractor(s).

Each delivery of materials and/or equipment will be inspected relative to approved submittals. Approved materials and/or equipment will be stored at a designated area of the Site.

Equipment will be set-up and tested in accordance with the RAWP and approved submittals.

3.2 Soil Excavation

The Soil/Materials Management Plan (SMMP), Section 7.0 of the RAWP, outlines the procedures to be performed during the handling of soil/fill materials on-site during all intrusive work. Inspections will be performed during soil excavation activities including concrete removal, soil excavation, stockpiling, and load out, shoring, and backfilling. Any impacts to building structural elements will be documented and assessed immediately. AKRF will confirm that all soil excavation related work will be conducted as specified in the RAWP, or are equivalent. Air monitoring will be conducted as outlined in the HASP, provided as Appendix F of the RAWP. Soil screening will be conducted as outlined in Section 6.8.1 of the RAWP. Any corrective actions will be summarized in the daily reports.

3.3 Soil Sampling

Soil sampling activities may include on-site waste classification, endpoint, and sampling of clean backfill from off-site sources. Proposed endpoint sample locations are shown on Figure 10 of the RAWP. All soil sampling activities will be conducted in accordance with the QAPP.

The applicable Soil Cleanup Objectives (SCOs) for the Site are the Track 4 Restricted Residential Use Soil Cleanup Objectives (RRSCOs) and include removal of a minimum 2-feet of soil across the Site, any petroleum source areas, and material classified as a hazardous waste.

Soil and materials management on-site and off-site will be conducted in accordance with the SMMP (Section 8.0 of the RAWP).

3.4 Groundwater Sampling

Groundwater sampling activities at the Site may include collection of groundwater samples from existing monitoring wells at the Site. If necessary, all groundwater sampling activities will be conducted in accordance with the QAPP.

3.5 Loading of Waste Material for Transportation

Inspections will be conducted to verify that material removed from the Site is properly loaded for transfer to a permitted treatment/disposal facility. Manifests and bills of lading will be maintained and will be included as an Appendix in the Final Engineering Report (FER).

3.6 Site Restoration

Site restoration will be observed and recorded to verify compliance with the RAWP and approved submittals. The surface will be restored to match the surrounding ground surface.

4.0 MEETINGS

A pre-construction meeting will be held with representatives of NYSDEC, the consultants, and contractor(s) performing the work prior to the start of major construction activities. Additional meetings will be called as necessary if work conditions change or deviations are necessary.

Project personnel and visitors will be given health and safety briefings periodically by the field team leader to assist Site personnel in safely conducting their work activities. The safety briefings will include information on new operations to be conducted, changes in work practices or changes in the Site's environmental conditions, as well as periodic reinforcement of previously discussed topics.

5.0 DOCUMENTATION AND REPORTING REQUIREMENTS

The value of this CQAP will be assured by proper documentation. The inspectors will use data sheets, field reports, log forms, schedules, and checklists to document Site work and verify compliance with the RAWP and approved submittals. Documentation will include, at a minimum, the following reports and information:

- Daily field construction reports;
- Photographs;
- Sampling chains of custody;
- Material disposition logs; and
- Any variances to the RAWP and approved submittals.

5.1 Daily Reports

The field team leader will prepare daily reports that identify the following:

- Work force and visitors to the Site;
- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and exported from the Site;
- References to an alphanumeric grid map for Site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of Community Air Monitoring Program (CAMP) findings, including any excursions;
- Any deviations from the RAWP;
- Weather conditions;
- Photographs of the Site and pertinent work; and
- An explanation of notable Site conditions.

5.2 Photographic Log

The photographic log will be kept to document construction activities by still photographs. The photographic log may also be used to record activities recorded in the daily report. All photographs will have date and time stamps.

5.3 Sampling Documentation

A dedicated project field logbook will be used to document all sampling activities and how they correspond to the RAWP. All observations and field and/or laboratory tests will be recorded in the project field logbook or on separate logs. Recorded field observations may take the form of notes, charts, sketches, and/or photographs (with date and time stamps).

5.4 Material Disposition Tracking

All materials that are taken off-site for disposal will be tracked and final disposition confirmed. Copies of all waste manifests and bills of lading will be maintained by the AKRF project manager.

5.5 Variances to the RAWP

Any required changes to the RAWP will be documented as construction proceeds, if needed. Any material deviations from the NYSDEC-approved RAWP will be communicated to the NYSDEC project manager. NYSDEC approval will be sought prior to proceeding with work deviating materially from the RAWP. In the event of an emergency change to the work plan, the NYSDEC project manager will be consulted immediately.

5.6 Final Engineering Report (FER)

At the completion of the project the consultant/construction manager will prepare an FER. This report will describe the implementation of the RAWP and will include a summary of the field work, as-built drawings for constructed elements, manifests, bills of lading, test results demonstrating that all mitigation and remedial systems are functioning properly, and photographic documentation. The FER will also include a description of any changes to the proposed Remedial Action (RA) from those provided in the RAWP.

5.7 Document Storage

The field team leader will maintain the current field logbook and all original field paperwork during the performance of work. The AKRF project manager will maintain the field paperwork after completion of the project and will maintain all submittal document files.

APPENDIX I
CITIZEN PARTICIPATION PLAN



**Department of
Environmental
Conservation**

Brownfield Cleanup Program

Citizen Participation Plan

for

John Tynan Senior Residence

March 2024

BCP Site #C224401
41 First Street
Brooklyn, NY 11231

Prepared by:



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

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* * * * *

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the brownfield site’s remedial investigation and cleanup process.

Applicant: **Catholic Charities Progress of Peoples Development Corporation (Applicant)**
Site Name: **John Tynan Senior Residence (Site)**
Site Address: **41 First Street, Brooklyn, NY 11231**
Site County: **Kings County**
Site Number: **C224401**

1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (BCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants that conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at:

<https://www.dec.ny.gov/chemical/8450.html>

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision-makers form or adopt final positions.

Involving citizens affected and interest in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment.
- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process.

- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process.
- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community.
- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision-making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the Site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the Site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The location of the reports and information related to the Site's investigation and cleanup program are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the Site and by other means, as appropriate.

Site Contact List

Appendix B contains the Site contact list. This list has been developed to keep the community informed about, and involved in, the Site's investigation and cleanup process. The Site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the Site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.

The Site contact list includes, at a minimum:

- Chief executive officer and planning board chairperson of each county, city, town, and village in which the site is located;
- Residents, owners, and occupants of the Site and properties adjacent to the Site;
- The public water supplier which services the area in which the Site is located;
- Any person who has requested to be placed on the Site contact list;
- The administrator of any school or day care facility located on or near the Site for purposes of posting and/or dissemination of information at the facility; and
- Location(s) of reports and information.

