

**153-157 Sherman Avenue  
NEW YORK, NY**

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# **Remedial Action Work Plan**

**NYC VCP Project Number: 15CVCP127M**

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# REMEDIAL ACTION WORK PLAN

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## LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C&D	Construction and Demolition
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering Controls and Institutional Controls
ELAP	Environmental Laboratory Accreditation Program
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations Emergency Response
IRM	Interim Remedial Measure
BCA	Brownfield Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYS DEC	New York State Department of Environmental Conservation
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYC OER	New York City Office of Environmental Remediation
NYC VCP	New York City Voluntary Cleanup Program
NYCRR	New York Codes Rules and Regulations
NYS DEC	New York State Department of Environmental Conservation

NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound
OSHA	United States Occupational Health and Safety Administration
PCBs	Professional Engineer Polychlorinated Biphenyls
PE	Professional Engineer
PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SSDS	Sub-Slab Depressurization System
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

## CERTIFICATION

I, Karen Tyll, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 153-157 Sherman Avenue Site (NYC OER Project Number 15TEMP001M and NYC VCP Project Number 15CVCP127M).

I, Eric Weinstock am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the 153-157 Sherman Avenue Site (NYC OER Project Number 15TEMP001M and NYC VCP Project Number 15CVCP127M).

I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

Karen Tyll  
Name  
079520  
NYS PE License Number  
Karen Tyll PE  
Signature  
4/22/15  
Date



Eric Weinstock  
QEP Name  
Eric Weinstock  
QEP Signature  
4/22/2015  
Date



# **EXECUTIVE SUMMARY**

TEP Charter School Assistance, Inc. is working with the NYC Office of Environmental Remediation (OER) to investigate and remediate a 12,000-square foot site located at 153-157 Sherman Avenue in Manhattan, New York. A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

## **Site Location and Current Usage**

The Site is located at 153-157 Sherman Avenue in the Inwood section in Manhattan, New York and is identified as Block 2221 and Lot 5 on the New York City Tax Map. Figure 2 shows the Site location. The Site is 12,000-square feet and is bounded by Sherman Avenue to the north, residential buildings to the south, public facilities and institutions to the east, and commercial and offices to the west. A map of the site boundary is shown in Figure 1. Currently, the Site is vacant and doesn't contain any structures.

## **Summary of Proposed Redevelopment Plan**

The proposed future use of the Site will consist of a six-story school building. Layout of the proposed site development is presented in Figure 4. The current zoning designation is R7-2. The proposed use is consistent with existing zoning for the property.

This project will result in the construction of a 62,000 square foot, 6-story middle school building to house The Equity Project Charter School (TEP). TEP will serve 480 students in grades 5 through 8. The building will achieve an energy efficiency certification from the New York State Energy Research and Development Authority (NYSERDA). The building will have 16 classrooms, a commercial kitchen and cafeteria, a gym with a regulation basketball court, and several outdoor terraces. The top floor will be dedicated for the arts, with music classrooms that open up into a concert-quality performance space seating an audience of 200+. The main floor will contain a vestibule, lobby, and elevator at grade. The remainder of the ground floor will be

situated four feet below grade and will contain a gymnasium, locker room, and ancillary space for restrooms, mechanical rooms, and storage. The building will take up the entire lot and will not contain any side yards or parking lots. A rear yard will be installed on the property above the second floor rear setback. Landscaped areas will be located on terraces above grade.

The proposed building footprint will occupy an approximate area of 75 feet by 160 feet with a proposed cellar depth of approximately four feet. As the depth of water is approximately 7 - 8.5 feet below grade it is anticipated excavation will not be below the water table. The Site is currently a vacant lot with no permanent structures, and therefore, will not require any demolition.

The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

### **Summary of Environmental Findings**

1. Elevation of the property ranges from 12.8 to 15.4 feet.
2. Depth to groundwater ranges from seven to nine feet at the Site.
3. Groundwater flow is generally from southeast to northwest beneath the Site.
4. Depth to bedrock varies from approximately five to 45 feet at the Site.
5. The stratigraphy of the site, from the surface down, consists of five to ten feet of historic fill underlain by five feet of sand underlain by five to 15 feet of clayey silt underlain by five to 20 feet of till. The dipping bedrock surface ranges from just below ground surface at the southern portion of the Property to 45 feet below ground surface to the north.
6. Soil/fill samples results were compared to New York State Department of Environmental Conservation (NYSDEC) Unrestricted Use Soil Cleanup Objectives and Restricted Residential Use Soil Cleanup Objectives (SCOs) as presented in 6NYCRR Part 375-6.8. Soil samples collected during the RI detected several Volatile Organic Compounds (VOC) at trace concentrations, all below their respective Unrestricted Use Soil Cleanup Objectives (SCOs). Two Semi-Volatile

- Organic Compounds (SVOC) including benzo(a)anthracene (max. of 1100 µg/kg), and benzo(b)fluoranthene (max. of 1300 µg/kg) were detected above their Restricted Residential Use SCOs in one shallow soil boring. PCBs were not detected in any soil samples. Three pesticides including 4,4-DDE (max. of 27.2 µg/kg), 4,4-DDD (max. of 30.2 µg/kg), and 4,4-DDT (max. of 213 µg/kg) were detected exceeding their Unrestricted Use SCOs, but below their Restricted Residential Use SCOs. Several metals including barium (max. of 390 ppm), cadmium (max. of 58 ppm), chromium (max. of 37 ppm), copper (max. of 110 ppm), lead (max. of 230 ppm), mercury (max. of 0.49 ppm), nickel (max. of 74 ppm), and zinc (max. of 320 ppm), were detected above Unrestricted Use SCOs. Cadmium was also detected above its Restricted Residential Use SCO in five shallow and deep soil samples.
7. Groundwater samples results were compared to New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). Groundwater samples collected during the RI showed that VOCs, SVOCs, pesticides, and PCBs were all below their respective GQSs. Several metals were identified in groundwater, but only magnesium (max. of 49.3ppm), manganese (max. of 0.5278ppm), and sodium (max. of 80.5ppm) were detected above their GQSs.
  8. Soil vapor samples collected during the 2015 EBC RI were compared to the compounds listed in by the NYSDOH located in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion dated October 2006. Soil vapor samples collected during the RI showed moderate levels of petroleum-related VOCs and elevated levels of chlorinated VOCs. The total concentration of petroleum-related VOCs (BTEX) ranged from 460.6 µg/m<sup>3</sup> to 1052.6 µg/m<sup>3</sup>. The chlorinated VOC, trichloroethylene (TCE) was detected in all three of the soil gas samples at concentrations ranging from 94 µg/m<sup>3</sup> to 132 µg/m<sup>3</sup>. Tetrachloroethylene (PCE) was detected in all three soil gas samples at concentrations ranging from 229 µg/m<sup>3</sup> to 397 µg/m<sup>3</sup>. Carbon tetrachloride was not detected. 1,1,1-trichloroethane (TCA) was detected at maximum concentrations of 5.67 µg/m<sup>3</sup>. Concentrations of the chlorinated PCE and TCE were above the

monitoring level ranges established within the NYSDOH soil vapor guidance matrix and require mitigation.

For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

### **Summary of the Remedy**

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. It achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and guidance; is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants; is cost effective and implementable; and uses standard methods that are well established in the industry.

The preferred remedial action alternative is a Track 4 Remedial Action.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
3. Establishment of Site Specific Track 4 Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility(s) as VOCs one sample per 800 cubic yards; SVOCs, Pesticides, PCBs, Total Metals, Paint Filter, Ignitability, Reactivity, Corrosivity/pH, Sulfide, Cyanide one composite sample per 800 cubic yards; TPH one sample per 100 cubic yards; TCLP Metals one composite sample per 800 cubic yards.

6. Excavation and removal of soil/fill exceeding Track 4 Site Specific SCOs. The entire footprint of the Site will be excavated to a depth of approximately four feet below grade for development purposes. Approximately, 3400 tons of soil will be excavated and removed from this property.
7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-Site.
8. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
9. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.
10. Collection and analysis of four end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
11. Installation and operation of an active sub-slab depressurization system. (The measured water table is within two to three feet of the planned elevation of bottom of the basement slab. If the SSD vent pipes are intermittently inundated by groundwater, the SSD system will be converted to a passive venting system).
12. Installation of a waterproofing / vapor barrier system beneath the building slab as well as behind foundation sidewalls of the proposed building below grade. The waterproofing barrier will consist of WR Grace Preprufe® 300R.
13. Construction and maintenance of an engineered composite cover consisting of 24-inch thick concrete building slab, to prevent human exposure to residual soil/fill remaining under the Site;
14. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
15. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.

16. Submission of an approved Site Management Plan (SMP) in the Remedial Action Report (RAR) for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
17. Submission of a RAR that describes the remedial activities certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.
18. Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and Institutional Controls and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

## COMMUNITY PROTECTION STATEMENT

### NYC VOLUNTARY CLEANUP PROGRAM

153-157 Sherman Avenue, New York, New York

NYC VCP SITE NUMBER: 15CVCP127M

<b>Affiliation</b>	<b>Name</b>	<b>Phone</b>	<b>Email address</b>
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Property Owner	Zeke Vanderhoek	646-254-6451	zeke@tepcharter.org
Construction Manager	Gino Fazio	(718)326-2266	<a href="mailto:gino@fazioconstruction.com">gino@fazioconstruction.com</a>
Document Repository	Inwood Library 4790 Broadway New York, NY, 10034	(212)942-2445	
Link to Document Repository	<a href="http://www.nyc.gov/html/oer/html/repository/RManhattan.shtml">http://www.nyc.gov/html/oer/html/repository/RManhattan.shtml</a>		

## COMMUNITY PROTECTION STATEMENT

The NYC Office of Environmental Remediation (OER) provides governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan (“cleanup plan”) describes the findings of prior environmental studies that show the location of contamination at the site, and describes the plans to clean up the site to protect public health and the environment.

This cleanup plan provides a very high level of protection for neighboring communities and also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and routing, and opportunities for community participation. The purpose of this Community Protection Statement is to explain these community protection measures in non-technical language to simplify community review.

**Remedial Investigation and Cleanup Plan** Under the oversight of the NYC OER, a thorough cleanup study of this property (called a remedial investigation) has been performed to identify past property usage, to sample and test soils, groundwater and soil vapor, and identify contaminant sources present on the property. The cleanup plan has been designed to address all contaminant sources that have been identified during the study of this property.

**Identification of Sensitive Land Uses:** Prior to selecting a cleanup, the neighborhood was evaluated to identify sensitive land uses nearby, such as schools, day care facilities, hospitals and residential areas. The cleanup program was then tailored to address the special conditions of this community.

**Qualitative Human Health Exposure Assessment:** An important part of the cleanup planning for the Site is the performance of a study to find all of the ways that people might come in contact with contaminants at the Site now or in the future. This study is called a Qualitative Human Health Exposure Assessment (QHHEA). A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential for people to come in contact with this contamination. All identified public exposures will be addressed under this cleanup plan.

**Health and Safety Plan:** This cleanup plan includes a Construction Health and Safety Plan (CHASP) that is designed to protect community residents and on-Site workers. The elements of this plan are in compliance with safety requirements of the United States Occupational Safety and Health Administration (OSHA). This plan includes many protective elements including those discussed below.

**Site Safety Coordinator:** This project has a designated Site safety coordinator to implement the CHASP. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is identified at the beginning of the Community Protection Statement.

**Worker Training:** Workers supervising the cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. The workers performing specific tasks, including removing contaminated material with excavators and installing cleanup systems in contaminated areas, will be provided a copy of the CHASP and will work under the direction of an OSHA trained field supervisor.

**Community Air Monitoring Plan:** Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. Air samples will be tested in accordance with a detailed plan called the Community Air Monitoring Plan or CAMP. Results will be regularly reported to the NYC Office of Environmental Remediation. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a 'Contingency Plan').

**Odor, Dust and Noise Control:** This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager or NYC Office of Environmental

Remediation Project Manager listed on the first page of this Community Protection Statement document.

**Quality Assurance:** This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be summarized in the final report, called the Remedial Action Report. This report will be submitted to the NYC Office of Environmental Remediation and will be thoroughly reviewed.

**Stormwater Management:** To limit the potential for soil erosion and discharge, this cleanup plan has provisions for stormwater management. The main elements of the stormwater management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection.

**Hours of Operation:** The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation will conform to requirements of Department of Buildings and will be conveyed to OER before the start of the remedial action.

**Signage** While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the NYC Voluntary Cleanup Program, provides project contact names and numbers, and locations of project documents can be viewed.

**Complaint Management** The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager, the NYC Office of Environmental Remediation Project Manager listed on the first page of this Community Protection Statement document, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

**Utility Mark-outs:** To promote safety during excavation in this cleanup, the contractor is required to first identify all: utilities and must perform all excavation and construction work in compliance with NYC Department of Buildings regulations.

**Soil and Liquid Disposal:** All soil and liquid material removed from the Site as part of the cleanup will be transported and disposed of in accordance with all applicable City, State and Federal regulations and required permits will be obtained.

**Soil Chemical Testing and Screening:** All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

**Stockpile Management:** Soil stockpiles will be kept covered with tarps to prevent dust, odors and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed to protect storm water catch basins and other discharge points.

**Trucks and Covers:** Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and records and placarded in compliance with applicable City, State and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with all laws and regulations.

**Imported Material:** All fill materials proposed to be brought onto the Site will comply with rules outlined in this cleanup plan and will be inspected and approved by a qualified worker located on-Site. Waste materials will not be brought onto the Site. Trucks entering the Site with imported clean materials will be covered in compliance with applicable laws and regulations.

**Equipment Decontamination:** All equipment used for cleanup work will be inspected and washed, if needed, before it leaves the Site. Trucks will be cleaned at a truck inspection station on the property before leaving the Site.

**Housekeeping:** Locations where trucks enter or leave the Site will be inspected every day and cleaned regularly to ensure that they are free of dirt and other materials from the Site.

**Truck Routing:** Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote overall safety in trucking; and (f) minimize off-Site line-ups (queuing) of trucks entering the property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

**Final Report:** The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for public review online. A link to the online document repository and the public library with Internet access nearest the Site are listed on the first page of this Community Protection Statement document

**Long-Term Site Management:** To provide long-term protection after the cleanup is complete, the property owner will be required to comply with an ongoing Site Management Plan (if Track 1 is not achieved) that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC Office of Environmental Remediation. Requirements that the property owner must comply with are defined either in the property's deed or established through a city environmental designation. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

# **REMEDIAL ACTION WORK PLAN**

## **1.0 SITE BACKGROUND**

TEP Charter School Assistance, Inc. is working with the Office of Environmental Remediation (OER) to investigate and remediate a property located at 153-157 Sherman Avenue in the Inwood section of Manhattan, New York (the “Site”). A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides a remedial alternatives analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

### **1.1 SITE LOCATION AND CURRENT USAGE**

The Site is located at 153-157 Sherman Avenue in the Inwood section in Manhattan, New York and is identified as Block 2221 and Lot 5 on the New York City Tax Map. Figure 2 shows the Site location. The Site is 12,000-square feet and is bounded by Sherman Avenue to the north, residential buildings to the south, public facilities and institutions to the east, and commercial and offices to the west. A map of the site boundary is shown in Figure 1. Currently, the Site is vacant and doesn't contain any structures.

### **1.2 PROPOSED REDEVELOPMENT PLAN**

The proposed future use of the Site will consist of six-story school building. Layout of the proposed site development is presented in Figure 4. The current zoning designation is R7-2. The proposed use is consistent with existing zoning for the property.

This project will result in the construction of a 62,000 square foot, 6-story middle school building to house The Equity Project Charter School (TEP). TEP serves 480 students in grades 5

through 8. The building will achieve an energy efficiency certification from the New York State Energy Research and Development Authority (NYSERDA). The building will have 16 classrooms, a commercial kitchen and cafeteria, a gym with a regulation basketball court, and several outdoor terraces. The top floor will be dedicated for the arts, with music classrooms that open up into a concert-quality performance space seating an audience of 200+. The main floor will contain a vestibule, lobby, and elevator at grade. The remainder of the ground floor will be situated four feet below grade and will contain a gymnasium, locker room, and ancillary space for restrooms, mechanical rooms, and storage. The building will take up the entire lot and will not contain any side yards or parking lots. A rear yard will be installed on the property above the second floor rear setback. Landscaped areas will be located on terraces above grade.

