

**245-247 DRIGGS AVENUE  
BROOKLYN, NEW YORK**

**REV 1**

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# **Remedial Action Work Plan**

**BLOCK 2699, LOTS 15 & 17  
NYC VCP Project Number: 14CVCP159K  
E-Designation Project Number: 13EHAZ072K**

**Prepared for:**

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**Prepared by:**



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**AUGUST 2013**

# REMEDIAL ACTION WORK PLAN

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## LIST OF ACRONYMS

<b>Acronym</b>	<b>Definition</b>
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering and Institutional Controls
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation
NYC VCP	New York City Voluntary Cleanup Program
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
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
RIR	Remedial Investigation Report
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOC	Semi-Volatile Organic Compound
USGS	United States Geological Survey
UST	Sub-grade Storage Tank
VCA	Voluntary Cleanup Agreement
VOC	Volatile Organic Compound

## CERTIFICATION

I, Stephen A. Morse, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 245-247 Driggs Avenue site.

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.

\_\_\_\_\_  
Name

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

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



## **EXECUTIVE SUMMARY**

Fin USA, LLC has applied to enroll in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate an 8,212-square foot site located in the Greenpoint section in Brooklyn, New York. A remedial investigation (RI) was performed between June 18, 2012 and June 20, 2012 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 245-247 Driggs Avenue in the Greenpoint section in Brooklyn, New York and is identified as Block 2699 and Lot 15 and 17 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 8,212-square feet and is bounded by Driggs Avenue to the north, a residential property at 565 Graham Avenue to the south, Graham Avenue to the east, and a residential property at 253 Driggs Avenue to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is used for mixed residential and commercial use and contains one (1), 3-floor residential building, and a vacated construction site trailer.

### **Summary of Proposed Redevelopment Plan**

The proposed future use of the Site will be residential. A five-story building with a cellar and a rear yard and parking area will be constructed. At the cellar level, the building will occupy the full footprint of the Site with the exception of a small unexcavated area in the northeast corner of the Site along Driggs Avenue and the rear yard/parking area. The cellar will be used for building utilities, storage, and accessory residential space. At grade level, there will be a small paved rear yard in the southwest corner of the Site, and the remainder of the open area in the rear will be a paved parking area.

Excavation will be required to a depth of approximately 11-14 feet below grade for constructing the cellar and to approximately 16 feet below grade for constructing the elevator pit. The remainder of the Site will be excavated to approximately 2 feet below grade. The groundwater

table is located approximately 11 feet below grade; therefore, soil excavation is expected below the groundwater table. Approximately 2500 cubic yards of soil will be excavated for development purposes.

As per the New York City Department of Planning, the Site is zoned R6B. The proposed use is consistent with existing zoning for the property. The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

### **Summary of the Remedy**

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. The proposed remedial action 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 standards methods that are well established in the industry.

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 (CPP);
2. Performance of a Community Air Monitoring Plan (CAMP) for particulates and volatile organic carbon compounds (VOCs).
3. Establishment of Track 4 Site Specific Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Excavation and removal of soil/fill exceeding Track 4 Site-specific SCOs. Excavation in the building cellar area will be to approximately 11-14 feet below existing grade. Excavation outside the cellar footprint will be to approximately 2 feet below grade.
6. 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.

7. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations.
8. Transportation and off-Site disposal of approximately 3,750 tons of 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.
9. Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of SCOs;
10. Dewatering in compliance with all city, state, and federal laws and regulations.
11. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
12. Installation of a vapor barrier/waterproofing system below the concrete slab underneath the building, as well as behind foundation walls of the proposed building.
13. Construction and maintenance of an engineered composite cover consisting of 1-foot thick concrete building foundation slab and walls over the proposed building footprint, a minimum 4-inch thick asphalt cap over parking areas, and two-foot clean common fill underlain by a demarcation layer in landscaped areas that comprise the remainder of the Site
14. Demarcation of residual soil/fill;
15. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
16. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
17. Import of materials to be used for backfill and cover, as needed, in compliance with OER approved plan and in accordance with applicable Federal, State and City laws and regulations;

18. Submission of a Remedial Action Report (RAR) that describes the remedial activities certifies that the remedial requirements have been achieved, defines the Site boundaries, describes all Engineering and Institutional controls to be implemented at the Site, and lists any changes from this RAWP;
19. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, inspection and certification of Engineering and Institutional controls and reporting at a specified frequency; and
20. The property will continue to be registered with an E-Designation at the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls; 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

The Office of Environmental Remediation created the New York City Voluntary Cleanup Program (NYC VCP) to provide 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 NYC VCP, 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. This plan includes many protective elements including those discussed below.

**Site Safety Coordinator.** This project has a designated Site safety coordinator to implement the Health and Safety Plan. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is Mr. Andrew Rizk, P.E. of GRANT and can be reached at (212) 464-8689.

**Worker Training.** Workers participating in 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. This pertains to workers performing specific tasks including removing contaminated material and installing cleanup systems in contaminated areas.

**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 NYC Office of Environmental Remediation Project Manager Ms. Hannah Moore at (212) 442-6372 or via email to [HMoore@dep.nyc.gov](mailto:HMoore@dep.nyc.gov).

Once the project contractor is determined the project manager contact information will be provided to the public.

**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.

**Storm-Water Management.** To limit the potential for soil erosion and discharge, this cleanup plan has provisions for storm-water management. The main elements of the storm water 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 are 7 AM to 6 PM.

**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 NYC Office of Environmental Remediation Project Manager, Ms. Hannah Moore at (212) 442-6372 or via email to [HMoore@dep.nyc.gov](mailto:HMoore@dep.nyc.gov), or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

Once the project contractor is determined the project manager contact information will be provided to the public.

**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 you to review in the public document repositories located at New York Public Library at 9 West 124<sup>th</sup> Street.

**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 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. 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**

Fin USA, LLC has applied to enroll in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate an 8,212-square foot site located in the Greenpoint section in Brooklyn, 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.

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

The Site is located at 245-247 Driggs Avenue in the Greenpoint section in Brooklyn, New York and is identified as Block 2699 and Lot 15 and 17 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 8,212 square feet and is bounded by Driggs Avenue to the north, a residential property at 565 Graham Avenue to the south, Graham Avenue to the east, and a residential property at 253 Driggs Avenue to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is used for mixed residential and commercial use and contains one (1), 3-floor residential building, and a vacated construction site trailer.

#### **1.2 PROPOSED REDEVELOPMENT PLAN**

The proposed future use of the Site will be residential. A five-story building with a cellar and a rear yard and parking area will be constructed. At the cellar level, the building will occupy the full footprint of the Site with the exception of a small unexcavated area in the northeast corner of the Site along Driggs Avenue and the rear yard/parking area. The cellar will be used for building utilities, storage, and accessory residential space. At grade level, there will be a small paved rear yard in the southwest corner of the Site, and the remainder of the open area in the rear will be a paved parking area.

Excavation will be required to a depth of approximately 11-14 feet below grade for constructing the cellar and to approximately 16 feet below grade for constructing the elevator pit. The remainder of the Site will be excavated to approximately 2 feet below grade. The groundwater table is located approximately 11 feet below grade; therefore, soil excavation is expected below the groundwater table. Approximately 2500 cubic yards of soil will be excavated for development purposes.

As per the New York City Department of Planning, the Site is zoned R6B. The proposed use is consistent with existing zoning for the property. The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

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

The Site is 8,212-square feet and is bounded by Driggs Avenue to the north, a residential property at 565 Graham Avenue to the south, Graham Avenue to the east, and a residential property at 253 Driggs Avenue to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is used for mixed residential and commercial use and contains one (1), 3-floor residential building, and a vacated construction site trailer.

### **1.4 REMEDIAL INVESTIGATION**

A site investigation was performed and the results are documented in a companion document called “*Remedial Investigation Report for 245-247 Driggs Avenue*”, dated August 21, 2012 (RIR).

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

##### *Past Uses and Ownership*

A review of the Phase I Environmental Site Assessment (ESA) dated May 23, 2012 indicates that the Site has historically been utilized for residential purposes (Lot 15) and mixed commercial purposes (Lot 17). The Site was developed prior to 1887. Commercial uses have included a bakery, a “Club House,” and printing. In 1978, lot 17 became vacant until it was used as parking around 1986.

The Site assessment was conducted by GRANT on May 15, 2012 and recorded surficial conditions only. The assessment included a walkthrough of the site and surroundings and an interview of the building owner. The Phase I ESA included a review of regulatory agency databases and historical documents and visual observations of the Site and adjoining properties.

The Phase I did not identify any RECs associated with the historic usage of the Site or surrounding properties, however the Site was listed on the New York City Department of City Planning (NYCDCP) list of e-designated properties. Therefore, the NYC Office of Environmental Remediation (OER) is required to review and approve environmental investigation and environmental mitigation measures in order for a Certificate of Occupancy (COO) to be issued by New York City Department of Buildings (NYCDOB).

#### Previous Investigations

Previous Investigation includes:

- Phase I ESA, dated May 23, 2012, prepared by GRANT engineering.
- Phase II RIR, dated August 21, 2012, prepared by GRANT engineering.