The Site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the Site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the Site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

Note: The first Site fact sheet (usually related to the draft Remedial Investigation Work Plan) is distributed both by paper mailing through the postal service and through DEC Delivers, its email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future site notifications. See <http://www.dec.ny.gov/chemical/61092.html>

Subsequent fact sheets about the Site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive Site information in paper form. The NYSDEC Site project manager identified in Appendix A will be notified if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the Site's investigation and cleanup program. The flowchart in Appendix D shows how these CP activities integrate with the site investigation and cleanup process. The public is informed about these CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.
- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

The public is encouraged to contact project staff at any time during the Site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the Site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine whether the Site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the Site, as described in Section 5.

If the Site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the Site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the Site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the Site.

As of the date the declaration (page 2) was signed by the NYSDEC project manager, the significant threat determination for the Site had not yet been made.

To verify the significant threat status of the Site, the interested public may contact the NYSDEC project manager identified in Appendix A.

For more information about TAGs, go online at:

<http://www.dec.ny.gov/regulations/2590.html>

Note: The table identifying the citizen participation activities related to the Site's investigation and cleanup program follows on the next page:

Citizen Participation Requirements (Activities)	Timing of CP Activity(ies)
Application Process:	
• Prepare site contact list • Establish document repositories	At time of preparation of application to participate in the BCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement:	
• Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
• Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes Remedial Investigation:	
• Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
• Distribute fact sheet to site contact list about proposed RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
• Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to site contact list that announces that cleanup action has been completed and that summarizes the Final Engineering Report • Distribute fact sheet to site contact list announcing issuance of Certificate of Completion (COC)	At the time NYSDEC approves Final Engineering Report. These two fact sheets are combined if possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the Site. Additional major issues of public concern may be identified during the course of the Site's investigation and cleanup process.

The following major issues of public concern were identified: air quality, health of workers and community, nuisance odors, noise, and construction-related traffic. These issues are of the most concern to adjacent businesses and residents. These issues will be addressed in the Community Air Monitoring Program (CAMP), Site-specific Health and Safety Program (HASP), and the RWP for the project to be approved by the NYSDEC prior to the respective phases of work.

The Site is located in a Potential Environmental Justice Area. Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Environmental justice efforts focus on improving the environment in communities, specifically minority and low-income communities, and addressing disproportionate adverse environmental impacts that may exist in those communities. Because the Site is located in a Potential Environmental Justice Area and in an area with a sizable Hispanic-American (approximately 20%) population nearby, all future fact sheets will be translated into Spanish.

For additional information, visit: <https://statisticalatlas.com/neighborhood/New-York/New-York/Gowanus/Race-and-Ethnicity>

The NYSDEC "Scoping Sheet for Major Issues of Public Concern" was used to complete this section (see Appendix E).

4. Site Information

Appendix C contains a map identifying the location of the Site.

Site Description

The approximately 42,200-square foot (0.976-acre) Site is located at in the Gowanus neighborhood of Brooklyn, New York and is identified on the New York City Tax Map as Brooklyn Tax Block 451, Lot 25. The Site lies at elevations ranging from approximately 11 (eastern portion, along Bond Street) to 19 feet (western portion, along Carroll Street) above the National Geodetic Vertical Datum of 1988 (an approximation of sea level). The Site is bound by Carroll Street, followed by residential and commercial buildings to the north; Bond Street, followed by residential and commercial buildings and Gowanus Canal to the east; residential buildings followed by First Street to the south; and residential buildings to the west. The Site is located in a predominantly residential and commercial area with some open space/parks and industrial/manufacturing uses.

The Site currently has an existing residential building as well as landscaped areas and asphalt-paved parking which serves the residential building. Specific construction details regarding the proposed redevelopment project are pending; however, the general redevelopment plan for the Site includes construction of approximately 121 units of affordable senior housing, approximately 3,573-square feet of indoor amenity space, and 7,843-square feet of outdoor amenity space. The existing building will remain and the new building will be constructed on the remaining portion of the lot.

The Site is currently zoned as R6A (residential). The proposed post-remediation use is consistent with the applicable land use plans. The proposed development complies with the current zoning of the Site and would provide affordable housing units on the Site as part of the goals of the Mayor's Housing New York: A Five-Borough, Ten-Year Plan.

History of Site Use, Investigation, and Cleanup

Based on the review of the historical fire insurance maps, the Site was historically occupied by mixed-use residential and retail buildings along Carroll Street, residential buildings along Bond Street and a portion of a factory constructed prior to 1886. Throughout its history, the factory consisted of various operations, including tobacco manufacturing, metal packaging, paper products and box manufacturing, as well as other various manufacturing processes, and a baking company. According to the City Directory listings, Cafaro Jos A. Trucking Co and Fine Arts Lamps Ltd, and Fine Arts In Plastic Inc., were also former tenants. Former structures were demolished sometime between 1982 and 1986.

Based on available subsurface testing data collected to date, the primary contaminants of concern for the Site are: semivolatile organic compounds (SVOCs) - primarily polycyclic aromatic hydrocarbons (PAHs) (commonly found in fill materials), and metals in soil; PAHs, metals, and perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) in groundwater; and chlorinated solvent-related and petroleum-related volatile organic compounds (VOCs) in soil vapor.

The soil analytical results revealed that concentrations of SVOCs, pesticides, PCBs, metals, and PFAS were detected above laboratory detection limits in the soil samples, with concentrations the NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs) and/or the Restricted Residential Soil Cleanup Objectives (RRSCOs).

The groundwater analytical results revealed that concentrations of SVOCs, metals, and PFAS were detected above laboratory detection limits in the groundwater samples, with some concentrations above the NYSDEC Technical and Operational Guidance Series (TOGs) 1.1.1 Ambient Water Quality Standards and Guidance Values (AWQSGVs) and/or ambient water quality guidance values noted in the Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) guidance document dated April 2023.

The soil vapor analytical results identified elevated concentrations of the chlorinated VOCs (CVOCs) tetrachloroethylene (PCE) and carbon tetrachloride in the soil vapor samples. Additionally, petroleum-related and other solvent-related VOCs were identified in multiple samples.

Prior to entry into the NYSDEC BCP, the Site was the subject of environmental investigations, which are documented in the following reports:

- Phase I Environmental Site Assessment, 41 1st Street, Brooklyn, NY, ALC Environmental, June 2022.
- Phase II Sampling Letter Report – 41 1st Street, Brooklyn, NY, AKRF, Inc., October 2023.

Summaries of the reports are provided below.