The proposed building footprint will occupy an approximate area of 75 feet by 160 feet with a proposed cellar depth of approximately four feet. As the depth of water is approximately 7 - 8.5 feet below grade it is anticipated excavation will not be below the water table. The Site is currently a vacant lot with no permanent structures, and therefore, will not require any demolition.

The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

### **1.3 DESCRIPTION OF SURROUNDING PROPERTY**

According to the OER's SPEED application the Site is bound Sherman Avenue to the north, La Iglesia De Cristoe (zoned R7-2 for public facilities and institutions) and Pentecostal Church ET (zoned R7-2 for public facilities and institutions) to the east, a five-story residential building (zoned R7-2 for multi-family walk-up buildings), and a one-story commercial building with a Laundromat and dry cleaner (zoned R7-2 for commercial and office buildings) to the west. There are no hospitals within a 500-foot radius from the Site. There is one school within a 500-foot radius from the Site located at 186 Sherman Avenue, New York, New York. Figure 3 shows the surrounding land usage.

## 1.4 REMEDIAL INVESTIGATION

A remedial investigation was performed and the results are documented in a companion document called “*Remedial Investigation Report, 153-157 Sherman Avenue*”, dated March, 2015 (RIR).

### Summary of Past Uses of Site and Areas of Concern

The Site was used for commercial purposes since 1927. A laundry and dyeing facility was located on 155A Sherman Avenue in 1927. According to the EDR City Directory the past uses of the Site are:

#### 153 Sherman Avenue

- 1927- Jeffrey Thos Fruits and Vegetables and Piston Gus Butcher.
- 1938 to 1942- Homestead Grill.
- 1973- The Club Bolero.
- 1988- El Melibel Restaurant.
- 1998 to 2000- El Mudo Shipping & Furniture.
- 2006- 153 Pharmacy Corp.

#### 155A Sherman Avenue

- 1927- Bluebird Cleaners and Dyers.
- 1983 to 1998- Chan’s Kitchen

#### 155 Sherman Avenue

- 1938 to 1942- Rosenbaum M Partner.
- 1983- Model Wiring Corporation.
- 1988 to 1993- Taino Liquor.
- 1998- Eca Liquor Inc.

- 2000- Eca Liquor Inc. and Chan's Kitchen.
- 2006- 24 Hour Emergency Locksmith, Chan's Kitchen, and G&G Hair Extension Supply.

#### 157A Sherman Avenue

- 1927- Sobel Harry Dairy.

#### 157 Sherman Avenue

- 1983- Esperanza Beauty Parlor and LMS Electrical Service.
- 1988 to 1998- Citident, Sherman Medical and Dental Office, and Mahesh Pharmacy.
- 2000- Quality Health Center.
- 2006- Citident and Delmonte Ramon MD.

Currently the Site does not have any structures and is a vacant lot.

### **Summary of the Work Performed under the Remedial Investigation**

CA Rich performed the following scope of work:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed six soil borings across the entire project Site, and collected twelve soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installed three groundwater monitoring wells throughout the Site to establish groundwater flow and collected three groundwater samples for chemical analysis to evaluate groundwater quality;
4. Installed three soil vapor probes around Site perimeter and collected three samples for chemical analysis.
- 5.

### **Summary of Environmental Findings**

1. Elevation of the property ranges from 12.8 to 15.4 feet.
2. Depth to groundwater ranges from seven to nine feet at the Site.
3. Groundwater flow is generally from southeast to northwest beneath the Site.
4. Depth to bedrock varies from approximately five to 45 feet at the Site.
5. The stratigraphy of the site, from the surface down, consists of five to ten feet of historic fill underlain by five feet of sand underlain by five to 15 feet of clayey silt underlain by five to 20 feet of till. The dipping bedrock surface ranges from just below ground surface at the southern portion of the Property to 45 feet below ground surface to the north.
6. Soil/fill samples results were compared to New York State Department of Environmental Conservation (NYSDEC) Unrestricted Use Soil Cleanup Objectives and Restricted Residential Use Soil Cleanup Objectives (SCOs) as presented in 6NYCRR Part 375-6.8. Soil samples collected during the RI detected several Volatile Organic Compounds (VOC) at trace concentrations, all below their respective Unrestricted Use Soil Cleanup Objectives (SCOs). Two Semi-Volatile Organic Compounds (SVOC) including benzo(a)anthracene (max. of 1100 µg/kg), and benzo(b)fluoranthene (max. of 1300 µg/kg) were detected above their Restricted Residential Use SCOs. PCBs were not detected in any soil samples. Three pesticides including 4,4-DDE (max. of 27.2 µg/kg), 4,4-DDD (max. of 30.2 µg/kg), and 4,4-DDT (max. of 213 µg/kg) were detected exceeding their Unrestricted Use SCOs, but below their Restricted Residential Use SCOs. Several metals including barium (max. of 390 ppm), cadmium (max. of 58 ppm), chromium (max. of 37 ppm), copper (max. of 110 ppm), lead (max. of 230 ppm), mercury (max. of 0.49 ppm), nickel (max. of 74 ppm), and zinc (max. of 320 ppm), were detected above UUSCOs. Cadmium was also detected above its Restricted Residential Use SCO.
7. Groundwater samples results were compared to New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). Groundwater samples collected during the RI showed that VOCs, SVOCs, pesticides, and PCBs were all below their

respective GQSs. Several metals were identified in groundwater, but only magnesium (max. of 49.3ppm), manganese (max. of 0.5278ppm), and sodium (max. of 80.5ppm) were detected above their GQSs.

8. Soil vapor samples collected during the 2015 EBC RI were compared to the compounds listed in Table 3.1 Air Guideline Values Derived by the NYSDOH located in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion dated October 2006. Soil vapor samples collected during the RI showed moderate levels of petroleum-related VOCs and elevated levels of chlorinated VOCs. The total concentration of petroleum-related VOCs (BTEX) ranged from 460.6  $\mu\text{g}/\text{m}^3$  to 1052.6  $\mu\text{g}/\text{m}^3$ . The chlorinated VOC, trichloroethylene (TCE) was detected in all three of the soil gas samples at concentrations ranging from 94  $\mu\text{g}/\text{m}^3$  to 132  $\mu\text{g}/\text{m}^3$ . Tetrachloroethylene (PCE) was detected in all three soil gas samples at concentrations ranging from 229  $\mu\text{g}/\text{m}^3$  to 397  $\mu\text{g}/\text{m}^3$ . Carbon tetrachloride was not detected. 1,1,1-trichloroethane (TCA) was detected at maximum concentrations of 5.67  $\mu\text{g}/\text{m}^3$ . Concentrations of the chlorinated PCE and TCE were above the monitoring level ranges established within the NYSDOH soil vapor guidance matrix and require mitigation.

For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

## **2.0 REMEDIAL ACTION OBJECTIVES**

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

### **Groundwater**

- Prevent direct exposure to contaminated groundwater.
- Prevent exposure to contaminants volatilizing from contaminated groundwater.

### **Soil**

- Prevent direct contact with contaminated soil.
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

### **Soil Vapor**

- Prevent exposure to contaminants in soil vapor.
- Prevent migration of soil vapor into dwelling and other occupied structures.

### **3.0 REMEDIAL ALTERNATIVES ANALYSIS**

The goal of the remedy selection process is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of applicable standards, criteria and guidance values (SCGs). Remedial alternatives are then developed and evaluated based on the following ten criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance;
- Land use; and
- Sustainability.

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. As required, a minimum of two remedial alternatives (including a Track 1 scenario) are evaluated, as follows:

#### **Alternative 1 involves:**

- Selection of NYSDEC 6NYCRR Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
- Removal of all soil/fill exceeding Track 1 Unrestricted Use SCOs throughout the Site and confirmation that Track 1 Unrestricted Use SCOs have been achieved with post-excavation endpoint sampling. Based on the results of the Remedial Investigation, it is expected that this alternative would require excavation across the entire Site to a depth greater than five feet to removal all historic fill. If soil/fill containing analytes at

concentrations above Unrestricted Use SCOs is still present at the base of the excavation after removal of all soil required for construction of the new building's cellar level is complete, additional excavation will be performed to ensure complete removal of soil that does not meet Track 1 Unrestricted Use SCOs.

- No Engineering or Institutional Controls are required for a Track 1 cleanup, but a waterproofing / vapor barrier, and passive sub-slab depressurization system (SSDS) would be installed beneath the basement foundation and behind foundation sidewalls of the new building as a part of development to prevent any potential future exposures from off-Site soil vapor.
- Placement of a final cover over the entire Site as part of construction.

### **Alternative 2 involves**

- Establishment of Site-Specific (Track 4) SCOs (listed in Section 4.2).
- Removal of all soil/fill exceeding Track 4 Site-Specific SCOs and confirmation that Track 4 Site-Specific SCOs have been achieved with post-excavation endpoint sampling. Excavation for construction of the new building's cellar level would take place to a depth of approximately four feet across the entire Site. If soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation, additional excavation will be performed to meet Track 4 Site-Specific SCOs.
- Placement of a cover system over the entire Site to prevent exposure to remaining soil/fill;
- Installation of a waterproofing Vapor barrier system beneath the building slab and along foundation side walls to prevent potential exposures from soil vapor;
- Installation of an active Sub Slab Depressurization System (SSDS);
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site; prohibitions of sensitive Site uses, such as farming or vegetable gardening, to prevent future exposure pathways; and prohibition of a higher level of land use without OER approval;
- Establishment of an approved Site Management Plan (SMP) to ensure long-term management of these Engineering and Institutional Controls including the

performance of periodic inspections and certification that the controls are performing as they were intended. The SMP will note that the property owner and property owner's successors and assigns must comply with the approved SMP; and

### **3.1 THRESHOLD CRITERIA**

#### **Protection of Public Health and the Environment**

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

Alternative 1 would be protective of human health and the environment by removing contaminated soil/fill exceeding Track 1 Unrestricted Use SCOs and groundwater protection standards, thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contamination leaching into groundwater.

Alternative 2 would achieve comparable protections of human health and the environment by excavating the historic fill at the Site and by ensuring that remaining soil/fill on-Site meets Track 4 Site-Specific SCOs, as well as by placement of Institutional and Engineering controls, including a composite cover system. The composite cover system would prevent direct contact with any remaining on-Site soil/fill. Implementing Institutional Controls including a Site Management Plan and continued deed restrictions of property would ensure that the composite cover system remains intact and protective. Establishment of Track 4 Site-Specific SCOs would minimize the risk of contamination leaching into groundwater.

For both Alternatives, potential exposure to contaminated soils or groundwater during construction would be minimized by implementing a Construction Health and Safety Plan, an approved Soil/Materials Management Plan and Community Air Monitoring Plan (CAMP). Potential contact with contaminated groundwater would be prevented as its use is prohibited by

city laws and regulations. Potential future migration of off-Site soil vapors into the new building would be prevented by installing a vapor barrier below and active SSDS.

### **3.2 BALANCING CRITERIA**

#### **Compliance with Standards, Criteria and Guidance (SCGs)**

This evaluation criterion assesses the ability of the alternative to achieve applicable standards, criteria and guidance.

Alternative 1 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to achieve Track 1 Unrestricted Use SCOs and Protection of Groundwater SCOs. Compliance with SCGs for soil vapor would also be achieved by installing a passive SSDS and/or a waterproofing barrier system below the new building's basement slab and continuing the vapor barrier around foundation walls, as part of development.

Alternative 2 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to meet Track 4 Site-Specific SCOs. Compliance with SCGs for soil vapor would also be achieved by installing an SSDS and a waterproofing barrier system below the new building's basement slab and continuing the vapor barrier around foundation walls. A Site Management Plan would ensure that these controls remained protective for the long term.

Health and safety measures contained in the CHASP and Community Air Monitoring Plan (CAMP) that comply with the applicable SCGs shall be implemented during Site redevelopment under this RAWP. For both Alternatives, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. These measures will protect on-site workers and the surrounding community from exposure to Site-related contaminants.

## **Short-term effectiveness and impacts**

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on public health and the environment during implementation of the remedial action, including protection of the community, environmental impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

Both Alternatives 1 and 2 have similar short-term effectiveness during their respective implementations, as each requires excavation of historic fill material. Both alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts could potentially be higher for Alternative 1 if excavation of greater amounts of historical fill material is encountered below the excavation depth of the proposed building. However, focused attention to means and methods during the remedial action during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of these activities.

An additional short-term adverse impact and risks to the community associated with both remedial alternatives is increased truck traffic. Approximately 136, 25-ton capacity truck trips would be necessary to transport fill and soil excavated during Site development. Truck traffic will be routed on the most direct course using major thoroughfares where possible and flaggers will be used to protect pedestrians at Site entrances and exits.

The effects of these potential adverse impacts to the community, workers and the environment would be minimized through implementation of corresponding control plans including a Construction Health and Safety Plan, a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), during all on-Site soil disturbance activities and would minimize the release of contaminants into the environment. Both alternatives provide short-term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a Construction Health and Safety Plan (CHASP) would be protected from on-Site contaminants (personal protective equipment would be worn consistent

with the documented risks within the respective work zones).

### **Long-term effectiveness and permanence**

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of Engineering Controls/Institutional Controls (ECs/ICs) that may be used to manage contaminant residuals that remain at the Site and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of ECs.

Alternative 1 would achieve long-term effectiveness and permanence related to on-Site contamination by permanently removing all impacted soil/fill above Track 1 Unrestricted Use SCOs. Removal of on-Site contaminant sources will prevent future groundwater contamination.

Alternative 2 would provide long-term effectiveness by removing most on-Site contamination and attaining Track 4 Site-Specific SCOs; a composite cover system across the Site, maintaining use restrictions, establishing an SMP to ensure long-term management of ICs, ECs, and maintaining continued registration as instituting restrictive declaration to memorialize these controls for the long term. The SMP would ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as they were intended assuring that protections designed into the remedy will provide continued high level of protection in perpetuity.

Both alternatives would result in removal of soil contamination exceeding their respective SCOs, providing the highest level, most effective and permanent remedy over the long-term with respect to a remedy for contaminated soil, which will eliminate any migration to groundwater. Potential sources of soil vapor and groundwater contamination will also be eliminated as part of the remedy.

### **Reduction of toxicity, mobility, or volume of contaminated material**

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their

principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

Alternative 1 will permanently eliminate the toxicity, mobility, and volume of contaminants from on-Site soil by removing all soil in excess of Track 1 Unrestricted Use SCOs.

Alternative 2 would remove most of the historic fill at the Site, and any remaining on-Site soil beneath the new building will meet Track 4 Site-Specific SCOs.

Alternative 1 would eliminate a greater total mass of contaminants on Site. The removal of soil to four feet for the new development in both scenarios would probably result in relatively minor differences between these two alternatives.

### **Implementability**

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g. obtaining permits for remedial activities), and availability of services and materials.

The techniques, materials and equipment to implement both remedial Alternatives 1 and 2 are readily available and have been proven effective in remediating the contaminants associated with the Site. They use standard materials and services that are well established technology. The reliability of each remedy is also high. There are no special difficulties associated with any of the activities proposed.

### **Cost effectiveness**

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site

management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

Since historic fill at the Site was found during the RI to only extend to a depth of up to five feet below grade, and the new building requires excavation of the entire Site to a depth of four feet, the costs associated with both Alternative 1 could potentially be higher than Alternative 2 if soil with analytes above Track 1 Unrestricted Use SCOs is encountered below the excavation depth required for development. Additional costs would include installation of additional shoring/underpinning, disposal of additional soil, and import of clean soil for backfill. However, long-term costs for Alternative 2 are higher than Alternative 1 based on implementation of a Site Management Plan as part of Alternative 2.