#### Site Inspection

A site inspection for the RIR was conducted on June 18, 2012. In attendance were Mr. Stephen Morse and Mr. Matthew Petrucci of GRANT. Mr. Stephen Morse was the Qualified Environmental Professional (QEP) evaluating potential areas of concern. The site inspection revealed that the Site is currently developed with the same existing structures described in the Phase I ESA. A three-story wood frame structure built in approximately 1928 comprises the western portion of the Site, and the eastern half of the Site is a previously developed vacant lot. No evidence of contamination, including stressed vegetation, visible staining, or historical tanks, was identified.

#### Areas of Concern

The Phase I did not identify any RECs associated with the historic usage of the Site or surrounding properties. The only AOC identified for this site is historic fill material.

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

GRANT 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 (6) soil borings (SB-01 to SB-06) across the entire project Site, and collected twelve (12) soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installed three (3) groundwater monitoring wells (TWP-02, TWP-03, and TWP-06) throughout the Site to establish groundwater flow and collected three (3) groundwater samples for chemical analysis to evaluate groundwater quality;
4. Installed four (4) soil vapor probes (SVP-01 to SVP-04) around the proposed future site perimeter and collected four (4) samples for chemical analysis.

### **Summary of Environmental Findings**

1. Depth to groundwater ranges from eleven (11) to twelve (12) feet at the Site.
2. Groundwater flow is generally from east to west towards the East River, however locally beneath the Site it was measured to flow towards the northeast.
3. Bedrock was not encountered during the RI.
4. The stratigraphy of the site, from the surface down, consists of ten (10) feet of fill material underlain by five (5) feet of medium-fine brown sand believed to be native soil.
5. Soil/fill samples collected during the RI showed no volatile organic compounds (VOCs) in soil above Track 1 Unrestricted Use SCOs except for acetone which was detected at a maximum concentration of 0.180 ppm, well below its Restricted Residential SCO of 100 ppm. No chlorinated VOCs were detected in any sample, and only trace levels of petroleum-related compounds, including toluene (max 0.089 ppm), ethyl benzene (max 0.017 ppm), and xylenes (max 0.064 ppm) were identified. Several semi-volatile organic compounds (SVOCs) were identified in two soil borings, above Track 2 Restricted Residential SCOs, and including benzo(a)pyrene

- (max. of 8.81 ppm), benzo(b)fluoranthene (max. of 5.59 ppm), benzo(k)fluoranthene (max. of 6.80 ppm), chrysene (max. of 9.53 ppm), dibenzo(a,h)anthracene (max. of 1.42 ppm) and indeno(1,2,3-c,d)pyrene (max. of 3.09 ppm). These SVOCs are all polycyclic aromatic hydrocarbons (PAHs) and their concentrations are consistent with observations of historic fill. No PCBs were detected above Track 1 Unrestricted Use SCOs in soil samples. Pesticides including 4,4'-DDD (max. of 5.1 ppb); 4,4'-DDE (max. of 6.2 ppb); and 4,4'-DDT (max. of 22.4 ppb) were detected above Unrestricted Use SCOs, but well below Restricted Residential SCOs. Six metals were detected above Unrestricted Use SCOs, and of these arsenic (max. of 18 ppm), barium (max. of 800 ppm), and lead (max. of 1620 ppm) were detected above Restricted Residential SCOs. Overall, the concentrations of PAHs, metals, and pesticides are consistent with observations of historic fill sites throughout NYC. Data collected during the RI is sufficient to delineate the vertical and horizontal distribution of contaminants in soil/fill at the Site.
6. Groundwater samples collected during the RI showed that methylene chloride (max 5.8 ug/L) was the only VOC detected exceeding its NYSDEC Part 703.5 Groundwater Quality Standards (GQS). Methylene chloride is a common laboratory contaminant and was also detected in the laboratory blank. Although several SVOCs had detection limits above GQSs, no SVOCs were detected in any sample. The only metals detected above GQSs in dissolved groundwater samples were manganese and sodium.

Soil vapor samples collected during the RI showed chlorinated and petroleum-related VOCs at generally low concentrations. Most compounds were detected at concentrations below 20  $\mu\text{g}/\text{m}^3$  except for acetone (max. of 420  $\mu\text{g}/\text{m}^3$ ), hexane (170  $\mu\text{g}/\text{m}^3$ ), xylene (520  $\mu\text{g}/\text{m}^3$ ), ethyltoluene (99  $\mu\text{g}/\text{m}^3$ ) and toluene (730  $\mu\text{g}/\text{m}^3$ ). The chlorinated VOCs 1,1,1 – Trichloroethane (TCA) and Carbon tetrachloride were not detected in any sample. Tetrachloroethylene (PCE) was detected in all four soil vapor samples and ranged from 49 to 140  $\mu\text{g}/\text{m}^3$ . Similarly, Trichloroethylene (TCE) was reported in the four soil vapor samples and ranged from 1.3 to 25  $\mu\text{g}/\text{m}^3$  respectively. Concentrations of both PCE and TCE fall within their respective

monitoring/mitigation ranges established by the NYSDOH Soil Vapor Intrusion matrices.

## **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.

### **Soil**

- Prevent direct contact with contaminated soil.
- Prevent migration of contaminants that would result in groundwater 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 under 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 exceedence of applicable standards, criteria and guidance values (SCGs). A remedy is then developed 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:**

- Establishment of Track 1 Unrestricted Use 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 of approximately to 10 feet to removal all historic fill.

- No Engineering or Institutional Controls are required for a Track 1 cleanup, but a waterproofing/ vapor barrier membrane would be installed beneath the basement foundation and behind foundation sidewalls of the new building as a part of development to prevent 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 Track 4 Site-Specific SCOs.
- 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. If soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation after removal of all soil required for construction of the new building is complete, additional excavation will be performed to meet Track 4 Site-Specific SCOs.
- Placement of a final cover over the entire Site to prevent exposure to remaining soil/fill;
- Installation of a soil vapor barrier/waterproofing system beneath the building slab and along foundation side walls to prevent any potential future exposures from off-Site soil vapor;
- 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 a Site Management Plan (SMP) to ensure long-term management of Institutional and Engineering Controls including the performance of periodic inspections and certification that the controls are performing as they were intended; . SMP will note that the property owner and property owner's successors and assigns must comply with the approved SMP; and
- The property will continue to be flagged with an E-Designation by the NYC Buildings Department.

### 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, 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 "E" designation 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 waterproofing/ vapor barrier system below the new building's basement slab and continuing the vapor barrier around foundation walls.

### 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 and groundwater through removal of soil/fill to achieve Track 1 Unrestricted Use SCOs. All soil/fill excavated from the Site would be managed and disposed of in accordance with all applicable regulations. Compliance with SCGs for soil vapor would also be achieved by installing a vapor barrier/waterproofing 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 a vapor barrier 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.

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. 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. 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, and load out of materials. Short term impacts would be higher for Alternative 1.

An additional short-term adverse impact and risks to the community associated with both remedial alternatives is increased truck traffic. Alternative 1 would result in more truck traffic than Alternative 2. 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.

Both alternatives would employ appropriate measures to prevent short term impacts, 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) will 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 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 Engineering Controls.

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. Installation of a waterproofing/ vapor barrier membrane would prevent potential future migration of soil vapors into the new building.

Alternative 2 would provide long-term effectiveness by removing most on-Site contamination and attaining Track 4 Site-Specific SCOs; establishing ECs including a composite cover system across the Site; establishing ICs including use restrictions, an SMP, and continued registration as an E-designated property 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 the 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 would permanently eliminate the toxicity, mobility and volume of contaminants from on-Site soil/fill 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.

### **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.

The capital costs associated with the Track 1 alternative are higher than the Track 4 alternative in that a higher volume of soil/fill will be excavated for off-site disposal to achieve a Track 1 status over the entire site. However, long-term costs for Alternative 2 are likely marginally higher than

Alternative 1 based on implementation of a Site Management Plan as part of Alternative 2. In both cases, appropriate public health and environmental protections are achieved.

Both alternatives satisfy the threshold balancing criterion and other criterion listed here, and each is fully protective of public health and the environment, will control migration of contaminants, will comply with SCGs, are effective for the short-term and long-term, are implementable, and reduces both mobility and toxicity.

### **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 observations by the project team, both of the alternatives for the Site are acceptable to the community. Both remedial actions provide for protection of public health and the environment and minimize potential contaminant exposures. This RAWP will be subject to and undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedial action. This public comment will be considered by OER prior to approval of this plan.

### **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.

Both alternatives provide protection of public health and the environment for both the proposed use of the Site. Both alternatives provide a remedial action that is beneficial to the surrounding community and is consistent with the goals of the City for remediating and redeveloping Brownfield sites.

Both alternatives for remedial action at the site are comparable with respect to the proposed use and to land uses in the vicinity of the Site. The proposed use is consistent with the existing zoning designation for the property and is consistent with recent development patterns. The Site is surrounded by commercial and residential property and both alternatives provide comprehensive protection of public health and the environment for these uses. 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. Both alternatives are equally protective of natural resources and cultural resources. This RAWP will be subject to undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the land use factors described in this section. This public comment will be considered by OER prior to approval of this plan.

### **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.

The overall sustainability of Alternative 2 is higher than Alternative 1, as Alternative 2 greatly reduces the overall project energy consumption and greenhouse gas emissions associated with soil/fill excavation and trucking.

## 4.0 REMEDIAL ACTION

### 4.1 SUMMARY OF PREFERRED REMEDIAL ACTION

The preferred remedial action alternative is Alternative 2, 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.