Phase I Environmental Site Assessment – 41 1st Street, Brooklyn, NY, ALC Environmental, June 2022

ALC Environmental performed a Phase I ESA in June 2022 for the Site, and while no Recognized Environmental Conditions (RECs) were noted, the following were identified:

- The Site contains an E-Designation for hazardous materials and noise and is listed in the New York City Department of City Planning E-Designation database as E-601. E-601 was established following the review of an Environmental Assessment Statement (EAS) prepared to satisfy the requirements of the City Environmental Quality Review (CEQR) for the Gowanus Neighborhood Rezoning.
- Based on the review of the historical fire insurance maps included in the Phase I ESA, the Site was historically occupied by mixed-use residential and retail buildings along Carroll Street, residential buildings along Bond Street and a portion of a factory which was constructed prior to 1886. Throughout its history, the factory building consisted of various operations, including tobacco manufacturing, metal packaging, paper products and box manufacturing, as well as other various manufacturing processes, and a baking company. According to the city directory listings, Cafaro Jos A. Trucking Co and Fine Arts Lamps Ltd, and Fine Arts In Plastic Inc., were also listed as former tenants. Former structures were demolished sometime between 1982 and 1986 and the Site has remained vacant since.

The Phase I ESA had the following recommendations:

- Regarding the E-Designations (E-601) associated with the Subject Property (Hazardous Materials Phase I and Phase II Testing Protocol and Window Wall Attenuation & Alternate Ventilation), prior to any redevelopment activities or issuance of building permits, the requirements of the referenced E-Designation should be satisfied under the supervision of the Office of Environmental Remediation (OER).

Phase II Sampling Letter Report – 41 1st Street, Brooklyn, NY, AKRF, Inc., October 2023

AKRF Inc. (AKRF) conducted a Phase II (Subsurface) Investigation on a portion of the Site in August 2023. The Phase II was conducted in accordance with an OER-approved work plan submitted as part of the E-designation process and included: a geophysical survey to identify the presence of any underground storage tanks (USTs) or any buried aboveground storage tanks (ASTs) across the accessible portions of the Site; the advancement of 10 soil borings with the collection of 20 soil samples; installation of 4 temporary groundwater wells with the collection of 4 groundwater samples; and the installation of 6 temporary soil vapor probes with the collection of 6 soil vapor samples. The results of the investigations indicated the following:

- No signs of an anomaly consistent with the presence of a UST or a buried AST were identified by the geophysical survey.
- The soil analytical results revealed concentrations of SVOCs, pesticides, PCBs, metals, and PFAS above the UUSCOs and/or RRSCOs in multiple samples including the following: ten SVOCs, 2-methylphenol [maximum concentration of 1.9 milligrams per kilograms (mg/kg)], 4-methylphenol (maximum concentration of 4.3 mg/kg), benzo(a)anthracene (maximum concentration of 13 mg/kg), benzo(a)pyrene (maximum concentration of 18 mg/kg), benzo(b)fluoranthene (maximum concentration of 19 mg/kg), benzo(k)fluoranthene (maximum concentration of 5.9 mg/kg), chrysene (maximum concentration of 13 mg/kg),

dibenz(a,h)anthracene (maximum concentration of 3.4 mg/kg), indeno(1,2,3-cd)pyrene (maximum concentration of 13 mg/kg), and phenol (maximum concentration of 4.4 mg/kg). Total SVOCs were detected at concentrations up to an estimated 165.15 mg/kg in sample RI-SB-05_7-9_20230801.

- Three pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT) were detected in the soil samples at concentrations above UUSCOs, but below RRSCOs. Total PCBs were detected above the UUSCO of 0.1 mg/kg, but below the RRSCO of 1 mg/kg in one sample (RI-SB-09_0-2_20230801) at a concentration of 0.13 mg/kg.
- Eight metals, arsenic (maximum concentration of 13.1 mg/kg), barium (maximum concentration of 1,000 mg/kg), cadmium (maximum concentration of 3.2 mg/kg), copper (maximum concentration of 177 mg/kg), lead (maximum concentration of 2,480 mg/kg), mercury (maximum concentration of 13.5 mg/kg), nickel (maximum concentration of 40.2 mg/kg) and zinc (maximum concentration of 1,030 mg/kg) were detected above UUSCOs and/or RRSCOs in the samples analyzed. Due to high concentration of total lead, soil sample RI-SB-07_0-2_20230802 was also analyzed for toxicity characteristic leaching procedure (TCLP) and the results were below the threshold limit for hazardous waste. Five of the 40 per- and polyfluoroalkyl substances (PFAS) analyzed for were detected in sample RI-SB-01_0-2_20230801 at estimated trace concentrations ranging from 0.024 micrograms per kilogram (µg/kg) to 1.36 µg/kg; four were detected in sample RI-SB-07_4-6_20230802 at estimated trace concentrations ranging from 0.019 µg/kg to 0.78 µg/kg; and were detected in sample RI-SB-06_6-8_20230802 at estimated trace concentrations ranging from 0.021 µg/kg to 2.23 µg/kg.
- The PFAS compound perfluorooctanesulfonic acid (PFOS) exceeded its unrestricted use guidance value (UUGV) of 0.88 µg/kg in two samples, and perfluorooctanoic acid (PFOA) was detected above its UUGV in one sample. All PFAS detections were below the respective restricted residential use guidance values (RRGV). 1,4-Dioxane was not detected in the samples analyzed.
- VOCs were not detected at concentrations above the UUSCOs or RRSCOs.
- The groundwater analytical results revealed that concentrations of SVOCs, metals, and PFAS were detected above laboratory detection limits in the groundwater samples, with some concentrations above the NYSDEC Technical and Operational Guidance Series (TOGs) 1.1.1 Ambient Water Quality Standards and Guidance Values (AWQSGVs) or ambient water quality guidance values noted in the Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) guidance document dated April 2023. Four SVOCs including benzo(a)anthracene (maximum concentration of 1.1 µg/L), benzo(a)pyrene (maximum concentration of 1.1 µg/L), benzo(b)fluoranthene (maximum concentration of 1.12 µg/L) and chrysene (maximum concentration of 1 µg/L) were detected above AWQSGVs in sample RI-TW-04_20230803.
- Twelve PFAS compounds were detected in sample RI-TW-02_20230803 at concentrations ranging from 1.13 ng/L to 108 ng/L; 11 PFAS compounds were detected in sample RI-TW-03_20230802 at concentrations ranging from 1.97 ng/L to 97.4 ng/L; and 11 PFAS compounds were detected in sample RI-TW-04_20230803 at concentrations ranging from 1.57 ng/L to 113 ng/L. Of compounds with guidance values, PFOA was detected in each of the three samples at

concentrations ranging from 60.7 ng/L to 169 ng/L, above the guidance value of 6.7 ng/L, and PFOS was detected in each of the three samples at concentrations ranging from 79.7 ng/L to 113 ng/L, above the guidance value of 2.7 ng/L.