The remedial plan creates an approach that combines the remedial action with the redevelopment of the Site, including the construction of the building foundation and subgrade structures. The remedial plan is also cost effective in that it will take into consideration the selection of the closest and most appropriate disposal facilities to reduce transportation and disposal costs during the excavation of historic fill and other soils during the redevelopment of the Site.

### **Community Acceptance**

This evaluation criterion addresses community opinion and support for the remedial action. Observations here will be supplemented by public comment received on the RAWP.

Based on the overall goals of the remedial program and initial permitting associated with the proposed site development, no adverse community opinion is anticipated for either alternative. This RAWP will be subject to a public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedy. This public comment will be considered by OER prior to approval of this plan. The Citizen Participation Plan for the project is provided in Appendix B. Observations here will be supplemented by public comment received on the RAWP.

## **Land use**

This evaluation criterion addresses the proposed use of the property. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the site.

The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy of soil remediation. The proposed future use of the Site includes a 62,000 square foot, 6-story middle school building to house The Equity Project Charter School (TEP) building. Following remediation, the Site will meet either Track 1 Unrestricted Use or Track 4 Site-Specific SCOs, both of which are appropriate for its planned use. The reasonably anticipated future use of the Site and its surroundings will be documented by the applicant in the NYC VCP application, which will include the following conclusions:

The proposed redevelopment of the Site is compatible with its current zoning and is consistent with recent development patterns. The areas surrounding the site are urban and consist of predominantly mixed residential and commercial buildings in zoning districts designated for commercial and residential uses. The development would replace an underutilized site with a modern commercial building. The proposed development would create new employment opportunities and economic and fiscal benefits to the City and State in the form of economic revitalization and tax revenue.

Temporary short-term project impacts are being mitigated through site management controls and truck traffic controls during remediation activities. Following remediation, the Site will

meet either Track 1 Unrestricted Use SCOs or Track 4 Site-Specific SCOs, which are appropriate for its planned use.

The Site is not in close proximity to important cultural resources, including federal or state historic or heritage sites or Native American religious sites, natural resources, waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species. The Site is located in an urban area with limited proximity to fish or wildlife. Both alternatives would prevent any potential exposure pathways of contaminant migration affecting fish or wildlife. Municipal water supply wells are not present in this part of City; therefore, groundwater from the Site cannot affect municipal water supply wells or recharge areas. The Site does not lie in a Federal Emergency Management Agency (FEMA)-designated flood plain. Both alternatives are equally protective of natural resources and cultural resources.

Improvements in the current environmental condition of the property achieved by both alternatives are also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse.

### **Sustainability of the Remedial Action**

This criterion evaluates the overall sustainability of the remedial action alternatives and the degree to which sustainable means are employed to implement the remedial action including those that take into consideration NYC's sustainability goals defined in *PlaNYC: A Greener, Greater New York*. Sustainability goals may include: maximizing the recycling and reuse of non-virgin materials; reducing the consumption of virgin and non-renewable resources; minimizing energy consumption and greenhouse gas emissions; improving energy efficiency; and promotion of the use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

While Alternative 2 would potentially result in lower energy usage based on reducing the volume of material transported off-Site, both remedial alternatives are comparable with respect to the opportunity to achieve sustainable remedial action. The remedial plan would take into consideration the shortest trucking routes during off-Site disposal of historic fill and other soils, which would reduce greenhouse gas emissions and conserve energy used to fuel trucks. The New York City Clean Soil Bank program may be utilized for reuse of native soils. To the extent

practicable, energy efficient building materials, appliances, and equipment will be utilized to complete the development. A complete list of green remedial activities considered as part of the NYC VCP is included in the Sustainability Statement, included as Appendix C.

## **4.0 REMEDIAL ACTION**

### **4.1 SUMMARY OF PREFERRED REMEDIAL ACTION**

The preferred remedial action alternative is the Track 4 Alternative. The preferred remedial action alternative achieves protection of public health and the environment for the intended use of the property. The preferred remedial action alternative will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The preferred remedial action alternative is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The preferred remedial action alternative is cost effective and implementable and uses standards methods that are well established in the industry.

#### **Track 4 Remedial Action**

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
3. Establishment of Site Specific Track 4 Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility(s) as: VOCs one sample per 800 cubic yards; SVOCs, Pesticides, PCBs, Total Metals, Paint Filter, Ignitability, Reactivity, Corrosivity/pH, Sulfide, Cyanide one composite sample per 800 cubic yards; TPH one sample per 100 cubic yards; TCLP Metals one composite sample per 800 cubic yards.
6. Excavation and removal of soil/fill exceeding Track 4 Site Specific SCOs. The entire footprint of the Site will be excavated to a depth of approximately four feet below grade for development purposes. Approximately, 3400 tons of soil will be excavated and removed from this property.

7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-Site.
8. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
9. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.
10. Collection and analysis of four end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
11. Installation and operation of an active sub-slab depressurization system. (The measured water table is within two to three feet of the planned elevation of bottom of the basement slab. If the SSD vent pipes are intermittently inundated by groundwater, the SSD system will be converted to a passive venting system).
12. Installation of a waterproofing / vapor barrier system beneath the building slab as well as behind foundation sidewalls of the proposed building below grade. The waterproofing barrier will consist of WR Grace Preprufe® 300R.
13. Construction and maintenance of an engineered composite cover consisting of 24-inch thick concrete building slab, to prevent human exposure to residual soil/fill remaining under the Site;
14. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
15. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
16. Submission of an approved Site Management Plan (SMP) in the Remedial Action Report (RAR) for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.

17. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.
18. Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and Institutional Controls and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

#### **4.2 SOIL CLEANUP OBJECTIVES AND SOIL/FILL MANAGEMENT**

Track 4 SCOs are proposed for this project. The Site-Specific SCOs for this Site are:

<b><u>Contaminant</u></b>	<b><u>Site-Specific SCO's</u></b>
Total SVOCs	250 ppm
Lead	250 ppm
Mercury	1.0 ppm

The entire Property will be excavated to a depth of four feet or more. Confirmatory end-point samples will be collected at the bottom of the excavation created for the foundation. Whatever concentrations of Cadmium are detected at that depth will be managed in-place. The slab poured at the bottom of the foundation will serve as a cap and an institutional control will be employed to ensure the cap remains intact.

Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix D. The location of planned excavations is shown in Figure 8.

Discrete contaminant sources (such as hotspots) identified during the remedial action will be identified by GPS or surveyed. This information will be provided in the Remedial Action Report.

## **Soil/Fill Removal Quantities**

The total quantity of soil/fill expected to be excavated and disposed off-Site is 3,400 tons.

Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.

## **End-point Sampling**

End-point samples will be analyzed for compounds and elements as described below utilizing the following methodology:

Soil analytical methods will include:

- Volatile organic compounds by EPA Method 8260;
- Semi-volatile organic compounds by EPA Method 8270;
- Target Analyte List metals; and
- Pesticides/PCBs by EPA Method 8081/8082.

New York State ELAP certified labs will be used for all end-point sample analyses. Labs performing end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all end-point sample results and will include all data including non-detects and applicable standards and/or guidance values.

## **Confirmation End-point Sampling**

Removal actions for development purposes under this plan will be performed in conjunction with confirmation soil sampling. Four confirmation samples will be collected from the base of the excavation at locations shown on Figure 10. To evaluate attainment of Track 4 Site-specific SCOs, analytes will include those for which SCOs have been developed, including Cadmium according to analytical methods described above. If Track 1 Unrestricted Use SCOs are pursued, samples will be analyzed for VOCs, SVOCs, pesticides, PCBs and metals according to analytical methods described above.

## **Additional Hotspot Sampling**

If hotspots are identified during the remedial program, hotspot removal actions will be performed to ensure that hot-spots are fully removed. Analytes for end-point sampling will be those parameters that are driving the hot-spot removal action and will be approved by OER. Analysis will be performed according to analytical methods described above. Frequency for hot-spot end-point sample collection is as follows:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.
2. For excavations 20 to 300 feet in perimeter:
  - For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
  - For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
3. For sampling of volatile organics, bottom samples should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches.
4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

Post-remediation end-point sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination.

If either LNAPL and/or DNAPL are detected, appropriate samples will be collected for characterization and “finger print analysis” and required regulatory reporting (i.e. spills hotline) will be performed.

### **Quality Assurance/Quality Control**

The fundamental QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance of the analytical protocol. The accuracy, precision and completeness requirements will be addressed by the laboratory for all data generated.

One blind duplicate sample for every 20 samples collected will be submitted to the approved laboratory for analysis of the same parameters. Trip blanks will be used whenever samples are transported to the laboratory for analysis of VOCs. One trip blank will be submitted to the laboratory with each shipment of soil samples. Trip blanks will not be used for samples to be analyzed for metals, SVOCs or pesticides.

Collected samples will be appropriately packaged, placed in coolers and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of ice or “cold-paks” to maintain a temperature of 4°C.

Dedicated disposable sampling materials will be used for the collection endpoint samples, eliminating the need to prepare field equipment (rinsate) blanks. However, if non-disposable equipment is used, (stainless steel scoop, etc.) field rinsate blanks will be prepared at the rate of 1 for every eight samples collected. Decontamination of non-dedicated sampling equipment will consist of the following:

- Gently tap or scrape to remove adhered soil
- Rinse with tap water
- Wash withalconox® detergent solution and scrub
- Rinse with tap water
- Rinse with distilled or deionized water

Field blanks will be prepared by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers.

### **Import and Reuse of Soils**

Import of soils onto the property and reuse of soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix 4. Soil import is not anticipated at this time. Soil import is not anticipated at this time.

### **4.3 ENGINEERING CONTROLS**

The excavation required for the proposed Site development will achieve Track 4 SCOs. Engineering Controls were employed in the remedial action to address residual contamination remaining at the site. The Site has three primary Engineering Control Systems. These are:

- Concrete building slab;
- Waterproofing / vapor barrier; and
- Active sub-slab depressurization system (The measured water table is within two to three feet of the planned elevation of bottom of the basement slab. If the SSD vent pipes are intermittently inundated by groundwater, the SSD system will be converted to a passive venting system).

### **Composite Cover**

Exposure to residual soil/fill will be prevented by an engineered, composite cover system to be built on the Site. This composite cover system is comprised of a 24-inch thick concrete building slab beneath the proposed building to cover the entire property.

Figure 9 shows the location of each cover type built at the Site.

The composite cover system will be a permanent engineering control. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the SMP and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the

remedial action is complete. Maintenance of this composite cover system will be described in the SMP in the RAR.

### **Vapor Barrier**

Migration of potential soil vapor from onsite or offsite sources in the future will be mitigated with a combination of building slab and vapor barrier. The vapor barrier will consist of WR Grace Preprufe® 300R waterproofing membrane. The vapor barrier will extend throughout the area occupied by the footprint of the new building and up the foundation sidewalls in accordance with manufacturer specifications.

The project's Professional Engineer licensed by the State of New York will have primary direct responsibility for overseeing the implementation of the vapor barrier. Product specification sheets are provided in Appendix F. The Remedial Action Report will include photographs (maximum of two photos per page) of the installation process, PE/RA certified letter (on company letterhead) from primary contractor responsible for installation oversight and field inspections, and a copy of the manufacturer's certificate of warranty.

The vapor barrier system (as part of the composite cover system) will be a permanent engineering control. The composite cover system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the SMP and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the SMP in the RAR.

### **Sub-Slab Depressurization System**

Migration of soil vapor will be mitigated with the construction of an active SSDS

The active SSDS will consist of 4-inch diameter ASTM F1760 recycled perforated pipe set into a one foot layer of Recycled Concrete Aggregate (RCA) meeting the NYSDOT specification. A four-inch diameter riser pipe will be extended to the roof and will be completed with an SSD fan to be selected after the performance of a pilot test. Preliminarily, Fantec Fan models HP220 and HP2190 will be evaluated for this project. The location and details of the system are presented on Figure 11. The SSDS is expected to operate continuously. However, the measured water

table is within two to three feet of the planned elevation of bottom of the basement slab. If the SSD vent pipes are intermittently inundated by groundwater, the SSD system will be converted to a passive venting system. Otherwise, the system will include an alarm that will activate in the event the riser pipe is no longer under vacuum, an indication that the fan has stopped working. If the alarm is activated, a maintenance worker will be instructed to call for service. The SSD fans are relatively inexpensive and can be easily replaced by an electrician. The SSDS has no filters or parts that require lubrication.

The SSDS should be inspected on an annual basis by a QEP or Professional Engineer, preferably during the winter heating season, to confirm that the fan is functioning properly. After the SSDS has been installed and placed in operation, the owner may petition OER for permission to convert the active system to a passive system. During the winter heating season, the SSD fan should be turned off for a period of 48 hours. Concurrent sub-slab vapor samples (collected from the monitoring points installed as part of the system) and basement indoor air samples should be collected using SUMMA canisters set to fill over an eight-hour period. These results should be provided to OER for evaluation to determine if the fan can be removed and the system can be converted to a passive vent.

- The SSDS system is planned to be constructed out of recycled 4" PVC;
- Layout and design of the SSDS system is shown in Figure 11;

If Track 1 Unrestricted Use SCOs are not achieved at the Site, the SSDS will be a permanent engineering control. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. Maintenance of this SSDS will be described in the SMP in the RAR.

#### **4.4 INSTITUTIONAL CONTROLS**

Institutional Controls (IC) will be incorporated in this remedial action to manage residual soil/fill and other media and render the Site protective of public health and the environment. Institutional Controls are listed below. Long-term employment of EC/ICs will be established in a Declaration of Covenant and Restrictions (DCR) for non E sites assigned to the property by the

title holder and will be implemented under a site-specific Site Management Plan (SMP) that will be included in the RAR.

Institutional Controls for this remedial action are:

- Recording of an OER-approved Declaration of Covenant and Restrictions (DCR) with the City Register or county clerk, as appropriate. The DCR will include a description of all ECs and ICs, will summarize the requirements of the SMP, and will note that the property owner and property owner's successors and assigns must comply with the DCR and the approved SMP. The recorded DCR will be submitted in the Remedial Action Report. The DCR will be recorded prior to OER issuance of the Notice of Completion;
- Submittal of a SMP in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, inspection, and certification of ECs and IC's. SMP will require that the property owner and property owner's successors and assigns will submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. OER retains the right to enter the Site in order to evaluate the continued maintenance of any controls. This certification shall be submitted at a frequency to be determine by OER in the SMP and will comply with RCNY §43-1407(1)(3).
- Vegetable gardens and farming on the Site are prohibited in contact with residual soil materials;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use;
- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP;
- The Site will be used for commercial use and will not be used for a higher level of use without prior approval by OER.

#### **4.5 SITE MANAGEMENT PLAN**

Site Management is the last phase of remediation and begins with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial Action. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by the DCR and this RAWP. The Site Management Plan is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the DCR and the Site Management Plan are implemented.

The SMP will provide a detailed description of the procedures required to manage residual soil/fill left in place following completion of the remedial action in accordance with the Brownfield Cleanup Agreement with OER. This includes a plan for: (1) implementation of EC's and ICs; (2) implementation of monitoring programs; (3) operation and maintenance of EC's; (4) inspection and certification of EC's; and (5) reporting.

Site management activities, reporting, and EC/IC certification will be scheduled by OER on a periodic basis to be established in the SMP and will be subject to review and modification by OER. The Site Management Plan will be based on a calendar year and certification reports will be due for submission to OER by July 31 of the year following the reporting period.

#### **4.6 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT**

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur.

Data and information reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA). As part of the VCP process, a QHHEA was performed to determine whether the Site poses an existing or future health hazard to the Site's exposed or potentially exposed population. The sampling data from the RI were evaluated to determine whether there is any health risk under current and future conditions by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This QHHEA was prepared in accordance with Appendix 3B and Section 3.3 (b) 8 of the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation.

##### **Known and Potential Contaminant Sources**

Based on the results of the RIR, the contaminants of concern are:

Soil:

- Two Semi-Volatile Organic Compounds (SVOC) including benzo(a)anthracene, and benzo(b)fluoranthene were detected above their Restricted Residential Use SCOs.
- Three pesticides including 4,4-DDE, 4,4-DDD, and 4,4-DDT were identified but did not exceed their Restricted Residential Use SCOs
- Cadmium was detected above its Restricted Residential Use SCO.