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 (CPP);
2. Performance of a Community Air Monitoring Plan (CAMP) for particulates and volatile organic carbon compounds (VOCs).
3. Establishment of Track 4 Site Specific Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Excavation and removal of soil/fill exceeding Track 4 Site-specific SCOs. Excavation in the building cellar area will be to approximately 11-14 feet below existing grade. Excavation outside the cellar footprint will be to approximately 2 feet below grade.
6. 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.
7. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations.

8. Transportation and off-Site disposal of approximately 3,750 tons of 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.
9. Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of SCOs;
10. Dewatering in compliance with all city, state, and federal laws and regulations.
11. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
12. Installation of a vapor barrier/waterproofing system below the concrete slab underneath the building, as well as behind foundation walls of the proposed building.
13. Construction and maintenance of an engineered composite cover consisting of 1-foot thick concrete building foundation slab and walls over the proposed building footprint, a minimum 4-inch thick asphalt cap over parking areas, and two-foot deep clean common fill underlain by a demarcation layer in landscaped areas that comprise the remainder of the Site.
14. Demarcation of residual soil/fill;
15. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
16. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
17. Import of materials to be used for backfill and cover, as needed, in compliance with OER approved plan and in accordance with applicable Federal, State and City laws and regulations;
18. Submission of a Remedial Action Report (RAR) that describes the remedial activities certifies that the remedial requirements have been achieved, defines the Site boundaries, describes all Engineering and Institutional controls to be implemented at the Site, and lists any changes from this RAWP;

19. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, inspection and certification of Engineering and Institutional controls and reporting at a specified frequency; and
20. The property will continue to be registered with an E-Designation at the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls; 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 Soil Cleanup Objectives (SCOs) are proposed for this project.

The following Track 4 Soil Cleanup Objectives are proposed for the Site:

<b><u>Contaminant</u></b>	<b><u>SCO</u></b>
Total SVOCs	250 mg/kg
Arsenic	20 mg/kg
Barium	750 mg/kg
Lead	1,000 mg/kg

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 Appendix 3.

Soil and fill management at the Site will include impacted soil removal and disposal within the development cut. 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.

### **Estimated Soil/Fill Removal Quantities**

The anticipated total quantity of soil/fill to be excavated and disposed off-Site is approximately 2,500 cubic yards or 3,750 tons, which assumes an excavation depth of 11-14 feet across the building footprint (approximately 5,000 square feet) and approximately 2 feet of excavation across the remainder of the Site.

It is expected that groundwater will be encountered at the bottom of the proposed excavation.

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

### **End-Point Sampling**

Removal actions for development purposes under this plan will be performed in conjunction with confirmation endpoint soil. Three endpoint samples will be collected. If the levels are not acceptable for Track 4 SCOs standards, the excavation will continue until an acceptable level is reached. For comparison of confirmation endpoint sampling results to Track 1 SCOs, analytes will include SVOCs, pesticides, polychlorinated biphenyls (PCBs) and metals according to analytical methods described below. For comparison to Track 4 SCOs, analytes will only include trigger compounds and elements established on the Track 4 SCO list.

Hot-spot removal actions, whether established under this RAWP or identified during the remedial program will be performed in conjunction with remedial end-point sampling to ensure that hot-spots are fully removed. Analytes for endpoint sampling will be those parameters that are driving the hot-spot removal action and will be approved by OER. Frequency for hot-spot endpoint 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 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.

New York State ELAP certified labs will be used for all end-point sample analyses. Labs for 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. End-point samples will be analyzed for trigger analytes (those for which SCO exceedances are identified) 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.

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**

One (1) duplicate sample will be collected for each of 20 samples collected and at least one (1) field and one (1) lab blank samples or more will be collected to sufficiently assess sampling and lab artifacts.

### **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 3. The estimated quantity of soil to be imported into the Site for backfill and cover soil is zero tons. The estimated quantity of onsite soil/fill expected to be reused/relocated on Site is zero tons.

## **4.3 ENGINEERING CONTROLS**

Engineering Controls were employed in the remedial action to address residual contamination remaining at the site. The Site has two (2) primary Engineering Control Systems. These are:

- Composite cover system consisting of concrete slab below the sub-grade parking garage and cellar level occupying the entire proposed building footprint;
- Soil vapor barrier system for the Site building cellar floor and walls.

### **Composite Cover System**

Exposure to residual soil/fill will be prevented by an engineered, composite cover system to be built on the Site. This composite cover system will be comprised of 1-foot concrete slab beneath the building footprint, concrete foundation walls, a minimum 4-inch thick asphalt cap over parking areas, and two-foot clean common fill underlain by a demarcation layer in landscaped areas that comprise the remainder of the Site.

The composite cover system is a permanent engineering control for the Site. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil/Material Management Plan (SMMP) will be included in the Site Management Plan 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 Site Management Plan in the RAR.

### **Vapor Barrier**

Migration of soil vapor will be mitigated with a combination of building slab and waterproofing/vapor barrier. The waterproofing/ vapor barrier shall be installed between the concrete basement slabs and underlying sub-grade layer, extending along the four walls of the basement structure from the base of the excavation to surface grade level, as well as beneath the slab-on-grade areas. The waterproofing/vapor barrier system will have a minimum thickness of 20 mils.

As-built waterproofing/vapor barrier drawings, 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 manufacturers certificate of warranty will be submitted with the RAR. The Remedial Engineer will oversee implementation and document operations of the waterproofing/vapor barrier installation. The proposed waterproofing/vapor barrier will be manufactured by Raven Industries and will consist of VaporBlock Plus or OER-approved equal.

VaporBlock Plus is a seven-layer co-extruded barrier made from polyethylene and barrier resins to provide impact strength as well as resistance to gas and moisture transmission. The vapor barrier will be installed in accordance with the manufacturer instructions. A non-woven geotextile fabric may be placed directly under VaporBlock Plus to help protect the barrier from damage due to possible sharp coarse aggregate. The vapor barrier will be unrolled running the longest dimension parallel with the direction of the pour and all folds should be pulled open to full width. The vapor barrier will be placed over the footings and sealed with Raven Butyl Seal tape or approved equal at the footing-wall connections. Joints will be overlapped a minimum of 12” and sealed between overlaps with 2-sided Raven Butyl Seal Tape and then VaporBond Plus Tape.

#### 4.4 INSTITUTIONAL CONTROLS

Institutional Controls (IC) have been 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) 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:

- The property will continue to be registered with an E-Designation at the NYC Buildings Department. This RAWP includes a description of all ECs and ICs and summarizes the requirements of the Site Management Plan which will note that the property owner and property owner's successors and assigns must comply with the approved SMP;
- Submittal of a Site Management Plan in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, inspection, and certification of ECs. 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 monthly and will comply with RCNY §43-1407(1)(3).
- Vegetable gardens and farming on the Site are prohibited;
- 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 residential and 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 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 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 Voluntary Cleanup Agreement with OER. This includes a plan for: (1) implementation of EC's and ICs; (2) operation and maintenance of EC's; (3) and inspection and certification of EC's.

Site management activities, reporting, and EC/IC certification will be scheduled on an 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 30 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 that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the contaminants of concern take 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.

Investigations 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 by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This EA 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 Sources**

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

Soil:

- Metals, including lead, arsenic, and barium exceeding Track 2 Restricted Residential SCOs; and
- SVOCs exceeding Track 2 Restricted Residential SCOs.

Groundwater:

- Metals (Manganese and Sodium) exceeding GQS.

Soil Vapor:

- Chlorinated VOCs, including tetrachloroethylene (PCE) and trichloroethene (TCE) detected at low to moderate concentrations in soil vapor; and
- Petroleum-related VOCs detected at trace to low concentrations.

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

Metals and SVOCs are present throughout the site. The distribution of metals and PAHs across the Site is consistent with the presence of urban fill. Metals of concern were not found in filtered groundwater samples above TOGS, indicating that the property is not contributing to groundwater standard violation.

TCE and PCE were detected in soil vapor at concentrations exceeding NYSDOH vapor intrusion monitoring values. However, neither TCE nor PCE were identified in any groundwater samples above GQSs. Therefore, these findings do not support an onsite source of these compounds.

### **Receptor Populations**

On-Site Receptors -The Site is currently vacant and secured; therefore, potential receptors include Site representatives and potential trespassers. During construction and remediation activities, receptors will include construction and remediation workers. Under future conditions, receptors will include residents and employees of the proposed residence.

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

1. Commercial Businesses (up to 0.25 mile) – existing and future
2. Residential Buildings (up to 0.25 mile) – existing and future
3. Building Construction/Renovation (up to 0.25 mile) – existing and future
4. Pedestrians, Trespassers, Cyclists (up to .25 mile) – existing and future
5. Schools (up to .25 mile) – existing and future

## **Potential Points of Exposure**

### *Current Conditions*

As the site is currently capped with asphalt and concrete, there are no potential exposure pathways from soil/ fill. Groundwater is not exposed at the site, and because the site is served by the public water supply, groundwater is not used at the site. There are currently no structures on-Site where soil vapor could accumulate.

### *Construction/ Remediation Activities*

Once development activities begin, construction workers will come in direct contact with surface, subsurface soils and perched groundwater, as a result of on-Site construction and excavation work. On-site construction workers potentially could ingest, inhale or have dermal contact with any exposed soil, fill, or groundwater. Similarly, off Site receptors could be exposed to dust and vapors from excavation activities. During construction, on-Site and off-Site exposure to contaminated dust will be addressed through Soil/Materials Management Plan, dust controls and through the implementation of CAMP and the CHASP.