- Metals, 10 in total (unfiltered) metals analyses and three in dissolved (filtered) metals analyses, were detected above AWQSGVs in the groundwater samples including arsenic (maximum concentration of 45.1 µg/L), barium (maximum concentration of 1,480 µg/L), chromium (maximum concentration of 280 µg/L), copper (maximum concentration of 406 µg/L), iron (maximum concentration of 223,000 µg/L unfiltered and maximum concentration of 1,360 µg/L filtered), lead (maximum concentration of 1,440 µg/L), manganese (maximum concentration of 5,040 µg/L unfiltered and maximum concentration of 342 µg/L filtered), mercury (maximum concentration of 0.84 µg/L), nickel (maximum concentration of 698 µg/L) and sodium (maximum concentration of 50,600 µg/L unfiltered and maximum concentration of 53,500 µg/L filtered).
- The soil vapor analytical results identified elevated concentrations of the chlorinated VOCs (CVOCs) tetrachloroethylene (PCE) and carbon tetrachloride in the soil vapor samples. Additionally, petroleum-related and other solvent-related VOCs were identified in multiple samples. Concentrations of petroleum-related and chlorinated solvents were detected in the samples at concentrations ranging from 0.19 µg/m³ to 6,400 µg/m³. Elevated concentrations of the chlorinated VOC tetrachloroethylene (PCE) was detected in soil vapor sample RI-SV-05_20230801 (collected from the eastern portion of the Site) at 330 µg/m³ and carbon tetrachloride was detected at a concentration of 6,400 µg/m³ in sample RI-SV-03_20230801 (collected from the central portion of the Site, former industrial use area).

5. Investigation and Cleanup Process

Application

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program as a Participant. This means that the Applicant was responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place before the discharge or disposal of contaminants. The Participant must fully characterize the nature and extent of contamination onsite, and must conduct a "qualitative exposure assessment," a process that characterizes the actual or potential exposures of people, fish and wildlife to contaminants on the site and to contamination that has migrated from the site.

The Applicant in its Application proposes that the Site will be used for restricted-residential purposes.

To achieve this goal, the Applicant will conduct cleanup activities at the Site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting these activities at the Site.

Remedy Selection

When the investigation of the Site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its investigation report that no action is necessary at the Site. In this case, NYSDEC would make the investigation report available for public comment for

45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a “Certificate of Completion” (described below) to the Applicant.

or

2. The Applicant may recommend in its investigation report that action needs to be taken to address Site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a “Remedial Work Plan”. The Remedial Work Plan describes the Applicant’s proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would announce the availability of the draft plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the Site Decision Document.

The Applicant may then design and perform the cleanup action to address the Site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a final engineering report that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of public health and the environment for the intended use of the site.

Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the Site, it will approve the final engineering report. NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals have been achieved, and relieves the Applicant from future liability for site-related contamination, subject to certain conditions. The Applicant would be eligible to redevelop the site after it receives a COC.

Site Management

The purpose of Site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the Site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An institutional control is a non-physical restriction on use of the Site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

An engineering control is a physical barrier or method to manage contamination. Examples include: caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A

Project Contacts and Locations of Reports and Information

Project Contacts

For information about the Site's remedial program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Patrick Powers
Project Manager
NYSDEC

Public Participation Specialist
To be determined

Division of Environmental Remediation
625 Broadway
Albany, NY 12233
(518) 402-9706

New York State Department of Health (NYSDOH):

Public Health Specialist
To be determined

AKRF, Inc.

Axel Schwendt
Vice President
440 Park Avenue South, 7th Floor
New York, NY 10016
Phone: (646) 388-9529
Email: aschwendt@akrf.com

Document Repositories* :

Brooklyn Public Library, Pacific Branch 25 Fourth Avenue Brooklyn, NY 11217 Managing Librarian: Candace Vasquez (718) 638-1531 cvasquez@bklynlibrary.org	NYC Brooklyn Community Board 6 250 Baltic Street Brooklyn, NY 11201 Chairperson: Peter D. Fleming (718) 643-3027 infobkcb6@gmail.com
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*Repositories might be temporarily unavailable due to COVID-19 precautions. If you cannot access the online repository, please contact the NYSDEC project manager listed above for assistance.

Brooklyn Public Library Hours: Monday: 10:00am-6pm; Tuesday: 1:00pm-8:00pm; Wednesday: 10:00am-6:00pm; Thursday: 10:00am-8:00pm; Friday 10:00am-6:00pm; Saturday: 10:00am-5:00pm; Sunday: closed.

Appendix B Site Contact List

1. Local, State, and Federal Officials

Hon. Eric Adams Mayor of New York City City Hall Park New York, NY 10007	Hon. Brad Lander New York City Comptroller Office of the Comptroller, City of NY 1 Centre Street, Room 517 New York, NY 10007
Antonio Reynoso Brooklyn Borough President 209 Joralemon St Brooklyn, NY 11201	Andrew Gounardes New York State Senator, 26th District 497 Carroll St, Suite 31 Brooklyn, NY 11215
Shahana Hanif City Council District 39 456 5th Ave - 3rd Floor Brooklyn, NY 11215	Jo Anne Simon State Assembly District 52 341 Smith Street Brooklyn, NY 11231
NYC Department of City Planning Brooklyn Borough Office (Temporary Relocation) 120 Broadway, 31st Floor New York, NY 10271	Dan Garodnick, Chair NYC Department of City Planning 120 Broadway, 31st Floor New York, NY 10271
Hon. Kathy Hochul Governor of NY State NYS State Capitol Building Albany, New York 12224	NYSDEC, Division of Environmental Remediation 625 Broadway Albany, New York 12233
Hon. Hakeem S. Jeffries U.S. House of Representatives (NY-08) 55 Hanson Place Suite 603 Brooklyn, NY 11217	Charles Schumer U.S. Senate 322 Hart Senate Office Building Washington, DC 20510
Hon. Kirsten Gillibrand U.S. Senate 780 3rd Avenue, Suite 2601 New York, NY 10017	Mark McIntyre, Director Mayor's Office of Environmental Remediation 100 Gold Street, 2nd Floor New York, NY 10038

2. *Current Owners and Occupants of the Subject Site and Adjacent Sites*

The Site, Brooklyn Borough Block 451, Lot 25, is currently owned by Mary Star of the Sea Senior Housing Development Fund Corporation at 191 Joralemon Street, Brooklyn, NY 11201. A list of adjacent properties and their owners and occupants is provided below:

<u>Adjacent to the North:</u>	<u>Adjacent to the South (continued):</u>
<u>Block 451, Lot 34</u>	<u>Block 457, Lot 31</u>
Richard T Beaman (Owner) 362 Carroll Street Brooklyn, NY 11231	Salvatore Michael (Owner) 52 1st Street Brooklyn, NY 11231
<i>Current Occupant(s)</i> <i>Private Residence</i> <i>362 Carroll Street</i> <i>Brooklyn, NY 11231</i>	<i>Current Occupant(s)</i> <i>Private Residence(s)</i> <i>52 1st Street</i> <i>Brooklyn, NY 11231</i>
<u>Block 451, Lot 35</u>	<u>Block 457, Lot 30</u>
Gagliardo Joseph A (Owner) 364 Carroll Street Brooklyn, NY 11231	Bean, Matthew (Owner) 50 1st Street Brooklyn, NY 11231
<i>Current Occupant(s)</i> <i>Private Residence</i> <i>364 Carroll Street</i> <i>Brooklyn, NY 11231</i>	<i>Current Occupant(s)</i> <i>Private Residence(s)</i> <i>50 1st Street</i> <i>Brooklyn, NY 11231</i>
<u>Block 444, Lot 50</u>	<u>Block 457, Lot 29</u>
Unavailable Owner 345 Carroll Street Brooklyn, NY 11231	Singer, Stefan (Owner) 48 1st Street Brooklyn, NY 11231
<i>Current Occupant(s)</i> <i>Private Residences</i> <i>345 Carroll Street</i> <i>Brooklyn, NY 11231</i>	<i>Current Occupant(s)</i> <i>Private Residence(s)</i> <i>48 1st Street</i> <i>Brooklyn, NY 11231</i>
<u>Block 444, Lot 21</u>	<u>Block 457, Lot 28</u>
President St Condominium Association (Owner) 402 President Street Brooklyn, NY 11231	Reid Veto, Eugene (Owner) 46 1st Street Brooklyn, NY 11231
<i>Current Occupant(s)</i> <i>Private Residences</i> <i>402 President Street</i> <i>Brooklyn, NY 11231</i>	<i>Current Occupant(s)</i> <i>Private Residence(s)</i> <i>46 1st Street</i> <i>Brooklyn, NY 11231</i>

<u>Block 444, Lot 44</u> Unavailable Owner 342 Bond Street Brooklyn, NY 11231 <i>Current Occupant(s)</i> <i>Private Residences</i> 345 Bond Street Brooklyn, NY 11231 <u>Block 444, Lot 46</u> Canal Corner LLC (Owner) 354 Bond Street Brooklyn, NY 11231 <i>Current Occupant(s)</i> <i>Private Residences</i> 354 Bond Street Brooklyn, NY 11231 <u>Block 445, Lot 1</u> E&M Realty Corp (Owner) 335 Bond Street Brooklyn, NY 11231 <i>Current Occupant(s)</i> <i>Commercial Occupants</i> 335 Bond Street Brooklyn, NY 11231 <u>Adjacent to the East:</u> <u>Block 452, Lot 5</u> Fire Department of New York (Owner) 347 Bond Street Brooklyn, NY 11231 <i>Current Occupant</i> <i>Fire Department of New York</i> 347 Bond Street Brooklyn, NY 11231 <u>Block 452, Lot 1</u> 363 Gowanus Developers, LLC (Owner) 363 Bond Street Brooklyn, NY 11231	<u>Block 457, Lot 27</u> Cohen, Warren (Owner) 44 1st Street Brooklyn, NY 11231 <i>Current Occupant(s)</i> <i>Private Residence(s)</i> 44 1st Street Brooklyn, NY 11231 <u>Block 457, Lot 26</u> Olesker Elizabeth (Owner) 42 1st Street Brooklyn, NY 11231 <i>Current Occupant(s)</i> <i>Private Residence(s)</i> 42 1st Street Brooklyn, NY 11231 <u>Block 457, Lot 25</u> Monica C Barrett (Owner) 40 1st Street Brooklyn, NY 11231 <i>Current Occupant(s)</i> <i>Private Residence(s)</i> 40 1st Street Brooklyn, NY 11231 <u>Block 457, Lot 24</u> Justin Burke (Owner) 38 1st Street Brooklyn, NY 11231 <i>Current Occupant(s)</i> <i>Private Residence(s)</i> 38 1st Street Brooklyn, NY 11231 <u>Block 457, Lot 23</u> Cretella Florence (Owner) 36 1st Street Brooklyn, NY 11231 <i>Current Occupant(s)</i>
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<i>Current Occupant(s)</i> <i>Private Residences and Commercial</i> 363 Bond Street Brooklyn, NY 11231 <u>Adjacent to the South:</u> <u>Block 451, Lot 43</u> Antonio Trigo (Owner) 372 Bond Street Brooklyn, NY 11231 <i>Current Occupant(s)/(Operator)</i> <i>Bond Craft Studio and Private Residences</i> 372 Bond Street Brooklyn, NY 11231 <u>Block 458, Lot 1</u> LSG 365 BOND STREET LLC (Owner) 365 Bond Street Brooklyn, NY 11231 <i>Current Occupant(s)/(Operator)</i> <i>Bond St Coffee and Goods and Private Residences</i> 365 Bond Street Brooklyn, NY 11231 <i>Quik Park</i> 365 Bond Street Brooklyn, NY 11231 <i>Gowanus Dredgers Canoe Club Boathouse</i> 165 2nd Street Brooklyn, NY 11231 <u>Block 457, Lot 33</u> Carl Teitelbaum, Trustee (Owner) 374 Bond Street Brooklyn, NY 11231 <i>Current Occupant(s)</i> <i>Private Residence(s)</i> 374 Bond Street Brooklyn, NY 11231	<i>Private Residence(s)</i> 36 1st Street Brooklyn, NY 11231 <u>Adjacent to the West:</u> <u>Block 451, Lot 53</u> Cretella, Anthony Jr. (Owner) 39 1st Street Brooklyn, NY 11231 <i>Current Occupant(s)</i> <i>Private Residence(s)</i> 36 1st Street Brooklyn, NY 11231 <u>Block 451, Lot 23</u> Pujals Irrevocable Trust (Owner) 345 Carroll Street Brooklyn, NY 11231 <i>Current Occupant(s)</i> <i>Private Residence(s)</i> 345 Carroll Street Brooklyn, NY 11231
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3. Local News Media

Brooklyn Reporter 16 Court Street, 30th Floor Brooklyn, NY 11241	The New York Times 229 West 43rd Street New York, NY 10036
WNBC News 4 30 Rockefeller Plaza New York, NY 10012	WNYW Fox 5 205 East 67th Street New York, NY 10021
New York 1 News 75 Ninth Avenue New York, NY 10011	1010 Wins – CBS Radio 888 7th Avenue, 10th Floor New York, NY 10106

4. Public Water Supply

Public water is provided by The City of New York, Department of Environmental Protection located at:

Rohit Aggarwala
Commissioner, NYCDEP
59-17 Junction Boulevard
Flushing, NY 11373

5. Additional Contacts:

None

6. Schools and Day Care Centers

Daycares:

Smith Street Workshop Administrator Unknown 388 Carroll Street Brooklyn, NY 11231 (718) 852-8257 Distance: 270 feet east of the Site	Little Brooklyn Playschool Kate and Silas 114 2nd Place Brooklyn, NY 11231 (718) 596-6955 Distance: 1,456 feet southwest of the Site
Smith Street Workshop Administrator Unknown 388 Carroll Street Brooklyn, NY 11231 (718) 852-8257 Distance: 270 feet east of the Site	