Groundwater:

- Several metals were identified, but only magnesium, manganese, and sodium were detected above their Groundwater Quality Standards.

#### Soil Vapor:

- Petroleum-related VOCs (BTEX) were detected at moderate concentrations.
- The chlorinated VOC, trichloroethylene (TCE) and tetrachloroethylene (PCE) was at elevated concentrations and were above the monitoring level ranges established within the NYSDOH soil vapor guidance matrix and require mitigation.

### **Nature, Extent, Fate and Transport of Contaminants**

SVOCs, pesticides and metals are present in the soil/fill materials throughout the Site at shallow and deep depths. Cadmium in soil was detected at elevated concentration and in both shallow and deep soils. Cadmium and lead were not detected in groundwater. Metal found in groundwater are most likely linked to regional impacts. The VOCs that were identified in soil gas at elevated concentrations were not found in on-Site soils and were not detected in groundwater and indicate off-site sources.

#### **Receptor Populations**

*On-Site Receptors:* Because the site is currently vacant and undeveloped access to Site is restricted by a 6 foot high, chained and locked, perimeter fence. Onsite receptors are limited to trespassers and site representatives and visitors granted access to the property. During construction, potential on-site receptors include construction workers, site representatives, and visitors. Under proposed future conditions, potential on-site receptors include adult workers and visitors and child students and visitors.

*Off-Site Receptors:* Potential off-site receptors within a 400 foot radius of the Site include: adult and child residents; commercial and construction workers; pedestrians; trespassers; and passerby based on the following:

1. Commercial Businesses (up to 400 foot) – existing and future

2. Residential Buildings (up to 400 foot) – existing and future
3. Building Construction/ Renovation (up to 400 foot) – existing and future
4. Pedestrians, Trespassers, Cyclists (up to 400 foot) – existing and future
5. Schools (up to 400 foot) – existing and future

### **Potential Routes of Exposure**

Three potential primary routes exist by which chemicals can enter the body: ingestion, inhalation, and dermal absorption. Exposure can occur based on the following potential media:

- Ingestion of groundwater or fill/ soil;
- Inhalation of vapors or particulates; and
- Dermal absorption of groundwater or fill/ soil.

### **Potential Exposure Points**

*Current Conditions:* The site is currently a vacant lot surrounded by a locked six foot chain-link fence. Therefore, there are no potential exposure pathways from ingestion, inhalation, or dermal absorption of soil/ fill except for trespassers or site representatives. Groundwater is marginally contaminated and is not exposed at the site, and because the site is served by the public water supply, groundwater is not used at the site and there are no potential for exposure. Because the site is currently undeveloped, there is no potential for soil vapor to accumulate on site.

*Construction/ Remediation Activities:* During the remedial action, onsite workers will come into direct contact with surface soils, subsurface soils, and groundwater, as a result of on-Site construction and excavation activities. Due to the depth of groundwater, contact with groundwater is possible. On-Site construction workers potentially could ingest, inhale or have dermal contact with any exposed impacted soil, and fill. Similarly, off-Site receptors could be exposed to dust and vapors from on-Site activities. During construction, on-Site and off-Site exposures to contaminated dust from on-Site will be addressed through the Soil/Materials Management Plan, dust controls, and through the implementation of the Community Air-Monitoring Program and a Construction Health and Safety Plan.

*Proposed Future Conditions:* Under future remediated conditions, all soils in excess of Site Specific Track 4 SCOs will be removed. The site will be fully capped, limiting potential direct exposure to soil and groundwater remaining in place, and engineering controls (vapor barrier/SSDS) will prevent any exposure to potential for inhalation via soil vapor intrusion. The site is served by the public water supply, and groundwater is not used at the site. There are no plausible off-site pathways for oral, inhalation, or dermal exposure to contaminants derived from the site.

### **Overall Human Health Exposure Assessment**

There are potential complete exposure pathways for the current site condition. There is a potential complete exposure pathway that requires mitigation during implementation of the remedy. There is no complete exposure pathway under future conditions after the site is developed. This assessment takes into consideration the reasonably anticipated use of the site, which includes a commercial structure, site-wide impervious surface cover cap, and a subsurface vapor barrier system for the building. Under current conditions, on-Site exposure pathways exist for those given access to the Site or trespassers. During remedial construction, on-Site and off-Site exposures to contaminated dust from historic fill material will be addressed through dust controls, and through the implementation of the Community Air Monitoring Program, the Soil/Materials Management Plan, and a Construction Health and Safety Plan. Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There are no surface waters in close proximity to the Site that could be impacted or threatened.

## **5.0 REMEDIAL ACTION MANAGEMENT**

### **5.1 PROJECT ORGANIZATION AND OVERSIGHT**

Principal personnel who will participate in the remedial action include the following. The Professional Engineer (PE) and Qualified Environmental Professionals (QEP) for this project are Karen Tyll and Eric Weinstock.

### **5.2 SITE SECURITY**

Site access will be controlled by through gated entrances to the fenced property.

### **5.3 WORK HOURS**

The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. The hours of operation will be conveyed to OER during the pre-construction meeting.

### **5.4 CONSTRUCTION HEALTH AND SAFETY PLAN**

The Health and Safety Plan is included in Appendix E. The Site Safety Coordinator will be Thomas Brown. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations. The HASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign an HASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

An emergency contact sheet with names and phone numbers is included in the CHASP. That document will define the specific project contacts for use in case of emergency.

## **5.5 COMMUNITY AIR MONITORING PLAN**

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

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedences of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be reported to the OER Project Manager and included in the Daily Report.

## **VOC Monitoring, Response Levels, and Actions**

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

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

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

## **Particulate Monitoring, Response Levels, and Actions**

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\text{mcg}/\text{m}^3$ ) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will 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.
- 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 will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within  $150 \text{ mcg}/\text{m}^3$  of the upwind level and in preventing visible dust migration.

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

## **5.6 AGENCY APPROVALS**

All permits or government approvals required for remedial construction have been or will be obtained prior to the start of remedial construction. Approval of this RAWP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

## **5.7 SITE PREPARATION**

### **Pre-Construction Meeting**

OER will be invited to attend the pre-construction meeting at the Site with all parties involved in the remedial process prior to the start of remedial construction activities.

### **Mobilization**

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all sampling equipment needed for the field investigation), marking/staking sampling locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

### **Utility Marker Layouts, Easement Layouts**

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Mark-Out Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAWP. The integrity and safety of on-Site and off-Site structures will be maintained during all invasive, excavation or other remedial activity performed under the RAWP.

### **Equipment and Material Staging**

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations.

### **Stabilized Construction Entrance**

Steps will be taken to ensure that trucks departing the site will not track soil, fill or debris off-Site. Such actions may include use of cleaned asphalt or concrete roads or use of stone or other aggregate-based egress paths between the truck inspection station and the property exit. Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils, fill and debris.

### **Truck Inspection Station**

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the NYC VCP Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

### **Extreme Storm Preparedness and Response Contingency Plan**

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of site structures and construction materials and equipment, and dislocation of support of excavation structures. Damage from wind during an extreme storm event can create unsafe or unstable structures, damage safety structures and cause downed power lines creating dangerous site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the enrollee will undertake the following steps for site preparedness prior to the event and response after the event.

#### **Storm Preparedness**

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from holes, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped

stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and fortified, including, as necessary: clean and reposition silt fences, hay bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

### **Storm Response**

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to OER at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911. Petroleum spills will be reported to NYS DEC within 2 hours of identification and consistent with State regulations. Emergency and spill conditions will also be reported to OER. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed. Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will be collected and appropriately managed. Support of excavation structure will be inspected and fortified as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Stormwater control systems and structures will be inspected and maintained as necessary. If soil or fill materials are discharged off site to adjacent properties, property owners and OER will be notified and corrective measure plan designed to remove and clean dislocated material will be submitted to OER and implemented following approval by OER and granting of site access by the property owner. Impacted offsite areas may require characterization based on site conditions, at the discretion of OER. If onsite petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYS DEC's spill hotline at DEC 800-457-7362. If the source of the spill is ongoing and can be identified, it should

be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYS DEC.

### **Storm Response Reporting**

A site inspection report will be submitted to OER at the completion of site inspection. An inspection report established by OER is available on OER's website ([www.nyc.gov/oer](http://www.nyc.gov/oer)) and will be used for this purpose. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. The site inspection report will be sent to the OER project manager and will include the site name, address, tax block and lot, site primary and alternate contact name and phone number. Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the site was dislocated and whether any of the soil left the site; estimates of the volume of soil that left the site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of onsite or offsite exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYS DEC; description of corrective actions; schedule for corrective actions. This report should be completed and submitted to OER project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

## **5.8 TRAFFIC CONTROL**

Drivers of trucks leaving the NYC VCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site is shown on Figure 12.

## **5.9 DEMOBILIZATION**

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);

- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination, and;
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (*e.g.*, soil excavators) will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

## **5.10 REPORTING AND RECORD KEEPING**

### **Daily Reports**

Daily reports providing a general summary of activities for each day of *active remedial work* will be emailed to the OER Project Manager by the end of the following day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of work performed;
- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP excursions, if any;
- Photograph of notable Site conditions and activities.

The frequency of the reporting period may be revised in consultation with OER project manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to OER of emergencies (accidents, spills), requests for changes to the RAWP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAWP will be

communicated directly to the OER project manager by personal communication. Daily reports will be included as an Appendix in the Remedial Action Report.

## **Record Keeping and Photo Documentation**

Job-site record keeping for all remedial work will be performed. These records will be maintained on-Site during the project and will be available for inspection by OER staff. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas. Photographs will be submitted at the completion of the project in the RAR in digital format (i.e. jpeg files).

### **5.11 COMPLAINT MANAGEMENT**

All complaints from citizens will be promptly reported to OER. Complaints will be addressed and outcomes will also be reported to OER in daily reports. Notices to OER will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

### **5.12 DEVIATIONS FROM THE REMEDIAL ACTION WORK PLAN**

All changes to the RAWP will be reported to the OER Project Manager and will be documented in daily reports and reported in the Remedial Action Report. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from OER noting the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and
- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

## **6.0 REMEDIAL ACTION REPORT**

A Remedial Action Report (RAR) will be submitted to OER following implementation of the remedial action defined in this RAWP. The RAR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RAR will include:

- Information required by this RAWP;
- As-built drawings for all constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy;
- Site Management Plan (if Track 1 is not achieved);
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results and all material characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material.
- Account of the origin and required chemical quality testing for material imported onto the Site.
- Recorded Declaration of Covenants and Restrictions.
- Reports and supporting material will be submitted in digital form.



### Remedial Action Report Certification

The following certification will appear in front of the Executive Summary of the Remedial Action Report. The certification will include the following statements:

*I, Karen Tyll am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 153-157 Sherman Avenue Site (NYC OER Project Number 15TEMP001M and NYC VCP Project Number 15CVCP127M).*

*I, Eric Weinstock, am a Qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the 153-157 Sherman Avenue Site (NYC OER Project Number 15TEMP001M and NYC VCP Project Number 15CVCP127M).*

*I certify that the OER-approved Remedial Action Work Plan dated March 27 2015 and Stipulations in a letter dated month day, year; if any were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.*

\_\_\_\_\_  
Name

\_\_\_\_\_  
NYS PE License Number

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



\_\_\_\_\_  
QEP Name

\_\_\_\_\_  
QEP Signature

\_\_\_\_\_  
Date

## 7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a number month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	-
Mobilization	1	1
Remedial Excavation	2	24
Demobilization	26	2
Record Declaration of Covenants and Restrictions	28	2
Submit Remedial Action Report	30	4

**APPENDIX A**  
**PROPOSED DEVELOPMENT PLANS**

## **APPENDIX B**

### **CITIZEN PARTICIPATION PLAN**

The NYC Office of Environmental Remediation and WSFSSH have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program. This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, WSFSSH will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the NYC Office of Environmental Remediation (OER) until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841.

**Project Contact List** OER has established a Site Contact List for this project to provide public notices in the form of fact sheets to interested members of the Community. Communications will include updates on important information relating to the progress of the cleanup program at the Site as well as to request public comments on the cleanup plan. The Project Contact List includes owners and occupants of adjacent buildings and homes, principal administrators of nearby schools, hospitals and day care centers, the public water supplier that serves the area, established document repositories, the representative Community Board, City Council members, other elected representatives and any local Brownfield Opportunity Area (BOA) grantee organizations. Any member of the public or organization will be added to the Site Contact List on request. A copy of the Site Contact List is maintained by OER's project manager. If you would like to be added to the Project Contact List, contact NYC OER at (212) 788-8841 or by email at [brownfields@cityhall.nyc.gov](mailto:brownfields@cityhall.nyc.gov).

**Repositories** A document repository is maintained online. Internet access to view OER's document repositories is available at public libraries. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. The library nearest the Site is:

Inwood Library

4790 Broadway

New York, NY, 10034

(212) 942-2445

Sun Closed

Mon 11:00am - 7:00pm

Tue 11:00am - 6:00pm

Wed 11:00am - 7:00pm

Thu 11:00am - 6:00pm

Fri 10:00am - 5:00pm

Sat 10:00am - 5:00pm

**Digital Documentation** NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use.

**Public Notice and Public Comment** Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with descriptive project summaries, updates on recent and upcoming project activities, repository information, and important phone and email contact information. All notices will be prepared by WSFSSH, reviewed and approved by OER prior to distribution and mailed by WSFSSH. Public

comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

**Citizen Participation Milestones** Public notice and public comment activities occur at several steps during a typical NYC VCP project. See flow chart on the following page, which identifies when during the NYC VCP public notices are issued: These steps include:

- **Public Notice of the availability of the Remedial Investigation Report and Remedial Action Work Plan and a 30-day public comment period on the Remedial Action Work Plan.**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.

- **Public Notice announcing the approval of the RAWP and the start of remediation**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.

- **Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site and announcing the issuance of the Notice of Completion.

## APPENDIX C

### SUSTAINABILITY STATEMENT

This Sustainability Statement documents sustainable activities and green remediation efforts planned under this remedial action.

**Reuse of Clean, Recyclable Materials** Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

When possible the use of sustainable, recycled products such as RCA blend and ASTM F1760 pipe.

An estimate of the quantity (in tons) of clean, non-virgin materials (reported by type of material) reused under this plan will be quantified and reported in the RAR.

**Reduce Consumption of Virgin and Non-Renewable Resources** Reduced consumption of virgin and non-renewable resources lowers the overall environmental impact of the project on the region by conserving these resources.

[When possible use of sustainable, recycled products such as RCA blend and ASTM F1760 pipe.](#) An estimate of the quantity (in tons) of virgin and non-renewable resources, the use of which will be avoided under this plan, will be quantified and reported in the RAR.

**Reduced Energy Consumption and Promotion of Greater Energy Efficiency** Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

Best efforts will be made to quantify energy efficiencies achieved during the remediation and will be reported in the Remedial Action Report (RAR). Where energy savings cannot be easily quantified, a gross indicator of the amount of energy saved or the means by which energy savings was achieved will be reported.

**Conversion to Clean Fuels** Use of clean fuel improves NYC's air quality by reducing harmful emissions.

An estimate of the volume of clean fuels used during remedial activities will be quantified and reported in the RAR.

**Recontamination Control** Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

An estimate of the area of the Site that utilizes recontamination controls under this plan will be reported in the RAR in square feet.

**Stormwater Retention** Stormwater retention improves water quality by lowering the rate of combined stormwater and sewer discharges to NYC's sewage treatment plants during periods of precipitation, and reduces the volume of untreated influent to local surface waters.

An estimate of the enhanced stormwater retention capability of the redevelopment project will be included in the RAR.

**Linkage with Green Building** Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

The number of Green Buildings that are associated with this brownfield redevelopment property will be reported in the RAR. The total square footage of green building space created as a function of this brownfield redevelopment will be quantified for residential, commercial and industrial/manufacturing uses.