### *Proposed Future Conditions*

Under future remediated conditions, the site will be fully capped, limiting potential direct exposure to soil remaining in place. A waterproofing/vapor barrier system will prevent exposure to potential on-site or off-site soil vapors, and because the building foundation will be below the depth of groundwater, there will be no vadose zone where vapors would accumulate beneath the building. The Site is served by a public water supply, and groundwater is not used at the Site for potable supply.

### **Potential Routes of Exposure**

The five elements of an exposure pathway are: (1) a contaminant source; (2) contaminant release and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population. An exposure pathway is considered complete when all five elements of an exposure pathway are documented. A potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway cannot be documented. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

- Ingestion of water, fill or soil;
- Inhalation of vapors and particulates; and
- Dermal contact with water, fill, or soil.

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

Complete on-site exposure pathways appear to be present only during the construction and remediation phase. During the remedial action, on-site exposure pathways will be prevented by preventing access to the site, through implementation of soil/ materials management, stormwater pollution prevention, and dust controls, employment of a community air monitoring plan, and implementation of a Construction Health and Safety Plan.

## **5.0 REMEDIAL ACTION MANAGEMENT**

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

Principal personnel who will participate in the remedial action include the following representatives from GRANT:

- Senior Engineer, Mr. Stephen A. Morse, PE, LEED AP
- Site Safety Officer, Mr. Andrew Rizk, P.E.

The Professional Engineer (PE) for this project is Mr. Stephen A. Morse of GRANT.

### **5.2 SITE SECURITY**

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

### **5.3 WORK HOURS**

The hours for operation of remedial construction will conform to the New York City Department of Buildings construction code requirements or according to specific variances issued by that agency.

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

The Construction Health and Safety Plan (CHASP) is included in Appendix 4. The Site Safety Coordinator will be Mr. Andrew Rizk, P.E. of GRANT. 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 HASP. 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 baling/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. Exceedances 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). Sub-grade 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 Markout 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.

## **Dewatering**

Groundwater is expected to be encountered at the base of the excavation and therefore, some dewatering will be necessary during excavation activities. Groundwater handling will be performed in accordance with the Fluids Management section as outlined in Appendix 1: Soil/Materials Management Plan of this report. Extracted groundwater will either be containerized for offsite disposal or be treated as necessary to meet New York City Department of Environmental Protection (NYCDEP) requirements, and discharged to the NYCDEP sewer

system. If dewatering to the NYC storm/ sewer system is determined to be necessary, a New York City Department of Environmental Protection Sewer Discharge Permit will be obtained prior to the start of dewatering activities.

### **Equipment and Material Staging**

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. The location of proposed equipment and material staging areas, truck inspection station, stockpile areas, and other pertinent remedial management feature will be reported to OER prior to the start of the remedial action.

### **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/ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; storm water 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. The 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 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 offsite 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 off-Site 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. The 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. The 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 on-Site or off-Site 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 provided in Figure 6.

## 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 that day and an updated record of the total quantity of material imported and exported;

- 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;
- 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;
- 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.
- 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, Stephen A. Morse, 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 245-247 Driggs Avenue Site No. 14CVCP159K.*

*I certify that the OER-approved Remedial Action Work Plan dated July 2013 was 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.*

## 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, an approximate 4 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	0	3
Remedial Excavation and Shoring	2	16
Footing and Foundation	8	16
Remedial Site Work	40	2
Submit Remedial Action Report	42	1

The entire construction project is estimated to occur from approximately October 2013 to January 2015.

FIGURES



**Project Site Location:  
247-245 Driggs Avenue  
Block 2966, Lots 17 & 15**



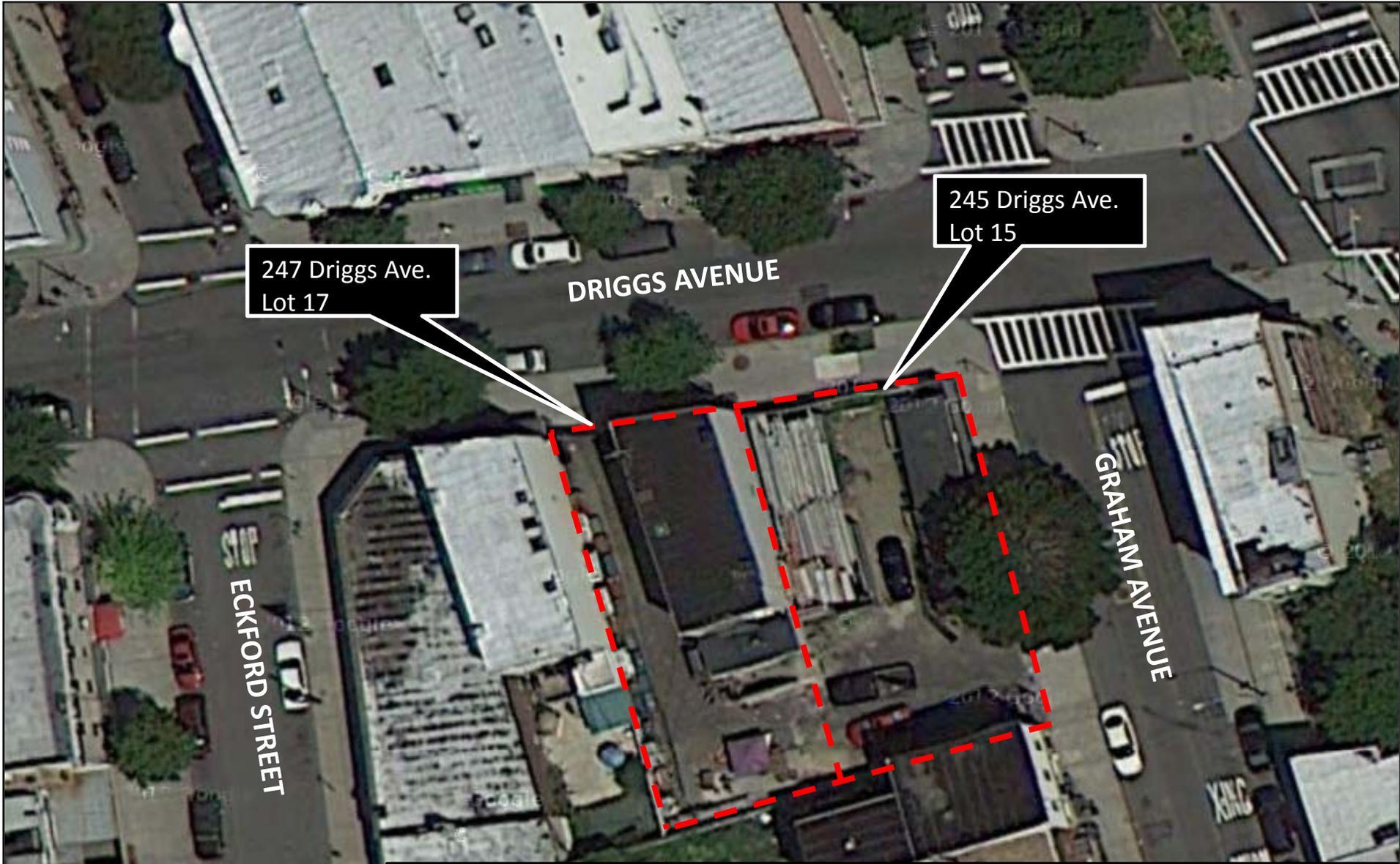
Approximate Site Location



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247-245 Driggs Ave, Brooklyn  
Remedial Action Work Plan

Figure 1: Site Map



Existing  
Property Line

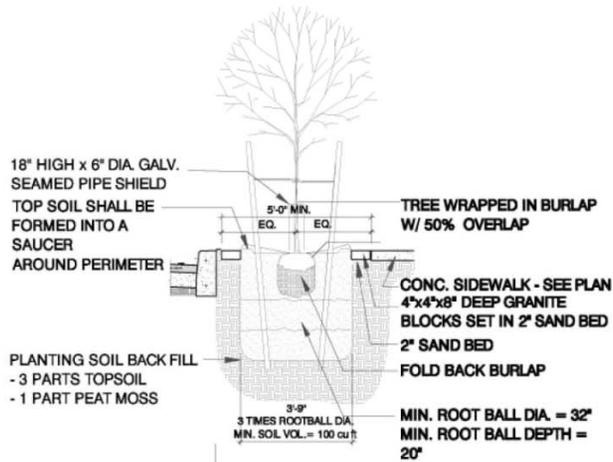


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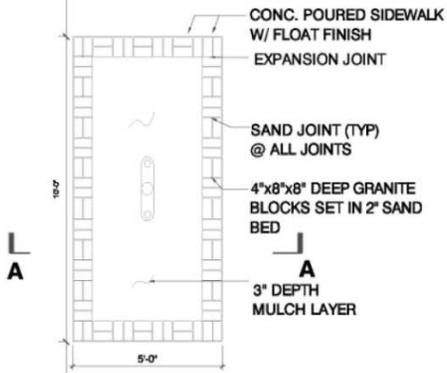
**FIN USA, LLC**

247-245 Driggs Ave, Brooklyn  
Remedial Action Work Plan

Figure 2: Site Location Plan



SECTION AA: TREE PLANTING & STAKE DET.