Schools:

Public School 032 Samuel Mills Sprole Denise Watson-Adin, Principal 420 Union Street Brooklyn, NY 11231 (718) 222-6400 Distance: 425 feet northwest of the Site	Hannah Senesh Community Day School Nicole Nash, Head of School 342 Smith Street Brooklyn, NY 11231 (718) 858-8663 Distance: 1,204 feet west of the Site
Public School 058 The Carroll Carolyn Rogalsky, Director 330 Smith Street Brooklyn, NY 11231 (718) 330-9322 Distance: 1,292 feet west of the Site	The Little Brooklyn Pre-K Center Administrator Unknown 305-307 3rd Avenue Brooklyn, NY 11215 (718) 237-6720 Distance: 1,380 feet southeast of the Site
Rivendell School Katy Hill, Executive Director 277 Third Avenue Brooklyn, NY 11215 (718) 499-5667 Distance: 1,388 feet northeast of the Site	

7. Local Community Board

NYC Brooklyn Community Board 6
250 Baltic Street
Brooklyn, NY 11201
(718) 643-3027
Chairperson: Peter D. Fleming
infobkcb6@gmail.com

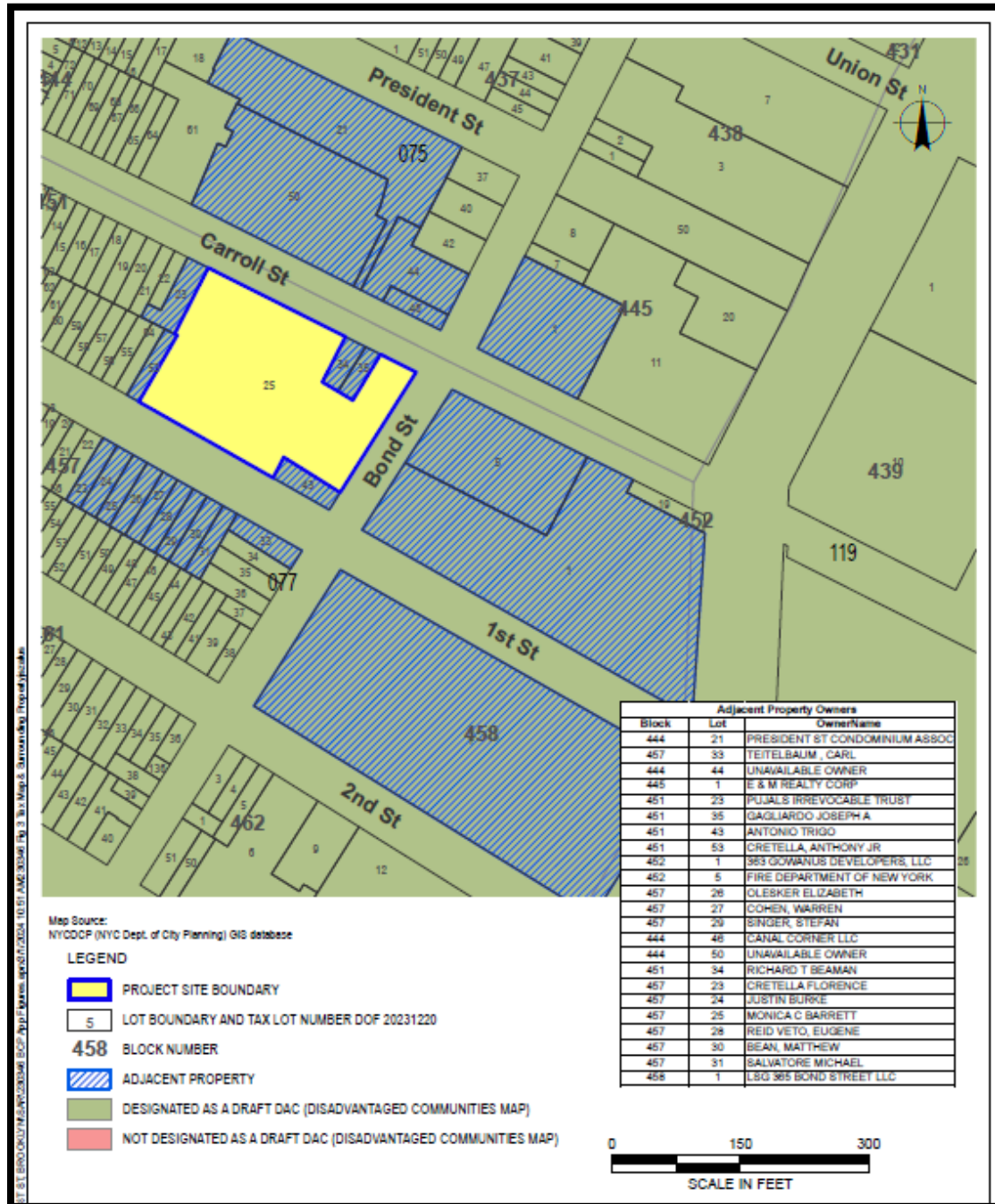
*8. Local Document Repository**

Brooklyn Public Library, Pacific Branch 25 Fourth Avenue Brooklyn, NY 11217 Managing Librarian: Candace Vasquez (718) 638-1531 cvasquez@bklynlibrary.org	NYC Brooklyn Community Board 6 250 Baltic Street Brooklyn, NY 11201 Chairperson: Peter D. Fleming (718) 643-3027 infobkcb6@gmail.com
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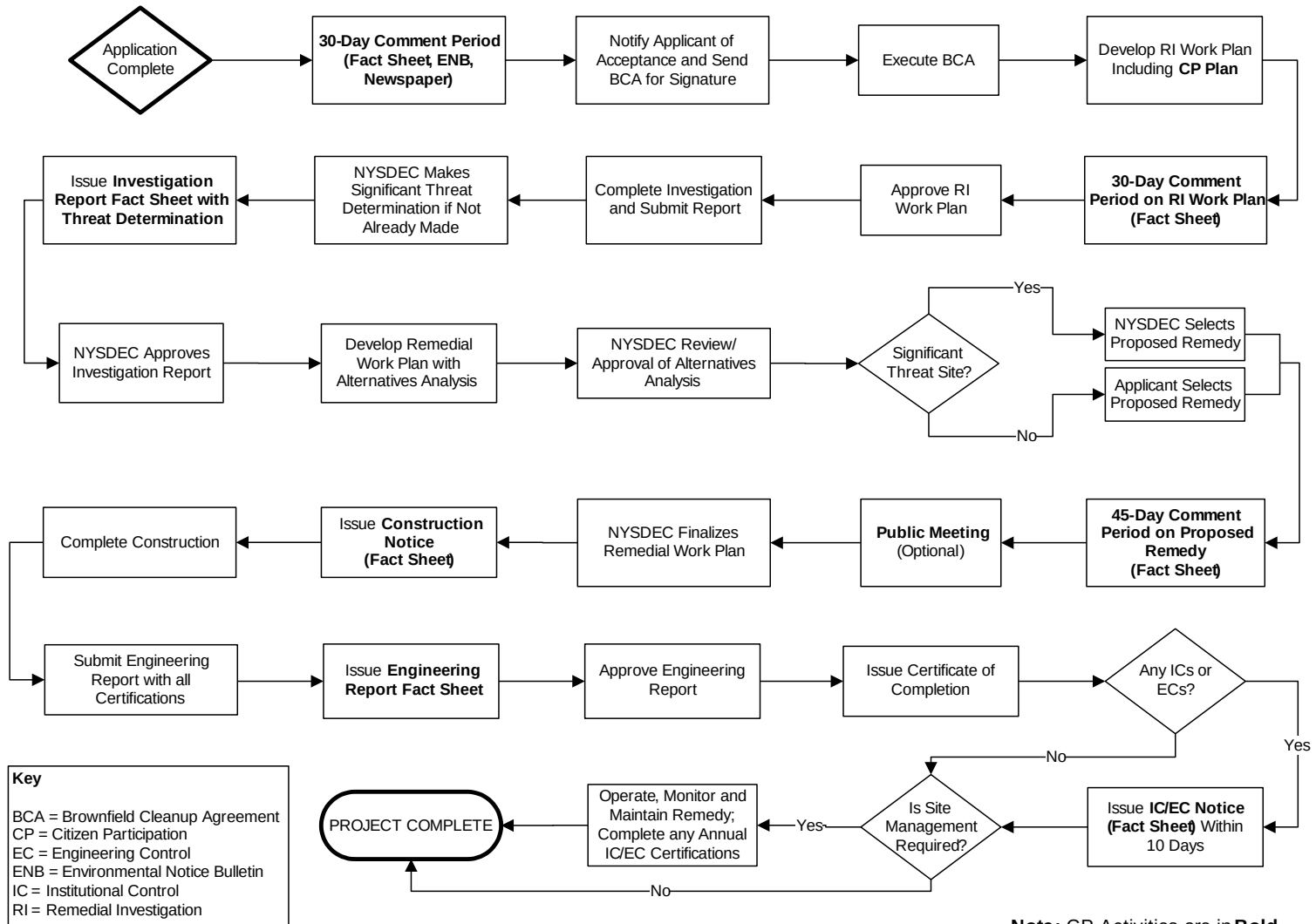
*Repositories might be temporarily unavailable due to COVID-19 precautions. If you cannot access the online repository, please contact the NYSDEC project manager listed above for assistance.

Brooklyn Public Library Hours: Monday: 10:00am-6pm; Tuesday: 1:00pm-8:00pm; Wednesday: 10:00am-6:00pm; Thursday: 10:00am-8:00pm; Friday 10:00am-6:00pm; Saturday: 10:00am-5:00pm; Sunday: closed

Appendix C Site Location Map



Appendix D– Brownfield Cleanup Program Process



Appendix E

Scoping Sheet

Remedial Programs

Scoping Sheet for Major Issues of Public Concern

Instructions

This Scoping Sheet assesses: major issues of public concern; impacts of the site and its remedial program on the community; community interest in the site; information the public needs; and information needed from the public, if applicable.

The information generated helps to plan and conduct required citizen participation (CP) activities, and to choose and conduct additional CP activities, if appropriate. The scoping sheet can be revisited and updated as appropriate during the site's remedial process to more effectively implement the site's CP program.

Note: Use the information as an aid to prepare and update the Major Issues of Public Concern section of the site CP Plan.

General Instructions

- When to prepare: During preparation of the CP Plan for the site. It can be revisited and updated anytime during the site remedial process.
- Fill in site name and other information as appropriate.

Instructions for Numbered Parts

Consider the bulleted issues and questions below and any others that may be appropriate to the site and the community to help complete the five Parts of this Scoping Sheet. Include the issue stakeholders in Parts 1 through 3 and adjust the site's contact list accordingly.

Part 1. List Major Issues of Public Concern and Information the Community Wants.

- Is our health being impacted? (e.g. Are there problems with our drinking water or air? Are you going to test our water, yards, sumps, basements? Have health studies been done?)
- There are odors in the neighborhood. Do they come from the site and are they hazardous?