**Paperless Brownfield Cleanup Program** WSFSSH is participating in OER's Paperless Brownfield Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

**Low-Energy Project Management Program** WSFSSH is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

**Trees and Plantings** Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance.

An estimate of the land area that will be vegetated, including the number of trees planted or preserved, will be reported in square feet in the RAR.

## **APPENDIX D**

### **SOIL/MATERIALS MANAGEMENT PLAN**

#### **1.1 SOIL SCREENING METHODS**

Visual, olfactory and PID soil screening and assessment will be performed under the supervision of a Qualified Environmental Professional and will be reported in the RAR. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Completion.

#### **1.2 STOCKPILE METHODS**

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

#### **1.3 CHARACTERIZATION OF EXCAVATED MATERIALS**

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Soils proposed for reuse on-Site will be managed as defined in this plan.

#### **1.4 MATERIALS EXCAVATION, LOAD-OUT, AND DEPARTURE**

The PE/QEP overseeing the remedial action will:

- oversee remedial work and the excavation and load-out of excavated material;
- ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
- ensure that Site development activities and development-related grading cuts will not interfere with, or otherwise impair or compromise the remedial activities proposed in this RAWP;
- ensure that the presence of utilities and easements on the Site has been investigated and that any identified risks from work proposed under this plan are properly addressed by appropriate parties;
- ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site;
- ensure that all egress points for truck and equipment transport from the Site will be kept clean of Site-derived materials during Site remediation.

Locations where vehicles exit the Site shall be inspected daily for evidence of soil tracking off premises. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site will not be performed without prior OER approval.

#### **1.5 OFF-SITE MATERIALS TRANSPORT**

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will

be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Outbound truck transport routes are shown in Figure 12. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

## **1.6 MATERIALS DISPOSAL OFF-SITE**

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the PE/QEP or Enrollee to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an environmental remediation Site in Manhattan, New York under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Enrollee. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material. These documents will be included in the RAR.

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the RAR.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the RAR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

### **1.7 MATERIALS REUSE ON-SITE**

Soil and fill that is derived from the property that meets the Soil Cleanup Objectives (SCOs) established in this plan may be reused on-Site. The SCOs for on-Site reuse are Track 1 Unrestricted Use SCOs **or** Track 2 Commercial **or** Track 2 Commercial as modified by the Track 4 Site-Specific SCOs listed Section 4.2. ‘Reuse on-Site’ means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC VCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

### **1.8 DEMARCATION**

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, the top of the residual soil/fill will be defined by one of three methods: (1) placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent material to be placed on the surface of residual soil/fill to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the SMP; or (2) a land survey of the top elevation of residual soil/fill before the placement of cover soils, pavement and associated sub-soils, or other materials or structures or, (3) all materials beneath the approved cover will be considered impacted and subject to site management after the

remedy is complete. Demarcation may be established by one or any combination of these three methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RAR.

This demarcation will constitute the top of the site management horizon. Materials within this horizon require adherence to special conditions during future invasive activities as defined in the Site Management Plan.

### **1.9 IMPORT OF BACKFILL SOIL FROM OFF-SITE SOURCES**

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. The backfill and cover soil quality objectives are listed in Section 4.2.

A process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYS DEC.

All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this RAWP. The RAR will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

## **Source Screening and Testing**

Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:

- Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;
- The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the RAR. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

### **1.10 FLUIDS MANAGEMENT**

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New

York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by New York State Department of Environmental Conservation.

### **1.11 STORMWATER POLLUTION PREVENTION**

Applicable laws and regulations pertaining to stormwater pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this RAWP (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

### **1.12 CONTINGENCY PLAN**

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER.

Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

### **1.13 ODOR, DUST, AND NUISANCE CONTROL**

#### **Odor Control**

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

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying the Remedial Action Report.

#### **Dust Control**

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. OER will

be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the Remedial Action Report.

### **Other Nuisances**

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided, during Site clearing and grubbing, and during the remedial program, as necessary, to prevent nuisances.

**APPENDIX E**  
**CONSTRUCTION HEALTH AND SAFETY PLAN**



## **Construction Health & Safety Plan**

**153-157 Sherman Avenue  
New York, New York 10034**

**March 2015**

**Prepared for:**

**West Side Federation for Senior and Supportive Housing, Inc.  
2345 Broadway  
New York, NY 10024**

**Prepared by:**

**CA RICH CONSULTANTS, INC.  
17 Dupont Street  
Plainview, New York 11803-1614**

## Construction Health & Safety Plan

### Soil Excavation

153-157 Sherman Avenue  
New York, NY 10034  
Block 2221; Lot 5

#### 1.0 INTRODUCTION

This Construction Health and Safety Plan (“CHASP”) is developed for utilization during construction activities located at the above-referenced site in Inwood, New York (the Site or Property). The HASP is to be enforced by CA RICH’s Project Health and Safety Manager, the on-site Health & Safety Coordinator (HSC) or their assignee. The on-site HSC will interact with the Project Manager and is vested with the authority to make field decisions including the termination of on-site activities if an imminent health and safety hazard, condition or related concern arises. Information and protocol in the CHASP is applicable to all on-site personnel who will be entering the designated work zone.

#### 2.0 POTENTIAL HAZARDS

##### 2.1 Chemical Hazards

The known chemicals or constituents of concern according to the Remedial Investigation Report (RIR) prepared by CA RICH Consultants, dated March 2015 consist of the metal; Cadmium which was detected in Site soils above New York State Department of Environmental Conservation (NYSDEC) Part 375 guidance values.

During the construction activities, CA RICH will operate as if there is a potential hazard from the above-listed compounds. Physical properties and toxicological information is included in Appendix A.

##### 2.2 Other Health & Safety Risks

Normal physical hazards associated with using excavation equipment and hand tools as well as hazards associated with adverse climatic conditions (heat & cold) or physical site-related debris represent a certain degree of risk to be assumed by on-site personnel.

Certain provisions in this Plan, specifically the use of personnel protective equipment, may tend to increase the risk of physical injury, as well as susceptibility to cold or heat stress. This is primarily due to restrictions in dexterity, hearing, sight, and normal body heat transfer inherent in the use of protective gear.

### **3.0 RISK MANAGEMENT**

#### **3.1 Work / Exclusion Zones**

The subject Property currently a vacant lot. The Tax Map designation for the Property is Block 2221 and Lot 5. The project plans currently anticipate the excavation depth for the building to be four feet below grade. All work (including, but not limited to the grading and excavation) activities conducted will establish a work/exclusion zone. Access to this area will be limited to properly trained, properly protected personnel directly involved with the work. Enforcement of the work/exclusion zone boundaries is the responsibility of the on-site Health & Safety Coordinator (HSC) or his/her properly trained assignee.

#### **3.2 Personnel Protection**

Health & Safety regulatory personnel have developed different levels of personnel protection to deal with differing degrees of potential risks of exposure to chemical constituents. The levels are designated as **A**, **B**, **C**, and **D** and are ranked according to the amount of personnel protection afforded by each level. Level **A** is the highest level of protection and Level **D** is the lowest level of protection.

The different levels are primarily dependent upon the degree of respiratory protection necessary, in conjunction with appropriate protective clothing. Levels of protection mandate a degree of respiratory protection. However, flexibility exists within the lower levels (B, C, and D) concerning proper protective clothing.

The four levels of protection were developed for utilization in situations which involve suspected or known atmospheric and/or environmental hazards including airborne contamination and skin-affecting substances. It is anticipated that all of the work will be performed using Level D protection (no respiratory protection with protective clothing requirements limited to long sleeved shirts, long pants or coveralls, work gloves and leather work boots).

Level D may be modified by the HSC to include protective clothing or equipment (Saran-coated disposable coveralls or PVC splash suits, safety glasses, hard hat with face shield, and chemically resistant boots) based upon physical hazards, skin contact concerns, and real-time monitoring.

Real-time air monitoring for total airborne organics using either an Organic Vapor Analyzer (OVA) or a Photo-Ionization Detector (PID) will determine if and when an upgrade from Level D to a higher level of respiratory protection is warranted. Decisions for an upgrade from Level D to higher levels of protection, mitigative actions, and/or suspension of work are the responsibility of the Project Manager and/or the designated on-site HSC.

#### **3.3 Air Monitoring**

The HSC or his/her properly trained assignee will conduct "Real Time" air monitoring for total organic vapors and total particulates. 'Real-time' monitoring refers to the utilization of instrumentation, which yields immediate measurements. The utilization of real time monitoring helps determine immediate or long-term risks to on-site personnel and the general public, the appropriate level of personnel respiratory protection necessary, and actions to mitigate the recognized hazard.

### **3.3.1. Particulate Monitoring**

#### **A. Instrumentation**

Dust particulates in air will be monitored using a light scattering technique MINIRAM Model PDM-3 Miniature Real-time Aerosol Monitor (MINIRAM) or equivalent. The MINIRAM is capable of measuring airborne dust particles within the range of 10 to 100,000 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ). Particulate monitoring will only be necessary during major excavation activities.

#### **B. Application**

Dust monitoring will occur at regular intervals during major excavation activities. Monitoring will be conducted in upgradient and downgradient locations, relative to prevailing wind direction) along the perimeter of the work zone. The HSC or his assignee will perform the monitoring. As outlined in the NYSDOH Community Air Monitoring Plan, if particulate levels in the downwind location are  $150 \text{ mg}/\text{m}^3$  greater than those measured in the upwind location, dust suppression techniques shall be employed.

### **3.3.2 Organic Vapor**

#### **A. Instrumentation**

Real-time monitoring for total organic vapor (TOV) utilizes either a PID or flame ionization detector (FID). The appropriate PID is an intrinsically safe HNU Systems Model PI-101, MiniRae PID or equivalent, which is factory calibrated to benzene. The appropriate FID is a Foxboro model 128 OVA or equivalent, which is factory calibrated to methane.

#### **B. Application**

Organic vapor monitoring is performed as outlined in the NYSDOH Community Air Monitoring Plan. Specifically, monitoring shall be conducted at the downwind perimeter of the work zone periodically during work activities. If TOV levels exceed 5 milligrams per meter cubed ( $\text{mg}/\text{m}^3$ ) above established pre-work background levels, work activities will be halted and monitoring will be continued under the provision of a Vapor Emission Response Plan (outlined in Section 5).

### **3.4 Worker Training**

Personnel overseeing the excavation of the contaminated soil will be properly trained. This includes the Health & Safety Coordinator and the Project Health and Safety Manager.

Prior to any work, all workers involved with the project should be aware of the potential chemical, physical and biological hazards discussed in this document, as well as the general safety practices outlined below. A safety briefing by the on-site HSC and/or assistant assignee shall take place at the outset of work activities.

The HSC will be available to address environmentally-related health & safety issues a site worker (such as an equipment operator or laborer) may have regarding the site conditions. Once an issue is brought to the HCS's attention, he or she will evaluate the issue and apply the procedures outlined in this Health & Safety Plan.

### **3.5 General Safety Practices**

The following safety practices shall be followed by all project personnel.

1. Avoid unnecessary skin exposure to subsurface materials. Sleeved shirts tucked into long pants (or coveralls), work gloves, and steel-toe leather work boots are required unless modified gear is approved by the HSC. Remove any excess residual soil from clothes prior to leaving the site.
2. No eating, drinking, gum or tobacco chewing, or smoking allowed in designated work areas. Thoroughly wash hands prior to these activities outside the work area. Avoid sitting on the ground during breaks or while eating and drinking. Thoroughly wash all exposed body areas at the end of the workday.
3. Some symptoms of acute exposure include: dizziness, light-headedness, drowsiness, headache, and nose/eye/skin irritation. If these symptoms are experienced or strong odor is detected, leave the work area and immediately report the incident to the on-site HSC.

### **3.6 Enforcement**

Enforcement of the Site Safety Plan will be the responsibility of the HSC or the assignee. The Coordinator should be on-site as needed, based on the work being performed and performs or directly oversees all aspects of the Health & Safety Plan including: air monitoring; environmental mitigation; personnel respiratory and skin protection; general safety practices; documentation; emergency procedures and protocol; and reporting and recordkeeping as described below.

### **3.7 Reporting & Recordkeeping**

Incidents involving injury, symptoms of exposure, discovery of potentially hazardous materials, or unsafe work practices and/or conditions should be immediately reported to the HSC.

A logbook must be maintained on-site to document all aspects of HASP enforcement. The log is paginated and dated with entries made on a daily basis in waterproof ink, initialed by the HSC or assignee. Log entries should include date and time of instrument monitoring, instrument type, measurement method, test results, calibration and maintenance information, as well as appropriate mitigative actions responding to detections. Miscellaneous information to be logged may include weather conditions, reported complaints or symptoms, regulatory inspections, and reasons to upgrade personnel protection above the normal specification (Level D).

### **3.8 Mitigative Measures**

The primary mitigative measure anticipated for this project is dust suppression. Prior to commencing work each day, the excavation contractor should attach a hose to a nearby fire hydrant and attach a spray nozzle to the hose. This should be used to hose down trucks as they leave the Site and to set up a misting operation when excavating soil on dry days. The excavation contractor must obtain the necessary hydrant permit.

**4.0 EMERGENCIES**

**4.1 EMERGENCY RESPONSE SERVICES**

- |     |  |                       |
|-----|--|-----------------------|
| (1) | <b>HOSPITAL</b><br>Manhattanville Health Care Center<br>311 West 231 <sup>st</sup> Street<br>Bronx, New York 10463 | <b>(718) 601-8400</b> |
| (2) | <b>AMBULANCE</b>   | <b>911</b>            |
| (3) | <b>FIRE DEPARTMENT<br/>HAZARDOUS MATERIALS</b>   | <b>911</b>            |
| (4) | <b>POLICE DEPARTMENT</b>   | <b>911</b>            |
| (5) | <b>POISON CONTROL CENTER</b>   | <b>(800) 222-1222</b> |

The preceding list and associated attached map (Figure 1) illustrating the fastest route to the nearest hospital must be conspicuously posted in areas of worker congregation and adjacent to all on-site telephones (if any).

**4.2 EMERGENCY PROCEDURES**

**4.2.1 Contact or Exposure to Suspected Hazardous Materials**

In the event of a fire, chemical discharge, medical emergency, workers are instructed to immediately notify the HSC and proper emergency services (posted). Should physical contact with unknown or questionable materials occur, immediately wash the affected body areas with clean water and notify the HSC. Anyone experiencing symptoms of exposure should exit the work area, notify the HSC, and seek medical attention.

**4.2.2 Ingress/egress**

Clear paths of ingress/egress to work zones and site entrances/exits must be maintained at all times. Unauthorized personnel are restricted from accessing the site.

**5.0 COMMUNITY AIR MONITORING PLAN**

Real-time air monitoring, for volatile compounds and particulate levels at the perimeter of the work area is necessary. This plan includes the following:

- Volatile organic compounds must be monitored at the downwind perimeter of the work area on a continuous basis. If total organic vapor levels exceed 5 ppm above background, work activities must be halted and monitoring continued under the provisions of a Vapor Emission Response Plan. All readings must be recorded and be available for regulatory personnel to review.
- Particulates should be continuously monitored upwind, downwind and within the work area at temporary particulate monitoring stations during excavation activities. If the downwind particulate level is 150 µg/m<sup>3</sup> greater than the upwind particulate level, then dust suppression

techniques must be employed. All readings must be recorded and be available for regulatory personnel to review.

### **Vapor Emissions Response Plan**

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities can resume. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the work area, activities can resume provided:

- The organic vapor level 200 ft. downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 mg/m<sup>3</sup> over background.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. When work shutdown occurs, downwind air monitoring as directed by the Safety Officer will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

### **Major Vapor Emission**

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, the site soil will be misted with water and the downwind area will be monitored. If the water mist does not mitigate the elevated levels all work activities must be halted.

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 work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If efforts to abate the emission source are unsuccessful and, if organic vapor levels are approaching 5 ppm above background for more than 30 minutes in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect;

However, the Major Vapor Emission Response Plan shall be immediately placed into effect if organic vapor levels are greater than 10 ppm above background.