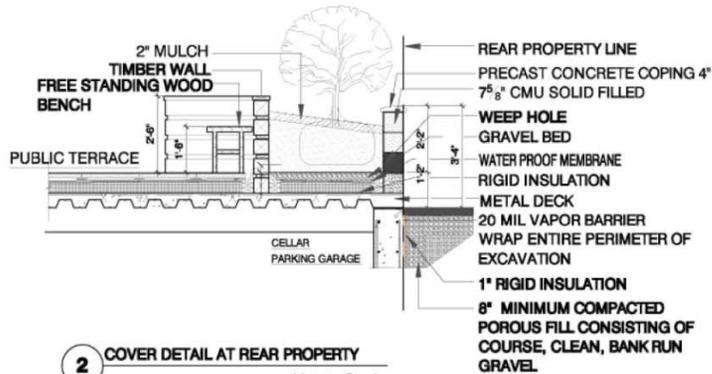


TREE PIT DIMENSIONS:

SOIL VOLUME MIN. 100 CU FT MIN. 2'-0" DEPTH.  
TREE PIT DEPTH SHOULD MATCH ROOT BALL HEIGHT. (IN THE CASE OF STRUCTURAL SOIL, PIT CAN BE DEEPER).

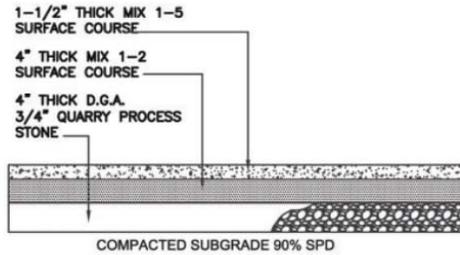
1 TREE PIT AT SIDEWALK

Not to Scale



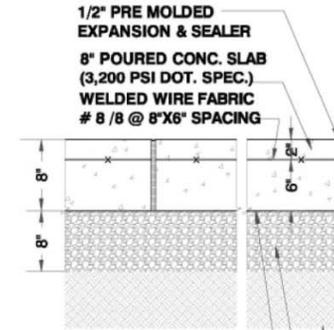
2 COVER DETAIL AT REAR PROPERTY

Not to Scale



4 HEAVY DUTY PAVEMENT (HD)

NOTE:  
PROVIDE THIC COAT BETWEEN COURSES OF PAVEMENT



3 CONCRETE SIDEWALK BEYOND PROPERTY LINE

Not to Scale

NOTES  
20'-0" MAX. SPACING AT EXPANSION JOINTS  
ALL EXPANSION JOINTS TO BE CAULKED

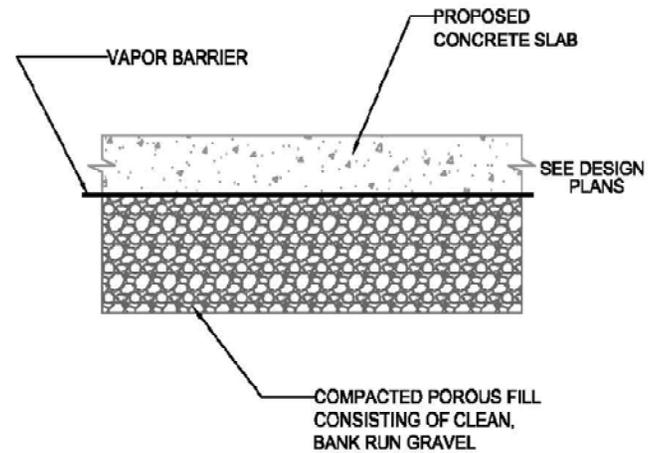
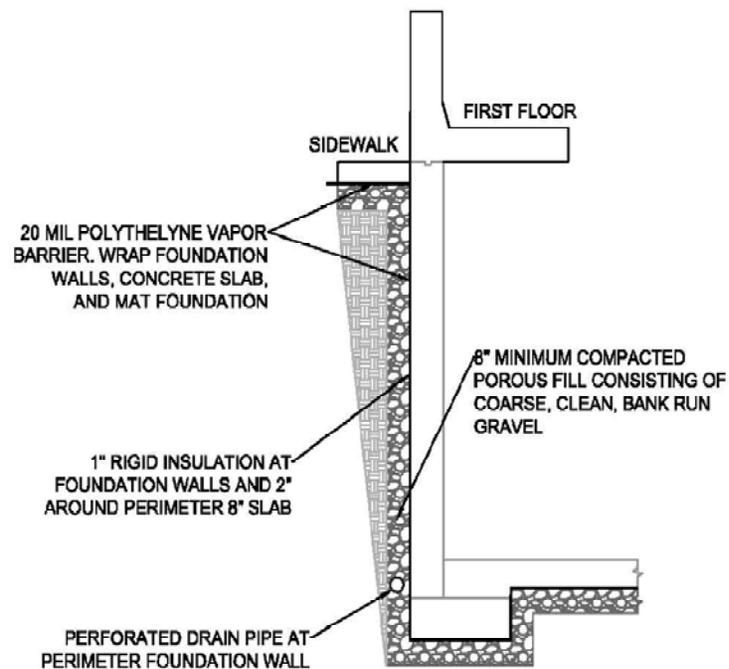


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247-245 Driggs Ave, Brooklyn  
Remedial Action Work Plan

Figure 3: Typical Floor Cover Detail

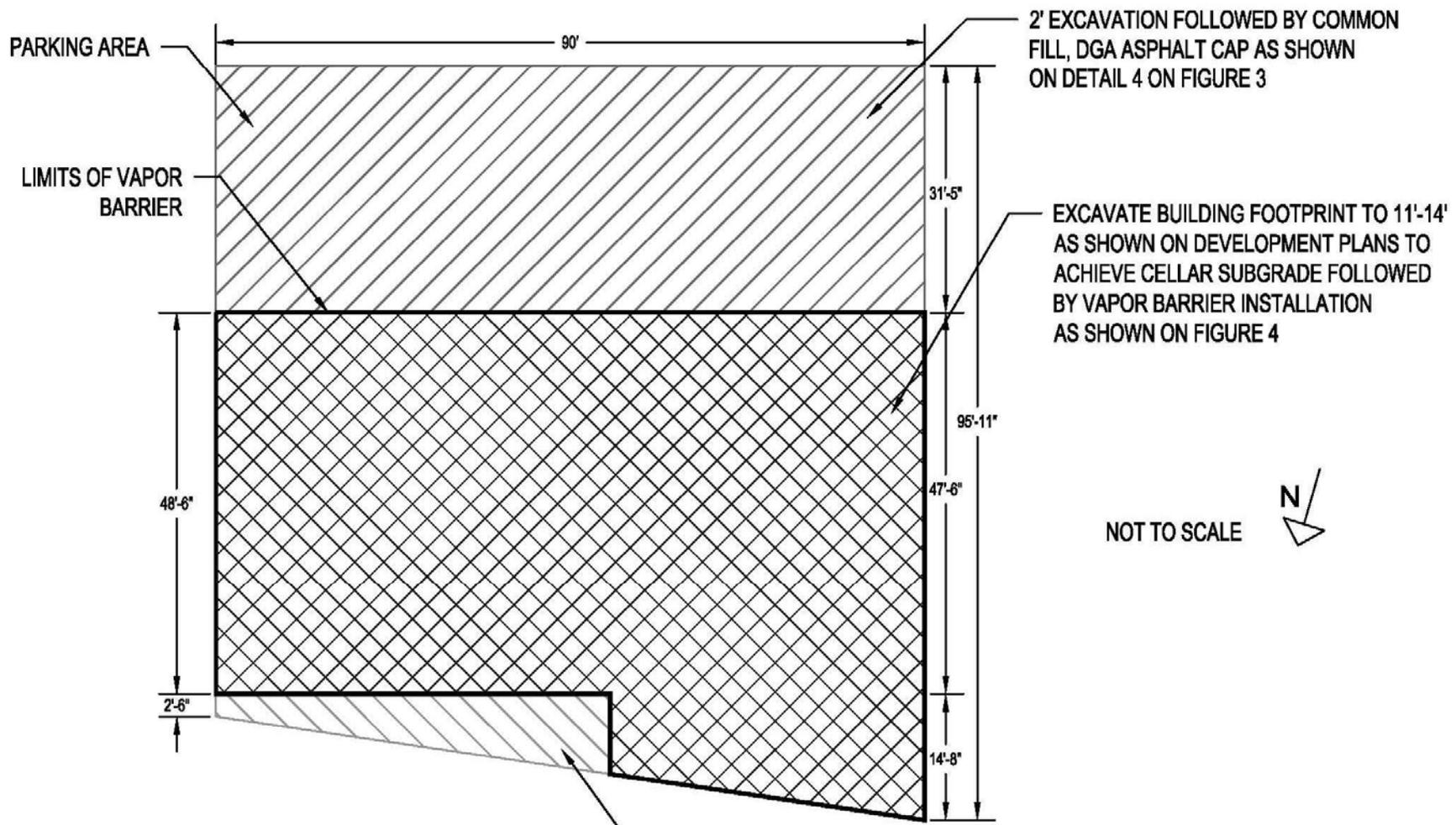


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Remedial Action Work Plan

Figure 4: Typical Cellar Cover  
Detail



PARKING AREA

LIMITS OF VAPOR BARRIER

2' EXCAVATION FOLLOWED BY COMMON FILL, DGA ASPHALT CAP AS SHOWN ON DETAIL 4 ON FIGURE 3

EXCAVATE BUILDING FOOTPRINT TO 11'-14' AS SHOWN ON DEVELOPMENT PLANS TO ACHIEVE CELLAR SUBGRADE FOLLOWED BY VAPOR BARRIER INSTALLATION AS SHOWN ON FIGURE 4