- Are there restrictions on what we may do (e.g. Can our children play outside? Can we garden? Must we avoid certain areas? Can we continue to recreate (fish, hunt, hike, etc. on/around the site?)
- How and when were the site's contamination problems created?
- What contaminants are of concern and why? How will you look for contamination and find out where it is going? What is the schedule for doing that?
- The site is affecting our property values!
- How can we get more information (e.g. who are the project contacts?)
- How will we be kept informed and involved during the site remedial process?
- Who has been contacted in the community about site remedial activities?
- What has been done to this point? What happens next and when?
- The site is going to be cleaned up for restricted use. What does that mean? We don't want redevelopment on a "dirty" site.

Part 2. List Important Information Needed From the Community, if Applicable.

- Can the community supplement knowledge about past/current uses of the site?
- Does the community have knowledge that the site may be significantly impacting nearby properties, natural resources, etc.?

- Are there activities currently taking place at the site or at nearby properties that may need to be restricted?
- Who may be interested or affected by the site that has not yet been identified?
- Are there unique community characteristics that could affect how information is exchanged?
- Do the community and/or individuals have any concerns they want monitored?
- Does the community have information about other sources in the area for the contamination?

Part 3. List Major Issues and Information That Need to be Communicated to the Community.

- The process and general schedule to investigate, remediate and, if applicable, redevelop the site.
- Current understanding about the site contamination and effects, if any, on public health and the environment.
- Site impacts on the community and any restrictions on the public's use of the site and/or nearby properties.
- Planned CP activities, their schedule, and how they relate to the site's remedial process.
- Ways for the community to obtain/provide information (document repositories, contacts, etc.).

Part 4. Community Characteristics

a. - e. Obtain information from local officials, property owners and residents, site reports, site visits, "windshield surveys," other staff, etc.

f. Has the affected community experienced other **significant** present or past environmental problems unrelated to this site? Such experiences could significantly affect public concerns and perspectives about the site; how the community will relate to project staff; the image and credibility of project staff within the community; and the ways in which project staff communicate with the community.

g. Consider factors such as:

- Is English the primary language of the affected community? If not, provisions should be considered regarding public outreach activities such as fact sheets, meetings, door-to-door visits and other activities to ensure their effectiveness.
- The age demographics of the community. For example, is there a significant number of senior citizens in the community? It may be difficult for some to attend public meetings and use document repositories. This may suggest adopting more direct interaction with the community with activities such as door-to-door visits, additional fact sheets, visits to community and church centers, nursing homes, etc.
- How do people travel about the community? Would most people drive to a public meeting or document repository? Is there adequate public transportation?