### **Major Vapor Emission Response Plan**

Upon activation, the following activities will be undertaken:

1. All Emergency Response Contacts as listed in the Health & Safety Plan of the Remedial Action Plan will go into effect.
2. The local police authorities will immediately be contacted by the Safety Officer and advised of the situation.
3. 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 Safety Officer.

**6.0 HEALTH & SAFETY PLAN REFERENCES**

1. American Conference Governmental Industrial Hygienists, 1989; Threshold Limit Values and Biological Exposure Indices, 111 Pp.
2. Geoenvironmental Consultants, Inc.; 1987; Safety & Operations At Hazardous Materials Sites.
3. NIOSH Guide To Chemical Hazards, 2002, US Department Of Health And Human Services, Centers For Disease Control.
4. US Department Of Labor Occupational Safety & Health Administration, 1989; Hazardous Waste Operations And Emergency Response Interim Final Rule, 29 CFR Part 1910.
5. Sax, N. I. Dangerous Properties Of Industrial Materials; © 1984.

**7.0 KEY PERSONNEL**

<u>Responsibility</u>	<u>Name and Phone Number</u>	<u>Task Description</u>
Remedial Engineer	<u>Karen Tyll (631) 629-5373</u>	Oversee all technical aspects of the project
Project Manager	<u>Eric Weinstoc (516) 576-8844</u>	Oversee and coordinate all technical aspects for the project
Site Safety Officer	<u>Thomas Brown (516) 576-8844</u>	Coordinate and inspect all health and safety operations from the project site
Site Contact	<u>Richard Barbarino (212) 652-2982</u>	
Project Manager Alternate	<u>Jason T. Cooper (516) 576-8844</u>	
Site Safety Officer Alternate	<u>Jessica Proscia (516) 576-8844</u>	
Client Representative	<u>Stephanie Green (212)-721-6032 x1014</u>	

**Figure 1  
Hospital Location & Directions**



Notes

Figure 1

Trip to:

**311 W 231st St**

Bronx, NY 10463-3804

1.68 miles / 5 minutes

Estimated Fuel Cost: **\$.42**



**153 Sherman Ave**, New York, NY 10034-460440.864679,  
-73.923127

(Address is approximate)

Download  
Free App



1. Start out going **northeast** on **Sherman Ave** toward **W 204th St**. [Map](#)

**0.3 Mi**

*0.3 Mi Total*



2. Turn **slight left** onto **10th Ave**. [Map](#)

*10th Ave is just past Isham St*

*COCO 4633 is on the corner*

**0.3 Mi**

*0.7 Mi Total*



3. Turn **slight right** onto **Broadway / US-9 N**. [Map](#)

*Broadway is just past W 216th St*

**0.5 Mi**

*1.2 Mi Total*



4. Turn **left** onto **W 230th St**. [Map](#)

*W 230th St is 0.1 miles past W 228th St*

*International Leadership Charter School is on the corner*

*If you are on US-9 N and reach Exterior St you've gone a little too far*

**0.3 Mi**

*1.6 Mi Total*



5. Turn **slight right** onto **Riverdale Ave**. [Map](#)

*Riverdale Ave is just past Tibbett Ave*

*Schools Elementary School is on the corner*

**0.10 Mi**

*1.7 Mi Total*



6. Turn **right** onto **W 231st St**. [Map](#)

*W 231st St is just past Riverdale Ave*

*If you reach W 232nd St you've gone about 0.1 miles too far*

**0.03 Mi**

*1.7 Mi Total*



7. **311 W 231ST ST** is on the **left**. [Map](#)

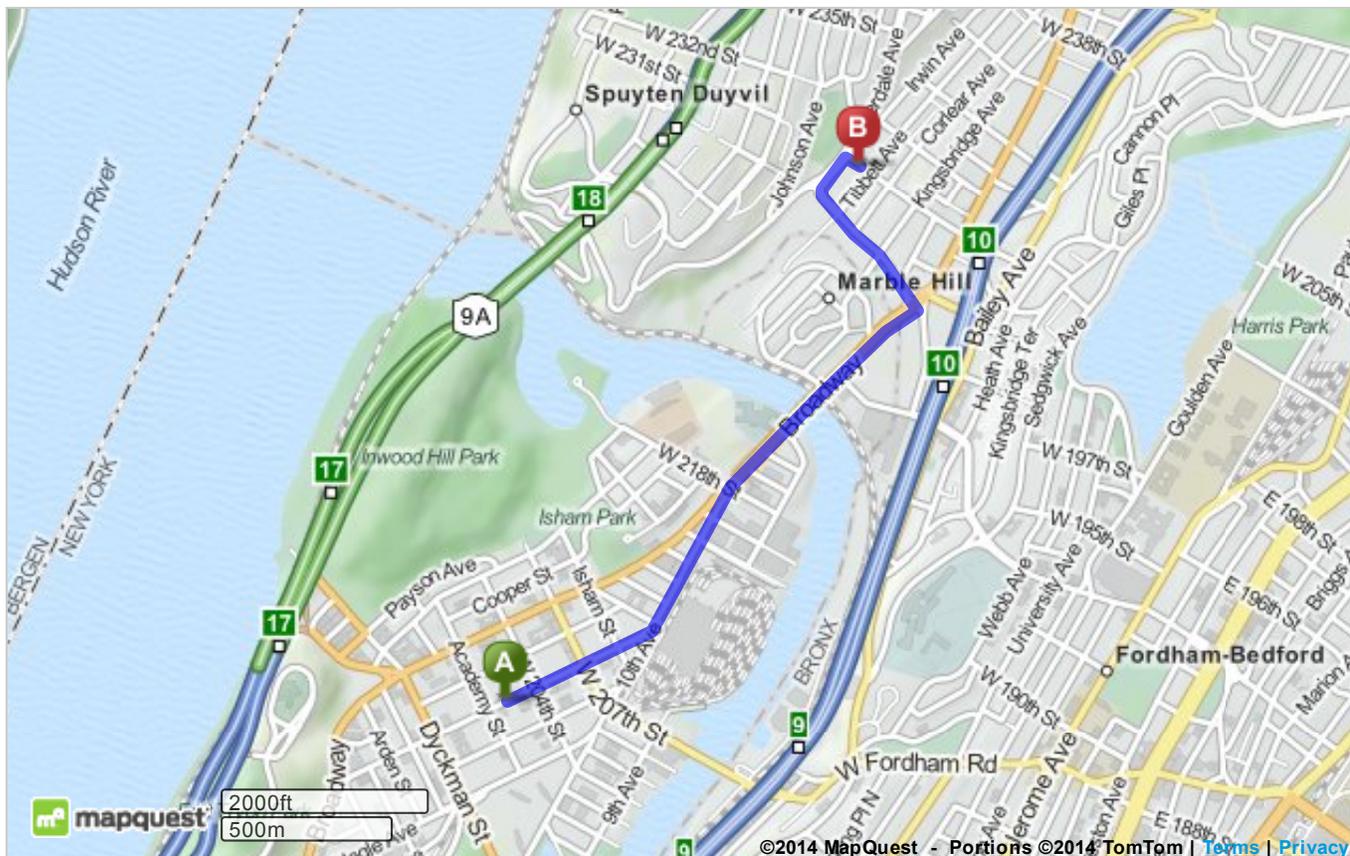
*If you reach Tibbett Ave you've gone a little too far*



**311 W 231st St**, Bronx, NY 10463-3804

Total Travel Estimate: **1.68 miles - about 5 minutes**

Estimated Fuel Cost: **\$.42**



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## **APPENDIX A**

### **Physical Properties and Toxicological Information**

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## Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

## Lead

**Synonyms & Trade Names** Lead metal, Plumbum

<b>CAS No.</b> 7439-92-1	<b>RTECS No.</b> <a href="/niosh-rtecs/OF72D288.html">OF7525000 (/niosh-rtecs/OF72D288.html)</a>	<b>DOT ID &amp; Guide</b>
<b>Formula</b> Pb	<b>Conversion</b>	<b>IDLH</b> 100 mg/m <sup>3</sup> (as Pb) See: <a href="/niosh/idlh/7439921.html">7439921 (/niosh/idlh/7439921.html)</a>

**Exposure Limits**

**NIOSH REL** \*: TWA (8-hour) 0.050 mg/m<sup>3</sup> [See Appendix C \(nengapdx.html\)](#) [\*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]

**OSHA PEL** \*: [1910.1025] TWA 0.050 mg/m<sup>3</sup> [See Appendix C \(nengapdx.html\)](#) [\*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]

**Measurement Methods**

**NIOSH 7082** (</niosh/docs/2003-154/pdfs/7082.pdf>), **7105** (</niosh/docs/2003-154/pdfs/7105.pdf>), **7300** (</niosh/docs/2003-154/pdfs/7300.pdf>), **7301** (</niosh/docs/2003-154/pdfs/7301.pdf>), **7303** (</niosh/docs/2003-154/pdfs/7303.pdf>), **7700** (</niosh/docs/2003-154/pdfs/7700.pdf>), **7701** (</niosh/docs/2003-154/pdfs/7701.pdf>), **7702** (</niosh/docs/2003-154/pdfs/7702.pdf>), **9100** (</niosh/docs/2003-154/pdfs/9100.pdf>), **9102** (</niosh/docs/2003-154/pdfs/9102.pdf>), **9105** (</niosh/docs/2003-154/pdfs/9105.pdf>);

**OSHA ID121**  
(<http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html>)  
 (<http://www.cdc.gov/Other/disclaimer.html>), **ID125G**  
(<http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html>)  
 (<http://www.cdc.gov/Other/disclaimer.html>), **ID206**  
(<http://www.osha.gov/dts/sltc/methods/inorganic/id206/id206.html>)  
 (<http://www.cdc.gov/Other/disclaimer.html>)

See: **NMAM** (</niosh/docs/2003-154/>) or **OSHA Methods**  
(<http://www.osha.gov/dts/sltc/methods/index.html>)   
(<http://www.cdc.gov/Other/disclaimer.html>)

**Physical Description** A heavy, ductile, soft, gray solid.

<b>MW:</b> 207.2	<b>BP:</b> 3164°F	<b>MLT:</b> 621°F	<b>Sol:</b> Insoluble	<b>VP:</b> 0 mmHg (approx)	<b>IP:</b> NA
<b>Sp.Gr:</b> 11.34	<b>Fl.P:</b> NA	<b>UEL:</b> NA	<b>LEL:</b> NA		

Noncombustible Solid in bulk form.

**Incompatibilities & Reactivities** Strong oxidizers, hydrogen peroxide, acids



## Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

## Mercury compounds [except (organo) alkyls] (as Hg)

**Synonyms & Trade Names** Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver  
Synonyms of "other" Hg compounds vary depending upon the specific compound.

**CAS No.** 7439-97-6 (metal)

**RTECS No.**  
OV4550000 (metal)  
(/niosh-rtecs/OV456D7o.html)

**DOT ID & Guide** 2809 172 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=172>)   
(<http://www.cdc.gov/Other/disclaimer.html>) (metal)

**Formula** Hg  
(metal)

**Conversion**

**IDLH** 10 mg/m<sup>3</sup> (as Hg)  
See: 7439976 (/niosh/idlh/7439976.html)

## Exposure Limits

**NIOSH REL :**

Hg Vapor: TWA 0.05 mg/m<sup>3</sup> [skin]  
Other: C 0.1 mg/m<sup>3</sup> [skin]

**OSHA PEL** † ([nengapdxg.html](http://www.nengapdxg.html)): TWA 0.1 mg/m<sup>3</sup>

**Measurement Methods**

**NIOSH 6009** (/niosh/docs/2003-154/pdfs/6009.pdf);

**OSHA ID140**

(<http://www.osha.gov/dts/sltc/methods/inorganic/id140/id140.html>)  
 (<http://www.cdc.gov/Other/disclaimer.html>)

See: **NMAM** (/niosh/docs/2003-154/) or **OSHA Methods**  
(<http://www.osha.gov/dts/sltc/methods/index.html>)   
(<http://www.cdc.gov/Other/disclaimer.html>)

**Physical Description** Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.]

**MW:**  
200.6

**BP:**  
674°F

**FRZ:**  
-38°F

**Sol:**  
Insoluble

**VP:** 0.0012 mmHg

**IP:** ?

**Sp.Gr:**  
13.6  
(metal)

**Fl.P:**  
NA

**UEL:**  
NA

**LEL:** NA

Metal: Noncombustible Liquid

**Incompatibilities & Reactivities** Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper

**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact

**Symptoms** 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

**Target Organs** Eyes, skin, respiratory system, central nervous system, kidneys

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

**Skin:** Prevent skin contact

**Eyes:** No recommendation

**Wash skin:** When contaminated

**Remove:** When wet or contaminated

**Change:** Daily

**First Aid** (See [procedures \(firstaid.html\)](#))

**Eye:** Irrigate immediately

**Skin:** Soap wash promptly

**Breathing:** Respiratory support

**Swallow:** Medical attention immediately

### Respirator Recommendations

#### Mercury vapor:

#### NIOSH

##### Up to 0.5 mg/m<sup>3</sup>:

(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern<sup>†</sup>

(APF = 10) Any supplied-air respirator

##### Up to 1.25 mg/m<sup>3</sup>:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern<sup>†</sup>(canister)

##### Up to 2.5 mg/m<sup>3</sup>:

(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern<sup>†</sup>

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern<sup>†</sup>

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern(canister)

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

##### Up to 10 mg/m<sup>3</sup>:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

#### Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

#### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern

Any appropriate escape-type, self-contained breathing apparatus

#### Other mercury compounds: NIOSH/OSHA

##### Up to 1 mg/m<sup>3</sup>:

(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern<sup>†</sup>

(APF = 10) Any supplied-air respirator

**Up to 2.5 mg/m<sup>3</sup>:**

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

**Up to 5 mg/m<sup>3</sup>:**

(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern(canister)

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

**Up to 10 mg/m<sup>3</sup>:**

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

**Emergency or planned entry into unknown concentrations or IDLH conditions:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0056](#)

[\(/niosh/ipcsneng/neng0056.html\)](#) See MEDICAL TESTS: [0136 \(/niosh/docs/2005-110/nmed0136.html\)](#)

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800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - [Contact CDC-INFO](#)





## Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

## Chromium metal

**Synonyms & Trade Names** Chrome, Chromium

<b>CAS No.</b> 7440-47-3	<b>RTECS No.</b> <a href="/niosh-rtecs/GB401640.html">GB4200000 (/niosh-rtecs/GB401640.html)</a>	<b>DOT ID &amp; Guide</b>
<b>Formula</b> Cr	<b>Conversion</b>	<b>IDLH</b> 250 mg/m <sup>3</sup> (as Cr) See: <a href="/niosh/idlh/7440473.html">7440473 (/niosh/idlh/7440473.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : TWA 0.5 mg/m <sup>3</sup> See <a href="#">Appendix C (nengapdx.html)</a> <b>OSHA PEL</b> *: TWA 1 mg/m <sup>3</sup> See <a href="#">Appendix C (nengapdx.html)</a> [*Note: The PEL also applies to insoluble chromium salts.]		<b>Measurement Methods</b> <b>NIOSH 7024</b> ( <a href="/niosh/docs/2003-154/pdfs/7024.pdf">/niosh/docs/2003-154/pdfs/7024.pdf</a> ), <b>7300</b> ( <a href="/niosh/docs/2003-154/pdfs/7300.pdf">/niosh/docs/2003-154/pdfs/7300.pdf</a> ), <b>7301</b> ( <a href="/niosh/docs/2003-154/pdfs/7301.pdf">/niosh/docs/2003-154/pdfs/7301.pdf</a> ), <b>7303</b> ( <a href="/niosh/docs/2003-154/pdfs/7303.pdf">/niosh/docs/2003-154/pdfs/7303.pdf</a> ), <b>9102</b> ( <a href="/niosh/docs/2003-154/pdfs/9102.pdf">/niosh/docs/2003-154/pdfs/9102.pdf</a> ) ; <b>OSHA ID121</b> ( <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html">http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ), <b>ID125G</b> ( <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html">http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> ( <a href="/niosh/docs/2003-154/">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> ( <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )

**Physical Description** Blue-white to steel-gray, lustrous, brittle, hard, odorless solid.

<b>MW:</b> 52.0	<b>BP:</b> 4788°F	<b>MLT:</b> 3452°F	<b>Sol:</b> Insoluble	<b>VP:</b> 0 mmHg (approx)	<b>IP:</b> NA
<b>Sp.Gr:</b> 7.14	<b>Fl.P:</b> NA	<b>UEL:</b> NA	<b>LEL:</b> NA		

Noncombustible Solid in bulk form, but finely divided dust burns rapidly if heated in a flame.