NOT TO SCALE 

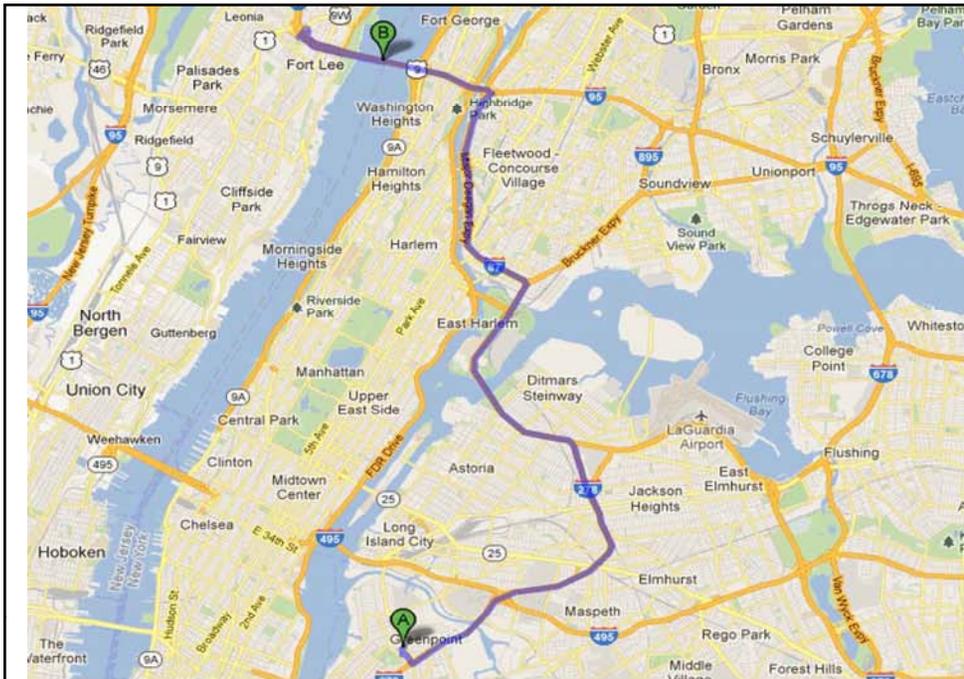
EXCAVATE TO TWO FEET, FOLLOWED BY INSTALLATION OF EITHER LANDSCAPING COVER OR CONCRETE COVER AS SHOWN ON FIGURE 3 CONSISTENT WITH DEVELOPMENT PLANS



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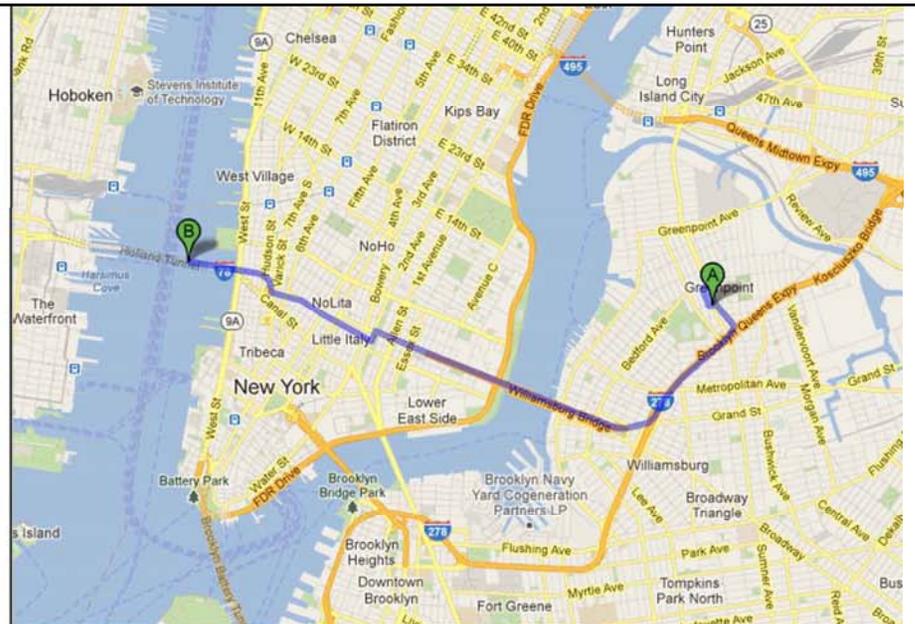
247-245 Driggs Ave, Brooklyn  
Remedial Action Work Plan

Figure 5: Remediation Plan



Alternate Route #1: Project Site to George Washington Bridge, 16.4mi, 29 minutes Travel Time

- Head west on Driggs Ave toward Eckford St (151 ft)
- Take the 1st left onto Eckford St (479 ft)
- Take the 1st left onto Engert Ave go 266 ft
- Take the 1st right onto Graham Ave (0.2 mi)
- Turn left onto Meeker Ave (0.5 mi)
- Continue onto Cherry St (210 ft)
- Take the I278 E/Bklyn Qns Expy ramp on the left to Queens/Bronx (0.2 mi)
- Merge onto I278 E (4.2 mi)
- Keep left at the fork, follow signs for I278/Triboro Bridge and merge onto I278 E (3.3 mi)
- Take exit 47 on the left for Interstate 87 N/Major Deegan Expressway toward Albany (0.2 mi)
- Merge onto I87 N (2.9 mi)
- Take exit 7N7S for U.S. 1 N/Interstate 95 N/Cross Bronx Expressway/Interstate 95 S toward New Haven/G Washington Bridge/Trenton (0.2 mi)
- Take exit 7S on the left for Interstate 95 S/U.S. 1 S toward George Washington Bridge/Trenton (0.4 mi)
- Merge onto I95 S/U.S. 1 S (0.1 mi)
- Slight right onto Interstate 95 Lower Level S Entering New Jersey (2.3 mi)
- Take exit 7374 for U.S. 9W toward NJ67/ Fort Lee/Palisesades Pkwy (0.2 mi)
- Turn left onto Fletcher Ave (0.2 mi)
- Turn left onto Kelby St (167 ft)
- Take the I95 ramp on the left (397 ft)
- Merge onto Interstate 95 Lower Level N (1.1 mi)
- George Washington Bridge on right



Alternate Route #2: Project Site to Holland Tunnel, 5.1mi, 14 minutes Travel Time

- Head west on Driggs Ave toward Eckford St (151 ft)
- Take the 1st right onto Eckford St (0.1mi)
- Take the 1st right onto Nassau Ave (249 ft)
- Take the 1st right onto McGuinness Blvd (0.3 mi)
- Slight right to merge onto I-278 W toward BKLYN-Ons Expy/Staten Island (0.7 mi)
- Take exit 32A on the left toward Williamsburg Bridge/Manhattan (0.5 mi)
- Merge onto Williamsburg Bridge (1.4 mi)
- Continue onto Delancey St (0.4 mi)
- Turn left onto Chrystie St (397 ft)
- Take the 1st right onto Broome St (0.6 mi)
- Slight left onto Watts St (0.2 mi)
- Take the ramp onto Holland Tunnel (0.7 mi)



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247-245 Driggs Ave, Brooklyn  
Remedial Action Work Plan