Part 5. Affected/Interested Public. Individuals and organizations who need or want information and input can change during the site's remedial process. This need is influenced by real, potential or perceived impacts of the site or the remedial process. Some people may want information and input throughout the remedial process. Others may participate only during specific remedial stages, or may only be interested in particular issues. It is important to revisit this question when reviewing this scoping sheet. Knowing who is interested in the site – and the issues that are important to them – will help in the selection and conduct of appropriate outreach activities, and to identify their timing and the information to be exchanged.

Check all affected/interested parties that apply to the site. **Note: Adjust the site's contact list appropriately.** The following are some ways to identify affected/interested parties:

- Tax maps of adjacent property owners
- Attendees at public meetings
- Telephone discussions
- Letters and e-mails to DER, the remedial party, and other agencies
- Political jurisdictions and boundaries
- Media coverage

- Current/proposed uses of site and/or nearby properties (recreational, commercial, industrial)
- Discussions with community organizations: grass roots organizations, local environmental groups, environmental justice groups, churches, and neighborhood advisory groups



Remedial Programs

Scoping Sheet for Major Issues of Public Concern (see instructions)

Remedial Party: Catholic Charities Progress of Peoples Development Corporation

Site Name: John Tynan Senior Residence

Site Number: C224401

Site County: Kings County

Note: For Parts 1. – 3., the individuals, groups, organizations, businesses, and units of government identified should be added to the site contact list as appropriate.

Part 1. List major issues of public concern and information the community wants. Identify individuals, groups, organizations, businesses, and/or units of government related to the issue(s) and/or information. **Use this information as an aid to prepare or update the Major Issues of Public Concern section of the site Citizen Participation Plan.**

Construction and remediation may impact air quality while work is performed. NYSDEC and NYSDOH will oversee the project to ensure the air and odor issues are monitored and mitigated during implementation of the remedial work plan.

How were these issues and/or information identified?
Previous investigations identified contamination at the Site.

Part 2. List important information needed **from** the community, if applicable. Identify individuals, groups, organizations, businesses, and/or units of government related to the needed information.
No additional information is required at this time.

How were these information needs identified?
There are no information needs at this time.

Part 3. List major issues and information that need to be communicated **to** the community. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and/or information.
Information related to the environmental cleanup and redevelopment at the site will be communicated to the public as outlined in the CPP.

How were these issues and/or information identified?
Identified in communication with NYSDEC and NYSDOH as documented in the CPP.

Part 4. Identify the following characteristics of the affected/interested community. This knowledge will help to identify and understand issues and information important to the community, and ways to effectively develop and implement the site citizen participation plan (mark all that apply):

a. Land use/zoning around site:

☒ **Residential** ☐ **Agricultural** ☐ **Recreational** ☒ **Commercial** ☒ **Industrial**

b. Residential type around site:

☒ **Urban** ☐ **Suburban** ☐ **Rural**

c. Population density around site:

☒ **High** ☐ **Medium** ☐ **Low**

d. Community economic status:

☐ **High** ☒ **Medium** ☒ **Low**

e. Water supply of nearby residences:

☒ **Yes** ☐ **No** ☒ **Public** ☐ **Private Wells** ☐ **Mixed**

f. Other environmental issues significantly impacting affected community?

Provide details if appropriate:

Site located in a potential environmental justice area

g. Special considerations:

☒ **Language** ☐ **Age** ☐ **Transportation** ☐ **Other**

Explain marked categories in g.:

Site located in an sizable Hispanic-American population.

Part 5. The site contact list must include, at a minimum, the individuals, groups, and organizations identified in the instructions for **Part 5**. Are other individuals, groups, organizations, and units of government affected by, or interested in, the site, or its remedial program? (Mark and identify all that apply, then adjust the site contact list as appropriate.)

☒ **Non-Adjacent Residents/Property Owners:** [Click here to enter text.](#)

☒ **Local Officials:** [Click here to enter text.](#)

☒ **Media:** [Click here to enter text.](#)

☒ **Business/Commercial Interests:** [Click here to enter text.](#)

☐ **Labor Group(s)/Employees:** [Click here to enter text.](#)

☐ **Indian Nation:** [Click here to enter text.](#)

☒ **Citizens/Community Group(s):** [Click here to enter text.](#)

☐ **Environmental Justice Group(s):** [Click here to enter text.](#)

☐ **Environmental Group(s):** [Click here to enter text.](#)

☐ **Civic Group(s):** [Click here to enter text.](#)

☐ **Recreational Group(s):** [Click here to enter text.](#)

☒ **Other(s):** nearby schools and daycare facilities

Date Completed: February 28, 2024

Prepared By: AKRF, Inc

Reviewed By: [Click here to enter text.](#)

APPENDIX J
REQUEST TO IMPORT/REUSE FILL MATERIAL FORM



**NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION**



Request to Import/Reuse Fill or Soil

This form is based on the information required by DER-10, Section 5.4(e) and 6NYCRR Part 360.13. Use of this form is not a substitute for reading the applicable regulations and Technical Guidance document.

SECTION 1 – SITE BACKGROUND

The allowable site use is:

Have Ecological Resources been identified?

Is this soil originating from the site?

How many cubic yards of soil will be imported/reused?

If greater than 1000 cubic yards will be imported, enter volume to be imported:

SECTION 2 – MATERIAL OTHER THAN SOIL

Is the material to be imported gravel, rock or stone?

Does it contain less than 10%, by weight, material that passes a size 100 sieve?

Is this virgin material from a permitted mine or quarry?

Is this material recycled concrete or brick from a DEC registered processing facility?

SECTION 3 - SAMPLING

Provide a brief description of the number and type of samples collected in the space below:

Example Text: 5 discrete samples were collected and analyzed for VOCs. 2 composite samples were collected and analyzed for SVOCs, Inorganics & PCBs/Pesticides.

If the material meets requirements of DER-10 section 5.4(e)5 (other material), no chemical testing needed.

SECTION 3 CONT'D - SAMPLING

Provide a brief written summary of the sampling results or attach evaluation tables (compare to DER-10, Appendix 5):

Example Text: Arsenic was detected up to 17 ppm in 1 (of 5) samples; the allowable level is 16 ppm.

If Ecological Resources have been identified use the "If Ecological Resources are Present" column in Appendix 5.

SECTION 4 – SOURCE OF FILL

Name of person providing fill and relationship to the source:

Location where fill was obtained:

Identification of any state or local approvals as a fill source:

If no approvals are available, provide a brief history of the use of the property that is the fill source:

Provide a list of supporting documentation included with this request:

The information provided on this form is accurate and complete.

Signature

Date

Print Name

Firm

APPENDIX K
NYSDOH GENERIC COMMUNITY AIR MONITORING PLAN

Appendix 1A

New York State Department of Health Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009