**Incompatibilities & Reactivities** Strong oxidizers (such as hydrogen peroxide), alkalis**Exposure Routes** inhalation, ingestion, skin and/or eye contact**Symptoms** irritation eyes, skin; lung fibrosis (histologic)**Target Organs** Eyes, skin, respiratory system

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))**Skin:** No recommendation**Eyes:** No recommendation**Wash skin:** No recommendation**Remove:** No recommendation**Change:** No recommendation**First Aid** (See [procedures \(firstaid.html\)](#))**Eye:** Irrigate immediately**Skin:** Soap wash**Breathing:** Respiratory support**Swallow:** Medical attention immediately**Respirator Recommendations****NIOSH****Up to 2.5 mg/m<sup>3</sup>:**

(APF = 5) Any quarter-mask respirator.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.\***Up to 5 mg/m<sup>3</sup>:**

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.\*

(APF = 10) Any supplied-air respirator\*

**Up to 12.5 mg/m<sup>3</sup>:**

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode\*

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.\*

**Up to 25 mg/m<sup>3</sup>:**

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

**Up to 250 mg/m<sup>3</sup>:**

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

**Emergency or planned entry into unknown concentrations or IDLH conditions:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](/niosh/npg/pgintrod.html) See ICSC CARD: [0029 \(/niosh/ipcsneng/neng0029.html\)](/niosh/ipcsneng/neng0029.html)

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## Chromium(III) compounds (as Cr)

**Synonyms & Trade Names** Synonyms vary depending upon the specific Chromium(III) compound. [Note: Chromium(III) compounds include soluble chromic salts.]

CAS No.	RTECS No.	DOT ID & Guide
	<b>Conversion</b>	<b>IDLH</b> 25 mg/m <sup>3</sup> [as Cr(III)] See: <a href="/niosh/idlh/cr3m3.html">cr3m3 (/niosh/idlh/cr3m3.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : TWA 0.5 mg/m <sup>3</sup> See <a href="#">Appendix C (nengapdxc.html)</a> <b>OSHA PEL</b> : TWA 0.5 mg/m <sup>3</sup> See <a href="#">Appendix C (nengapdxc.html)</a>		<b>Measurement Methods</b> <b>NIOSH 7024</b>  ( <a href="/niosh/docs/2003-154/pdfs/7024.pdf">/niosh/docs/2003-154/pdfs/7024.pdf</a> ), <b>7300</b>  ( <a href="/niosh/docs/2003-154/pdfs/7300.pdf">/niosh/docs/2003-154/pdfs/7300.pdf</a> ), <b>7301</b>  ( <a href="/niosh/docs/2003-154/pdfs/7301.pdf">/niosh/docs/2003-154/pdfs/7301.pdf</a> ), <b>7303</b>  ( <a href="/niosh/docs/2003-154/pdfs/7303.pdf">/niosh/docs/2003-154/pdfs/7303.pdf</a> ), <b>9102</b>  ( <a href="/niosh/docs/2003-154/pdfs/9102.pdf">/niosh/docs/2003-154/pdfs/9102.pdf</a> ) ; <b>OSHA ID121</b> <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html">http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html</a>  ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ), <b>ID125G</b> <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html">http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html</a>  ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> ( <a href="/niosh/docs/2003-154/">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a>  <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a>

**Physical Description** Appearance and odor vary depending upon the specific compound.

Properties vary depending upon the specific compound.				

**Incompatibilities & Reactivities** Varies**Exposure Routes** inhalation, ingestion, skin and/or eye contact

**Symptoms** irritation eyes; sensitization dermatitis

**Target Organs** Eyes, skin

**Personal**

**Protection/Sanitation** (See [protection codes](#) ([protect.html](#)))

**Skin:** Prevent skin contact

**Eyes:** Prevent eye contact

**Wash skin:** When contaminated

**Remove:** When wet or contaminated

**Change:** No recommendation

**First Aid** (See [procedures \(firstaid.html\)](#))

**Eye:** Irrigate immediately

**Skin:** Water flush promptly

**Breathing:** Respiratory support

**Swallow:** Medical attention immediately

**Respirator Recommendations**

**NIOSH/OSHA**

**Up to 2.5 mg/m<sup>3</sup>:**

(APF = 5) Any quarter-mask respirator.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.\*

**Up to 5 mg/m<sup>3</sup>:**

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.\*

(APF = 10) Any supplied-air respirator\*

**Up to 12.5 mg/m<sup>3</sup>:**

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode\*

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.\*

**Up to 25 mg/m<sup>3</sup>:**

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

**Emergency or planned entry into unknown concentrations or IDLH conditions:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-

contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See [MEDICAL TESTS: 0052 \(/niosh/docs/2005-110/nmed0052.html\)](#)

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# Benzene

**Synonyms & Trade Names** Benzol, Phenyl hydride

<b>CAS No.</b> 71-43-2	<b>RTECS No.</b> CY1400000 ( <a href="http://niosh-rtecs/CY155CCo.html">/niosh-rtecs/CY155CCo.html</a> )	<b>DOT ID &amp; Guide</b> 1114 130 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )
<b>Formula</b> C <sub>6</sub> H <sub>6</sub>	<b>Conversion</b> 1 ppm = 3.19 mg/m <sup>3</sup>	<b>IDLH</b> Ca [500 ppm] See: <a href="http://niosh/idlh/71432.html">71432 (/niosh/idlh/71432.html)</a>

### Exposure Limits

**NIOSH REL** : Ca TWA 0.1 ppm ST 1 ppm See [Appendix A \(nengapdx.html\)](http://nengapdx.html)  
**OSHA PEL** : [1910.1028] TWA 1 ppm ST 5 ppm See [Appendix F \(nengapdx.html\)](http://nengapdx.html)

### Measurement Methods

**NIOSH 1500** ([/niosh/docs/2003-154/pdfs/1500.pdf](http://niosh/docs/2003-154/pdfs/1500.pdf)), **1501** ([/niosh/docs/2003-154/pdfs/1501.pdf](http://niosh/docs/2003-154/pdfs/1501.pdf)), **3700** ([/niosh/docs/2003-154/pdfs/3700.pdf](http://niosh/docs/2003-154/pdfs/3700.pdf)), **3800** ([/niosh/docs/2003-154/pdfs/3800.pdf](http://niosh/docs/2003-154/pdfs/3800.pdf));  
**OSHA 12**  
(<http://www.osha.gov/dts/sltc/methods/organic/org012/org012.html>)  
 (<http://www.cdc.gov/Other/disclaimer.html>), **1005**  
(<http://www.osha.gov/dts/sltc/methods/validated/1005/1005.html>)  
 (<http://www.cdc.gov/Other/disclaimer.html>)  
See: **NMAM** ([/niosh/docs/2003-154/](http://niosh/docs/2003-154/)) or **OSHA Methods**  
(<http://www.osha.gov/dts/sltc/methods/index.html>)   
(<http://www.cdc.gov/Other/disclaimer.html>)

**Physical Description** Colorless to light-yellow liquid with an aromatic odor. [Note: A solid below 42°F.]

<b>MW:</b> 78.1	<b>BP:</b> 176°F	<b>FRZ:</b> 42°F	<b>Sol:</b> 0.07%	<b>VP:</b> 75 mmHg	<b>IP:</b> 9.24 eV
<b>Sp.Gr:</b> 0.88	<b>Fl.P:</b> 12°F	<b>UEL:</b> 7.8%	<b>LEL:</b> 1.2%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

**Incompatibilities & Reactivities** Strong oxidizers, many fluorides & perchlorates, nitric acid

**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact

**Symptoms** irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]

**Target Organs** Eves. skin. respiratory system. blood. central nervous system. bone marrow

**Cancer Site** [leukemia]**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))**Skin:** Prevent skin contact**Eyes:** Prevent eye contact**Wash skin:** When contaminated**Remove:** When wet (flammable)**Change:** No recommendation**Provide:** Eyewash, Quick drench**First Aid** (See [procedures \(firstaid.html\)](#))**Eye:** Irrigate immediately**Skin:** Soap wash immediately**Breathing:** Respiratory support**Swallow:** Medical attention immediately**Respirator Recommendations**(See [Appendix E \(nengapdx.html\)](#))**NIOSH****At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0015](#)[\(/niosh/ipcsneng/nengo015.html\)](#) See MEDICAL TESTS: [0022 \(/niosh/docs/2005-110/nmed0022.html\)](#)

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# Ethyl benzene

**Synonyms & Trade Names** Ethylbenzol, Phenylethane

<b>CAS No.</b> 100-41-4	<b>RTECS No.</b> DAO700000 (/niosh- rtecs/DAAAE60.html)	<b>DOT ID &amp; Guide</b> 1175 130 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )
<b>Formula</b> CH <sub>3</sub> CH <sub>2</sub> C <sub>6</sub> H <sub>5</sub>	<b>Conversion</b> 1 ppm = 4.34 mg/m <sup>3</sup>	<b>IDLH</b> 800 ppm [10%LEL] See: <a href="http://www.cdc.gov/Other/disclaimer.html">100414</a> (/niosh/idlh/100414.html)
<b>Exposure Limits</b> <b>NIOSH REL</b> : TWA 100 ppm (435 mg/m <sup>3</sup> ) ST 125 ppm (545 mg/m <sup>3</sup> ) <b>OSHA PEL</b> † ( <a href="http://www.cdc.gov/Other/disclaimer.html">nengapdxg.html</a> ): TWA 100 ppm (435 mg/m <sup>3</sup> )		<b>Measurement Methods</b> <b>NIOSH 1501</b> (/niosh/docs/2003-154/pdfs/1501.pdf); <b>OSHA 7</b> ( <a href="http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html">http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ), <b>1002</b> ( <a href="http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html">http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> (/niosh/docs/2003-154/) or <b>OSHA Methods</b> ( <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )

**Physical Description** Colorless liquid with an aromatic odor.

<b>MW:</b> 106.2	<b>BP:</b> 277°F	<b>FRZ:</b> -139°F	<b>Sol:</b> 0.01%	<b>VP:</b> 7 mmHg	<b>IP:</b> 8.76 eV
<b>Sp.Gr:</b> 0.87	<b>Fl.P:</b> 55°F	<b>UEL:</b> 6.7%	<b>LEL:</b> 0.8%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

**Incompatibilities & Reactivities** Strong oxidizers

**Exposure Routes** inhalation, ingestion, skin and/or eye contact

**Symptoms** irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma

**Target Organs** Eyes, skin, respiratory system, central nervous system

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](http://www.cdc.gov/Other/disclaimer.html))

**Skin:** Prevent skin contact

**Eyes:** Prevent eye contact

**Wash skin:** When contaminated

**Remove:** When wet (flammable)

**Change:** No recommendation

**First Aid** (See [procedures \(firstaid.html\)](http://www.cdc.gov/Other/disclaimer.html))

**Eye:** Irrigate immediately

**Skin:** Water flush promptly

**Breathing:** Respiratory support

**Swallow:** Medical attention immediately

**Respirator Recommendations****NIOSH/OSHA****Up to 800 ppm:**

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*

(APF = 10) Any supplied-air respirator\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

**Emergency or planned entry into unknown concentrations or IDLH conditions:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0268 \(/niosh/ipcsneng/nengo268.html\)](#)

See MEDICAL TESTS: [0098 \(/niosh/docs/2005-110/nmed0098.html\)](#)

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### m-Xylene

**Synonyms & Trade Names** 1,3-Dimethylbenzene; meta-Xylene; m-Xylol

<b>CAS No.</b> 108-38-3	<b>RTECS No.</b> <a href="/niosh-rtecs/ZE22B6B8.html">ZE2275000 (/niosh-rtecs/ZE22B6B8.html)</a>	<b>DOT ID &amp; Guide</b> 1307 130 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )
<b>Formula</b> C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>	<b>Conversion</b> 1 ppm = 4.34 mg/m <sup>3</sup>	<b>IDLH</b> 900 ppm See: <a href="/niosh/idlh/95476.html">95476 (/niosh/idlh/95476.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : TWA 100 ppm (435 mg/m <sup>3</sup> ) ST 150 ppm (655 mg/m <sup>3</sup> ) <b>OSHA PEL</b> † ( <a href="http://nengapdxg.html">nengapdxg.html</a> ): TWA 100 ppm (435 mg/m <sup>3</sup> )		<b>Measurement Methods</b> <b>NIOSH 1501</b> ( <a href="/niosh/docs/2003-154/pdfs/1501.pdf">/niosh/docs/2003-154/pdfs/1501.pdf</a> ), <b>3800</b> ( <a href="/niosh/docs/2003-154/pdfs/3800.pdf">/niosh/docs/2003-154/pdfs/3800.pdf</a> ); <b>OSHA 1002</b> ( <a href="http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html">http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> ( <a href="/niosh/docs/2003-154/">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> ( <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )

**Physical Description** Colorless liquid with an aromatic odor.

<b>MW:</b> 106.2	<b>BP:</b> 282°F	<b>FRZ:</b> -54°F	<b>Sol:</b> Slight	<b>VP:</b> 9 mmHg	<b>IP:</b> 8.56 eV
<b>Sp.Gr:</b> 0.86	<b>Fl.P:</b> 82°F	<b>UEL:</b> 7.0%	<b>LEL:</b> 1.1%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

**Incompatibilities & Reactivities** Strong oxidizers, strong acids

**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact

**Symptoms** irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis

**Target Organs** Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))  
**Skin:** Prevent skin contact  
**Eyes:** Prevent eye contact  
**Wash skin:** When contaminated  
**Remove:** When wet (flammable)

**First Aid** (See [procedures \(firstaid.html\)](#))  
**Eye:** Irrigate immediately  
**Skin:** Soap wash promptly  
**Breathing:** Respiratory support  
**Swallow:** Medical attention immediately

**Change:** No recommendation

### Respirator Recommendations

#### NIOSH/OSHA

##### Up to 900 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*

(APF = 10) Any supplied-air respirator\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

##### Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

##### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0085 \(/niosh/ipcsneng/neng0085.html\)](#)

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# o-Xylene

**Synonyms & Trade Names** 1,2-Dimethylbenzene; ortho-Xylene; o-Xylol

<b>CAS No.</b> 95-47-6	<b>RTECS No.</b> <a href="#">ZE2450000 (/niosh-rtecs/ZE256250.html)</a>	<b>DOT ID &amp; Guide</b> 1307 130 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )
<b>Formula</b> C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>	<b>Conversion</b> 1 ppm = 4.34 mg/m <sup>3</sup>	<b>IDLH</b> 900 ppm See: <a href="#">95476 (/niosh/idlh/95476.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : TWA 100 ppm (435 mg/m <sup>3</sup> ) ST 150 ppm (655 mg/m <sup>3</sup> ) <b>OSHA PEL</b> † ( <a href="#">nengapdxg.html</a> ): TWA 100 ppm (435 mg/m <sup>3</sup> )		<b>Measurement Methods</b> <b>NIOSH 1501</b> ( <a href="#">/niosh/docs/2003-154/pdfs/1501.pdf</a> ), <b>3800</b> ( <a href="#">/niosh/docs/2003-154/pdfs/3800.pdf</a> ); <b>OSHA 1002</b> ( <a href="http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html">http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> ( <a href="#">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> ( <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )

**Physical Description** Colorless liquid with an aromatic odor.

<b>MW:</b> 106.2	<b>BP:</b> 292°F	<b>FRZ:</b> -13°F	<b>Sol:</b> 0.02%	<b>VP:</b> 7 mmHg	<b>IP:</b> 8.56 eV
<b>Sp.Gr:</b> 0.88	<b>Fl.P:</b> 90°F	<b>UEL:</b> 6.7%	<b>LEL:</b> 0.9%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