Figure 6: Truck Route Map

TABLES

Table 4 – Soil Analytical Data Summary

Table 5 – Groundwater Analytical Data Summary

Table 6 – Soil Vapor Analytical Data Summary

SOIL ANALYSIS																				
SampleID	NYSDEC Part 375 Restricted Use Soil Cleanup Objectives - Residential		NYSDEC Part 375 Restricted Use Soil Cleanup Objectives - Residential		SB-01 A (0-2) 12F0704-11 6/19/2012 3:00:00 PM		SB-01 B (10-12) 12F0704-12 6/19/2012 3:00:00 PM		SB-02 A (0-2) 12F0704-06 6/19/2012 3:00:00 PM		SB-02 B (10-12) 12F0704-07 6/19/2012 3:00:00 PM		SB-03 A (0-2) 12F0704-13 6/19/2012 3:00:00 PM		SB-03 B (10.5-12.5) 12F0704-14 6/19/2012 3:00:00 PM		SB-04 A (0-2) 12F0704-08 6/19/2012 3:00:00 PM			
YorkID	Use Soil Cleanup Objectives - Residential		Use Soil Cleanup Objectives - Residential		10 Soil mg/kg dry		10 Soil mg/kg dry		10 Soil mg/kg dry		10 Soil mg/kg dry		20 Soil mg/kg dry		20 Soil mg/kg dry		10 Soil mg/kg dry			
Sampling Date	Soil mg/Kg		Soil mg/Kg		Result		Q		Result		Q		Result		Q		Result		Q	
DilutionFactor	CASNumber		CASNumber		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry	
ClientMatrix	Compound		Compound		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry	
RptUnits	mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry	
	<b>Volatile Organics, TCL (Target Compound List)</b>		<b>Volatile Organics, TCL (Target Compound List)</b>		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry	
	1,1,1-Trichloroethane	71-55-6	100	100	0.0023	U	0.0023	U	0.0023	U	0.0023	U	0.0023	U	0.0023	U	0.0023	U	0.0023	U
	1,1,2,2-Tetrachloroethane	79-34-5	~	~	0.0014	U	0.0013	U	0.0014	U	0.0015	U	0.0014	U	0.0014	U	0.0013	U	0.0013	U
	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	~	~	0.0015	U	0.0014	U	0.0014	U	0.0016	U	0.0014	U	0.0015	U	0.0014	U	0.0014	U
	1,1,2-Trichloroethane	79-00-5	~	~	0.0015	U	0.0014	U	0.0015	U	0.0016	U	0.0015	U	0.0015	U	0.0014	U	0.0014	U
	1,1-Dichloroethane	75-34-3	26	19	0.0017	U	0.0016	U	0.0016	U	0.0018	U	0.0016	U	0.0016	U	0.0017	U	0.0016	U
	1,1-Dichloroethylene	75-35-4	100	100	0.0033	U	0.0030	U	0.0032	U	0.0034	U	0.0032	U	0.0033	U	0.0031	U	0.0031	U
	1,2,4-Trichlorobenzene	120-82-1	~	~	0.0012	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U
	1,2-Dibromo-3-chloropropane	96-12-8	~	~	0.0032	U	0.0030	U	0.0032	U	0.0034	U	0.0032	U	0.0032	U	0.0031	U	0.0031	U
	1,2-Dibromoethane	106-93-4	~	~	0.0017	U	0.0015	U	0.0016	U	0.0018	U	0.0016	U	0.0017	U	0.0016	U	0.0016	U
	1,2-Dichloroethane	107-06-2	3.1	2.3	0.0016	U	0.0015	U	0.0016	U	0.0017	U	0.0016	U	0.0016	U	0.0015	U	0.0015	U
	1,2-Dichloropropane	78-87-5	~	~	0.00054	U	0.00050	U	0.00053	U	0.00057	U	0.00053	U	0.00055	U	0.00051	U	0.00051	U
	2-Butanone	78-93-3	100	100	0.0064	U	0.0059	U	0.012	J,D	0.0067	U	0.0062	U	0.0065	U	0.0060	U	0.0060	U
	2-Hexanone	591-78-6	~	~	0.0021	U	0.0020	U	0.0021	U	0.0023	U	0.0021	U	0.0022	U	0.0020	U	0.0020	U
	4-Methyl-2-pentanone	108-10-1	~	~	0.0065	U	0.0060	U	0.0063	U	0.0068	U	0.0063	U	0.0066	U	0.0061	U	0.0061	U
	Acetone	67-64-1	100	100	0.021	J,B,D	0.021	B,D	0.065	B,D	0.060	B,D	0.019	J,B,D	0.021	J,B,D	0.18	B,D	0.18	B,D
	Benzene	71-43-2	4.8	2.9	0.0012	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U
	Bromodichloromethane	75-27-4	~	~	0.0015	U	0.0014	U	0.0015	U	0.0016	U	0.0015	U	0.0016	U	0.0014	U	0.0014	U
	Bromoforn	75-25-2	~	~	0.0014	U	0.0013	U	0.0014	U	0.0015	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U
	Bromomethane	74-83-9	~	~	0.0031	U	0.0028	U	0.0030	U	0.0032	U	0.0030	U	0.0031	U	0.0029	U	0.0029	U
	Carbon disulfide	75-15-0	~	~	0.0016	U	0.0015	U	0.0015	U	0.0017	U	0.0015	U	0.0016	U	0.0015	U	0.0015	U
	Carbon tetrachloride	56-23-5	2.4	1.4	0.0024	U	0.0024	U	0.0025	U	0.0027	U	0.0025	U	0.0026	U	0.0024	U	0.0024	U
	Chlorobenzene	108-90-7	100	100	0.0086	U	0.0080	U	0.0084	U	0.0091	U	0.0084	U	0.0088	U	0.0082	U	0.0082	U
	Chloroethane	75-00-3	~	~	0.0019	U	0.0017	U	0.0018	U	0.0020	U	0.0018	U	0.0018	U	0.0018	U	0.0018	U
	Chloroform	67-66-3	49	10	0.0089	U	0.0082	U	0.0086	U	0.0093	U	0.0086	U	0.0090	U	0.0084	U	0.0084	U
	Chloromethane	74-87-3	~	~	0.0022	U	0.0020	U	0.0021	U	0.0023	U	0.0021	U	0.0021	U	0.0022	U	0.0021	U
	cis-1,2-Dichloroethylene	156-59-2	100	59	0.0024	U	0.0022	U	0.0023	U	0.0025	U	0.0023	U	0.0024	U	0.0022	U	0.0022	U
	cis-1,3-Dichloropropylene	10061-01-5	~	~	0.00086	U	0.00080	U	0.00084	U	0.00091	U	0.00084	U	0.00088	U	0.00082	U	0.00082	U
	Dibromochloromethane	124-48-1	~	~	0.0016	U	0.0015	U	0.0016	U	0.0017	U	0.0016	U	0.0017	U	0.0016	U	0.0016	U
	Dichlorodifluoromethane	75-71-8	~	~	0.0020	U	0.0019	U	0.0020	U	0.0021	U	0.0020	U	0.0021	U	0.0019	U	0.0019	U
	Ethyl Benzene	100-41-4	41	30	0.0086	U	0.0080	U	0.0084	U	0.0091	U	0.0084	U	0.0088	U	0.0082	U	0.0082	U
	Methyl tert-butyl ether (MTBE)	1634-04-4	100	62	0.0094	U	0.0087	U	0.0091	U	0.0098	U	0.0091	U	0.0095	U	0.0089	U	0.0089	U
	Methylene chloride	75-09-2	100	51	0.022	J,B,D	0.019	J,B,D	0.023	B,D	0.026	B,D	0.034	B,D	0.019	J,B,D	0.026	B,D	0.026	B,D
	o-Xylene	95-47-6	~	~	0.0012	U	0.0011	U	0.0012	U	0.0013	U	0.0012	U	0.0012	U	0.0011	U	0.0011	U
	p- & m- Xylenes	1330-20-7/P/M	~	~	0.0014	U	0.0013	U	0.0013	U	0.0014	U	0.0014	J,D	0.0014	U	0.0058	J,D	0.0058	J,D
	Styrene	100-42-5	19	5.5	0.0011	U	0.00098	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0010	U
	Tetrachloroethylene	127-18-4	~	~	0.0013	U	0.0012	U	0.0013	U	0.0013	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U
	Toluene	108-88-3	100	100	0.0057	U	0.0052	U	0.0055	U	0.0060	U	0.0054	U	0.0058	U	0.0045	U	0.0045	U
	trans-1,2-Dichloroethylene	156-60-5	~	~	0.0016	U	0.0015	U	0.0016	U	0.0017	U	0.0016	U	0.0016	U	0.0015	U	0.0015	U
	trans-1,3-Dichloropropylene	10061-02-6	~	~	0.0017	U	0.0015	U	0.0016	U	0.0018	U	0.0016	U	0.0017	U	0.0016	U	0.0016	U
	Trichloroethylene	79-01-6	21	10	0.0014	U	0.0013	U	0.0014	U	0.0015	U	0.0014	U	0.0014	U	0.0013	U	0.0013	U
	Trichlorofluoromethane	75-69-4	~	~	0.0022	U	0.0021	U	0.0022	U	0.0024	U	0.0022	U	0.0022	U	0.0021	U	0.0021	U
	Vinyl Chloride	75-01-4	0.9	0.21	0.0024	U	0.0022	U	0.0023	U	0.0025	U	0.0023	U	0.0024	U	0.0023	U	0.0023	U
	Xylenes, Total	1330-20-7	100	100	0.0014	U	0.0013	U	0.0013	U	0.0014	U	0.0014	J,D	0.0014	U	0.0080	J,D	0.0080	J,D
	<b>Semi-Volatiles, EPA TCL List</b>		<b>Semi-Volatiles, EPA TCL List</b>		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry	
	1,2,4-Trichlorobenzene	120-82-1	~	~	0.104	U	0.0959	U	0.503	U	0.109	U	2.01	U	2.11	U	0.982	U	0.982	U
	1,2-Dichlorobenzene	95-50-1	100	100	0.0831	U	0.0770	U	0.403	U	0.0875	U	1.61	U	1.69	U	0.788	U	0.788	U
	1,3-Dichlorobenzene	541-73-1	49	17	0.0905	U	0.0838	U	0.439	U	0.0952	U	1.76	U	1.84	U	0.858	U	0.858	U
	1,4-Dichlorobenzene	106-46-7	13	9.8	0.0651	U	0.0603	U	0.316	U	0.0686	U	1.26	U	1.33	U	0.618	U	0.618	U
	2,4,5-Trichlorophenol	95-95-4	~	~	0.0517	U	0.0478	U	0.251	U	0.0544	U	1.00	U	1.05	U	0.480	U	0.480	U
	2,4,6-Trichlorophenol	88-06-2	~	~	0.0829	U	0.0809	U	0.451	U	0.0978	U	1.89	U	1.89	U	0.881	U	0.881	U
	2,4-Dichlorophenol	120-83-2	~	~	0.0776	U	0.0718	U	0.376	U	0.0817	U	1.51	U	1.58	U	0.736	U	0.736	U
	2,4-Dimethylphenol	105-67-9	~	~	0.0609	U	0.0564	U	0.296	U	0.0641	U	1.18	U	1.24	U	0.578	U	0.578	U
	2,4-Dinitrophenol	51-28-5	~	~	0.160	U	0.148	U	0.774	U	0.168	U	3.10	U	3.25	U	1.51	U	1.51	U
	2,4-Dinitrotoluene	121-14-2	~	~	0.0831	U	0.0770	U	0.403	U	0.0875	U	1.61	U	1.69	U	0.			