**Incompatibilities & Reactivities** Strong oxidizers, strong acids

**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact

**Symptoms** irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis

**Target Organs** Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

**Skin:** Prevent skin contact

**Eyes:** Prevent eye contact

**Wash skin:** When contaminated

**Remove:** When wet (flammable)

**First Aid** (See [procedures \(firstaid.html\)](#))

**Eye:** Irrigate immediately

**Skin:** Soap wash promptly

**Breathing:** Respiratory support

**Swallow:** Medical attention immediately

**RECOMMENDATION:** (See Table 1)

**Change:** No recommendation

### Respirator Recommendations

#### NIOSH/OSHA

##### Up to 900 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*

(APF = 10) Any supplied-air respirator\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

##### Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

##### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0084 \(/niosh/ipcsneng/neng0084.html\)](#)

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### p-Xylene

**Synonyms & Trade Names** 1,4-Dimethylbenzene; para-Xylene; p-Xylol

<b>CAS No.</b> 106-42-3	<b>RTECS No.</b> <a href="#">ZE2625000 (/niosh-rtecs/ZE280DE8.html)</a>	<b>DOT ID &amp; Guide</b> 1307 130 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )
<b>Formula</b> C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>	<b>Conversion</b> 1 ppm = 4.41 mg/m <sup>3</sup>	<b>IDLH</b> 900 ppm See: <a href="#">95476 (/niosh/idlh/95476.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : TWA 100 ppm (435 mg/m <sup>3</sup> ) ST 150 ppm (655 mg/m <sup>3</sup> ) <b>OSHA PEL</b> † ( <a href="#">nengapdxg.html</a> ): TWA 100 ppm (435 mg/m <sup>3</sup> )		<b>Measurement Methods</b> <b>NIOSH 1501</b> ( <a href="#">/niosh/docs/2003-154/pdfs/1501.pdf</a> ), <b>3800</b> ( <a href="#">/niosh/docs/2003-154/pdfs/3800.pdf</a> ); <b>OSHA 1002</b> ( <a href="http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html">http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> ( <a href="#">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> ( <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )

**Physical Description** Colorless liquid with an aromatic odor. [Note: A solid below 56°F.]

<b>MW:</b> 106.2	<b>BP:</b> 281°F	<b>FRZ:</b> 56°F	<b>Sol:</b> 0.02%	<b>VP:</b> 9 mmHg	<b>IP:</b> 8.44 eV
<b>Sp.Gr:</b> 0.86	<b>Fl.P:</b> 81°F	<b>UEL:</b> 7.0%	<b>LEL:</b> 1.1%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

**Incompatibilities & Reactivities** Strong oxidizers, strong acids

**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact

**Symptoms** irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis

**Target Organs** Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))  
**Skin:** Prevent skin contact  
**Eyes:** Prevent eye contact  
**Wash skin:** When contaminated  
**Remove:** When wet (flammable)

**First Aid** (See [procedures \(firstaid.html\)](#))  
**Eye:** Irrigate immediately  
**Skin:** Soap wash promptly  
**Breathing:** Respiratory support  
**Swallow:** Medical attention immediately

**Change:** No recommendation

### Respirator Recommendations

#### NIOSH/OSHA

##### Up to 900 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*

(APF = 10) Any supplied-air respirator\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

##### Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

##### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0086 \(/niosh/ipcsneng/neng0086.html\)](#)

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## Chlorodiphenyl (54% chlorine)

**Synonyms & Trade Names** Aroclor® 1254, PCB, Polychlorinated biphenyl

<b>CAS No.</b> 11097-69-1	<b>RTECS No.</b> <a href="http://www.niosh-rtecs.com/TQ14Co80.html">TQ1360000 (/niosh-rtecs/TQ14Co80.html)</a>	<b>DOT ID &amp; Guide</b> 2315 171 <a href="http://www.wapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=171"> (http://www.wapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=171)</a> <a href="http://www.cdc.gov/Other/disclaimer.html"> (http://www.cdc.gov/Other/disclaimer.html)</a>
<b>Formula</b> C <sub>6</sub> H <sub>3</sub> Cl <sub>2</sub> C <sub>6</sub> H <sub>2</sub> Cl <sub>3</sub> (approx)	<b>Conversion</b>	<b>IDLH</b> Ca [5 mg/m <sup>3</sup> ] See: <a href="http://www.cdc.gov/Other/idlh/intridl4.html">IDLH INDEX (/idlh/intridl4.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> *: Ca TWA 0.001 mg/m <sup>3</sup> See <a href="http://www.niosh.gov/publications/nengapdx.html">Appendix A (nengapdx.html)</a> [*Note: The REL also applies to other PCBs.] <b>OSHA PEL</b> : TWA 0.5 mg/m <sup>3</sup> [skin]		<b>Measurement Methods</b> <b>NIOSH 5503</b> <a href="http://www.niosh.gov/docs/2003-154/pdfs/5503.pdf"> (/niosh/docs/2003-154/pdfs/5503.pdf)</a> ; <b>OSHA PV2088</b> <a href="http://www.osha.gov/dts/sltc/methods/partial/t-pv2088-01-8812-ch/t-pv2088-01-8812-ch.html"> (http://www.osha.gov/dts/sltc/methods/partial/t-pv2088-01-8812-ch/t-pv2088-01-8812-ch.html)</a> <a href="http://www.cdc.gov/Other/disclaimer.html"> (http://www.cdc.gov/Other/disclaimer.html)</a> See: <a href="http://www.niosh.gov/docs/2003-154/">NMAM (/niosh/docs/2003-154/)</a> or <a href="http://www.osha.gov/dts/sltc/methods/index.html">OSHA Methods</a> <a href="http://www.osha.gov/dts/sltc/methods/index.html"> (http://www.osha.gov/dts/sltc/methods/index.html)</a> <a href="http://www.cdc.gov/Other/disclaimer.html"> (http://www.cdc.gov/Other/disclaimer.html)</a>

**Physical Description** Colorless to pale-yellow, viscous liquid or solid (below 50°F) with a mild, hydrocarbon odor.

<b>MW:</b> 326 (approx)	<b>BP:</b> 689-734°F	<b>FRZ:</b> 50°F	<b>Sol:</b> Insoluble	<b>VP:</b> 0.00006 mmHg	<b>IP:</b> ?
<b>Sp.Gr(77°F):</b> 1.38	<b>Fl.P:</b> NA	<b>UEL:</b> NA	<b>LEL:</b> NA		

Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans, and chlorinated dibenzo-p-dioxins.

**Incompatibilities & Reactivities** Strong oxidizers**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]

Chlorodiphenyl

**Target Organs** Skin, eyes, liver, reproductive system**Cancer Site** [in animals: tumors of the pituitary gland & liver, leukemia]**Personal Protection/Sanitation** (See protection codes (protect.html))**Skin:** Prevent skin contact**Eyes:** Prevent eye contact**Wash skin:** When contaminated**Remove:** When wet or contaminated**Change:** Daily**Provide:** Eyewash, Quick drench**First Aid** (See procedures (firstaid.html))**Eye:** Irrigate immediately**Skin:** Soap wash immediately**Breathing:** Respiratory support**Swallow:** Medical attention immediately**Respirator Recommendations****NIOSH****At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0939](#)[\(/niosh/ipcsneng/neng0939.html\)](#) See MEDICAL TESTS: [0176 \(/niosh/docs/2005-110/nmed0176.html\)](#)

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# Tetrachloroethylene

**Synonyms & Trade Names** Perchloroethylene, Perchloroethylene, Perk, Tetrachloroethylene

<b>CAS No.</b> 127-18-4	<b>RTECS No.</b> KX3850000 ( <a href="/niosh-rtecs/KX3ABF10.html">/niosh-rtecs/KX3ABF10.html</a> )	<b>DOT ID &amp; Guide</b> 1897 160 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=160">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=160</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )
<b>Formula</b> Cl <sub>2</sub> C=CCl <sub>2</sub>	<b>Conversion</b> 1 ppm = 6.78 mg/m <sup>3</sup>	<b>IDLH</b> Ca [150 ppm] See: <a href="/niosh/idlh/127184.html">127184 (/niosh/idlh/127184.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : Ca Minimize workplace exposure concentrations. See Appendix A ( <a href="/nengapdx.html">nengapdx.html</a> ) <b>OSHA PEL</b> † ( <a href="/nengapdxg.html">nengapdxg.html</a> ): TWA 100 ppm C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm		<b>Measurement Methods</b> <b>NIOSH 1003</b> ( <a href="/niosh/docs/2003-154/pdfs/1003.pdf">/niosh/docs/2003-154/pdfs/1003.pdf</a> ); <b>OSHA 1001</b> <a href="http://www.osha.gov/dts/sltc/methods/mdt/mdt1001/1001.html">http://www.osha.gov/dts/sltc/methods/mdt/mdt1001/1001.html</a> ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> ( <a href="/niosh/docs/2003-154/">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a>

**Physical Description** Colorless liquid with a mild, chloroform-like odor.

<b>MW:</b> 165.8	<b>BP:</b> 250°F	<b>FRZ:</b> -2°F	<b>Sol:</b> 0.02%	<b>VP:</b> 14 mmHg	<b>IP:</b> 9.32 eV
<b>Sp.Gr:</b> 1.62	<b>Fl.P:</b> NA	<b>UEL:</b> NA	<b>LEL:</b> NA		

Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

**Incompatibilities & Reactivities** Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash

**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact

**Symptoms** irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]

**Target Organs** Eyes, skin, respiratory system, liver, kidneys, central nervous system

**Cancer Site** [in animals: liver tumors]

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))**Skin:** Prevent skin contact**Eyes:** Prevent eye contact**Wash skin:** When contaminated**Remove:** When wet or contaminated**Change:** No recommendation**Provide:** Eyewash, Quick drench**First Aid** (See [procedures \(firstaid.html\)](#))**Eye:** Irrigate immediately**Skin:** Soap wash promptly**Breathing:** Respiratory support**Swallow:** Medical attention immediately**Respirator Recommendations****NIOSH****At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0076](#)[\(/niosh/ipcsneng/neng0076.html\)](#) See MEDICAL TESTS: [0179 \(/niosh/docs/2005-110/nmedo179.html\)](#)

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## Trichloroethylene

**Synonyms & Trade Names** Ethylene trichloride, TCE, Trichloroethene, Trilene**CAS No.** 79-01-6**RETECS No.** [KX4550000](#)  
([/niosh-rtecs/KX456D70.html](#))**DOT ID & Guide** 1710 160 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=160>)   
(<http://www.cdc.gov/Other/disclaimer.html>)**Formula** ClCH=CCl<sub>2</sub>**Conversion** 1 ppm = 5.37 mg/m<sup>3</sup>**IDLH** Ca [1000 ppm]  
See: [79016](#) ([/niosh/idlh/79016.html](#))**Exposure Limits****NIOSH REL** : Ca See [Appendix A \(nengapdx.html\)](#)  
See [Appendix C \(nengapdx.html\)](#)**OSHA PEL** † ([nengapdx.html](#)): TWA 100 ppm C  
200 ppm 300 ppm (5-minute maximum peak  
in any 2 hours)**Measurement Methods****NIOSH 1022** ([/niosh/docs/2003-154/pdfs/1022.pdf](#)),  
**3800** ([/niosh/docs/2003-154/pdfs/3800.pdf](#));**OSHA 1001**(<http://www.osha.gov/dts/sltc/methods/mdt/mdt1001/1001.html>)  
 (<http://www.cdc.gov/Other/disclaimer.html>)See: [NMAM](#) ([/niosh/docs/2003-154/](#)) or [OSHA Methods](#)  
(<http://www.osha.gov/dts/sltc/methods/index.html>)   
(<http://www.cdc.gov/Other/disclaimer.html>)**Physical Description** Colorless liquid (unless dyed blue) with a chloroform-like odor.**MW:**  
131.4**BP:**  
189°F**FRZ:** -99°F**Sol:** 0.1%**VP:** 58 mmHg**IP:** 9.45 eV**Sp.Gr:**  
1.46**Fl.P:** ?**UEL(77°F):**  
10.5%**LEL(77°F):**  
8%

Combustible Liquid, but burns with difficulty.

**Incompatibilities & Reactivities** Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]**Target Organs** Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system**Cancer Site** [in animals: liver & kidney cancer]**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))**First Aid** (See [procedures \(firstaid.html\)](#))  
**Eye:** Irrigate immediately

Control Measures

**Skin:** Prevent skin contact  
**Eyes:** Prevent eye contact  
**Wash skin:** When contaminated  
**Remove:** When wet or contaminated  
**Change:** No recommendation  
**Provide:** Eyewash, Quick drench

First Aid Measures

**Skin:** Soap wash promptly  
**Breathing:** Respiratory support  
**Swallow:** Medical attention immediately

### Respirator Recommendations

#### NIOSH

#### At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

#### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0081 (/niosh/ipcsneng/neng0081.html)

See MEDICAL TESTS: 0236 (/niosh/docs/2005-110/nmedo236.html)

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# Toluene

**Synonyms & Trade Names** Methyl benzene, Methyl benzol, Phenyl methane, Toluol

**CAS No.** 108-88-3

**RTECS No.**  
[XS5250000 \(/niosh-rtecs/XS501BDo.html\)](#)

**DOT ID & Guide** 1294 130 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130>) [☞](http://www.cdc.gov/Other/disclaimer.html)

**Formula** C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>

**Conversion** 1 ppm =  
3.77 mg/m<sup>3</sup>

**IDLH** 500 ppm  
See: [108883 \(/niosh/idlh/108883.html\)](#)

### Exposure Limits

**NIOSH REL** : TWA 100 ppm (375 mg/m<sup>3</sup>)

ST 150 ppm (560 mg/m<sup>3</sup>)

**OSHA PEL** † ([nengapdxg.html](#)): TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)

### Measurement Methods

**NIOSH 1500** [☞ \(/niosh/docs/2003-154/pdfs/1500.pdf\)](#), **1501**

[☞ \(/niosh/docs/2003-154/pdfs/1501.pdf\)](#), **3800** [☞](#)

[\(/niosh/docs/2003-154/pdfs/3800.pdf\)](#), **4000** [☞](#)

[\(/niosh/docs/2003-154/pdfs/4000.pdf\)](#);

### OSHA 111

<http://www.osha.gov/dts/sltc/methods/organic/org111/org111.html>

[☞ \(http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html)

See: **NMAM** ([/niosh/docs/2003-154/](#)) or **OSHA Methods**

<http://www.osha.gov/dts/sltc/methods/index.html> [☞](#)

<http://www.cdc.gov/Other/disclaimer.html>

**Physical Description** Colorless liquid with a sweet, pungent, benzene-like odor.

**MW:**

92.1

**BP:**

232°F

**FRZ:**

-139°F

**Sol(74°F):**

0.07%

**VP:** 21 mmHg

**IP:** 8.82 eV

**Sp.Gr:**

0.87

**Fl.P:**

40°F

**UEL:**

7.1%

**LEL:** 1.1%

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

**Incompatibilities & Reactivities** Strong oxidizers

**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact

**Symptoms** 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

**Target Organs** Eyes, skin, respiratory system, central nervous system, liver, kidneys

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

**Skin:** Prevent skin contact

**First Aid** (See [procedures \(firstaid.html\)](#))

**Eye:** Irrigate immediately

**Skin:** Soap wash promptly

**Eyes:** Prevent eye contact  
**Wash skin:** When contaminated  
**Remove:** When wet (flammable)  
**Change:** No recommendation

**Breathing:** Respiratory support  
**Swallow:** Medical attention immediately

### Respirator Recommendations

#### NIOSH

##### Up to 500 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

(APF = 10) Any supplied-air respirator\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

##### Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

##### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0078](#)

[\(/niosh/ipcsneng/neng0078.html\)](#) See MEDICAL TESTS: [0232 \(/niosh/docs/2005-110/nmedo232.html\)](#)

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