SOIL ANALYSIS															
SampleID		NYSDEC Part 375 Restricted Use Soil Cleanup Objectives - Residential	NYSDEC Part 375 Restricted Use Soil Cleanup Objectives - Residential	SB-01 A (0-2) 12F0704-11 6/19/2012 3:00:00 PM	SB-01 B (10-12) 12F0704-12 6/19/2012 3:00:00 PM	SB-02 A (0-2) 12F0704-06 6/19/2012 3:00:00 PM	SB-02 B (10-12) 12F0704-07 6/19/2012 3:00:00 PM	SB-03 A (0-2) 12F0704-13 6/19/2012 3:00:00 PM	SB-03 B (10.5-12.5) 12F0704-14 6/19/2012 3:00:00 PM	SB-04 A (0-2) 12F0704-08 6/19/2012 3:00:00 PM					
YorkID		Soil mg/Kg	Soil mg/Kg	10 Soil mg/kg dry	10 Soil mg/kg dry	10 Soil mg/kg dry	10 Soil mg/kg dry	20 Soil mg/kg dry	20 Soil mg/kg dry	10 Soil mg/kg dry					
Sampling Date				Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
DilutionFactor															
ClientMatrix															
RptUnits															
Compound	CASNumber														
Aldrin	309-00-2	0.097	0.019	0.00240	U	0.00223	U	0.00233	U	0.00233	U	0.00233	U	0.00245	U
alpha-BHC	319-84-6	0.48	0.097	0.00284	U	0.00263	U	0.00275	U	0.00299	U	0.00275	U	0.00289	U
Aroclor 1016	12674-11-2	~	~	0.00900	U	0.00833	U	0.00873	U	0.00947	U	0.00873	U	0.00916	U
Aroclor 1221	11104-28-2	~	~	0.00900	U	0.00833	U	0.00873	U	0.00947	U	0.00873	U	0.00916	U
Aroclor 1232	11141-16-5	~	~	0.00900	U	0.00833	U	0.00873	U	0.00947	U	0.00873	U	0.00916	U
Aroclor 1242	53469-21-9	~	~	0.00900	U	0.00833	U	0.00873	U	0.00947	U	0.00873	U	0.00916	U
Aroclor 1248	12672-29-6	~	~	0.00900	U	0.00833	U	0.00873	U	0.00947	U	0.00873	U	0.00916	U
Aroclor 1254	11097-69-1	~	~	0.00775	U	0.00717	U	0.00752	U	0.00815	U	0.00789	U	0.00820	U
Aroclor 1260	11096-82-5	~	~	0.00775	U	0.00717	U	0.00752	U	0.00815	U	0.00789	U	0.00820	U
beta-BHC	319-85-7	0.36	0.072	0.00237	U	0.00219	U	0.00230	U	0.00249	U	0.00230	U	0.00241	U
Chlordane, total	57-74-9	~	~	0.0150	U	0.0139	U	0.0158	U	0.0168	U	0.0158	U	0.0163	U
delta-BHC	319-86-8	100	100	0.00205	U	0.00190	U	0.00199	U	0.00216	U	0.00199	U	0.00209	U
Dieldrin	60-57-1	0.2	0.039	0.00222	U	0.00206	U	0.00216	U	0.00234	U	0.00216	U	0.00226	U
Endosulfan I	959-98-8	24	4.8	0.00182	U	0.00169	U	0.00177	U	0.00192	U	0.00177	U	0.00186	U
Endosulfan II	33213-65-9	24	4.8	0.00230	U	0.00213	U	0.00223	U	0.00242	U	0.00223	U	0.00234	U
Endosulfan sulfate	1031-07-8	24	4.8	0.00193	U	0.00178	U	0.00187	U	0.00203	U	0.00187	U	0.00196	U
Endrin	72-20-8	11	2.2	0.00228	U	0.00211	U	0.00221	U	0.00240	U	0.00221	U	0.00232	U
Endrin aldehyde	7421-93-4	~	~	0.00253	U	0.00234	U	0.00245	U	0.00266	U	0.00245	U	0.00257	U
Endrin ketone	53494-70-5	~	~	0.00165	U	0.00153	U	0.00174	U	0.00180	U	0.00160	U	0.00168	U
gamma-BHC (Lindane)	58-89-9	1.3	0.28	0.00261	U	0.00242	U	0.00253	U	0.00275	U	0.00253	U	0.00266	U
Heptachlor	76-44-8	2.1	0.42	0.00300	U	0.00277	U	0.00291	U	0.00315	U	0.00291	U	0.00305	U
Heptachlor epoxide	1024-57-3	~	~	0.00165	U	0.00153	U	0.00160	U	0.00174	U	0.00160	U	0.00168	U
Methoxychlor	72-43-5	~	~	0.00970	U	0.00898	U	0.00941	U	0.0102	U	0.00941	U	0.00987	U
Total PCBs	1336-36-3	1	1	0.00775	U	0.00717	U	0.00752	U	0.00815	U	0.00789	U	0.00820	U
Toxaphene	8001-35-2	~	~	0.190	U	0.176	U	0.185	U	0.200	U	0.185	U	0.194	U
<b>Metals, Target Analyte</b>				<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>
Aluminum	7429-90-5	~	~	6760		4880		5570		15300		8360		6650	
Antimony	7440-36-0	~	~	0.160	U	0.148	U	0.168	U	0.155	U	0.168	U	0.151	U
Arsenic	7440-38-2	16	16	5.52	U	0.200	U	18.2	U	4.72	U	9.26	U	8.08	U
Barium	7440-39-3	400	350	85.0		27.5		800		44.9		149		174	
Beryllium	7440-41-7	72	14	0.009	U	0.008	U	0.009	U	0.010	U	0.009	U	0.009	U
Cadmium	7440-43-9	4.3	2.5	0.148	U	0.137	U	0.156	U	0.156	U	0.144	U	1.83	U
Calcium	7440-70-2	~	~	12400		499		20800		1560		12600		5720	
Chromium	7440-47-3	~	~	13.3		11.7		29.8		18.5		19.1		25.4	
Cobalt	7440-48-4	~	~	5.49		4.54		7.83		8.25		6.43		3.99	
Copper	7440-50-8	270	270	83.2		9.58		233		10.1		208		51.9	
Iron	7439-89-6	~	~	14300	E	23500	E	25200	E	21100	E	37100	E	12300	E
Lead	7439-92-1	400	400	184		5.41		1620		10.3		246		227	
Magnesium	7439-95-4	~	~	3540		1340		4490		3350		2790		17200	
Manganese	7439-96-5	2000	2000	244		413		337		245		399		266	
Nickel	7440-02-0	310	140	16.4		14.4		32.2		24.2		24.2		13.9	
Potassium	7440-09-7	~	~	775		560		898		923		1020		828	
Selenium	7782-49-2	180	36	0.240	U	0.223	U	0.611	U	0.253	U	0.233	U	0.245	U
Silver	7440-22-4	180	36	0.103	U	0.095	U	0.100	U	0.108	U	0.100	U	0.104	U
Sodium	7440-23-5	~	~	7.66	U	7.09	U	7.43	U	8.06	U	7.43	U	7.79	U
Thallium	7440-28-0	~	~	0.217	U	0.200	U	0.210	U	0.228	U	0.210	U	0.220	U
Vanadium	7440-62-2	~	~	23.1		57.6		27.9		37.8		25.5		17.6	
Zinc	7440-66-6	10000	2200	124		19.9		1310	E	42.7		253		803	
<b>Mercury by 7470/7471</b>				<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>
Mercury	7439-97-6	0.81	0.81	0.111	U	0.102	U	0.107	U	0.116	U	0.107	U	0.112	U
Total Solids		%	%	%		%		%		%		%		%	
% Solids	solids	~	~	87.8		94.8		90.4		83.4		90.4		86.2	
NOTES:															
Any Regulatory Exceedences are color coded by Regulation															
Q is the Qualifier Column with definitions as follows:															
U=analyte not detected at or above the level indicated															
B=analyte found in the analysis batch blank															
I=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated															
D=result is from an analysis that required a dilution															
E=result is estimated and cannot be accurately reported due to levels encountered or interferences															
NT=this indicates the analyte was not a target for this sample															
~=this indicates that no regulatory limit has been established for this analyte															
DISCLAIMER:															
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SOIL ANALYSIS																				
SampleID	NYSDEC Part 375 Restricted Use Soil Cleanup Objectives - Residential		NYSDEC Part 375 Restricted Use Soil Cleanup Objectives - Residential		SB-04 B (10-11.5) 12F0704-09 6/19/2012 3:00:00 PM		SB-05 A (0-2) 12F0704-15 6/19/2012 3:00:00 PM		SB-05 B (6-8) 12F0704-16 6/19/2012 3:00:00 PM		SB-06 Sample#1 (0-2) 12F0704-01 6/19/2012 3:00:00 PM		SB-06 Sample (0-2) 12F0704-02 6/19/2012 3:00:00 PM		SB-06 Sample#2 (7-9) 12F0704-03 6/19/2012 3:00:00 PM		SB-06 #2 (7-9) 12F0704-04 6/19/2012 3:00:00 PM			
YorkID	Soil mg/Kg		Soil mg/Kg		10 mg/kg dry		10 mg/kg dry		10 mg/kg dry		2 mg/kg dry		10 mg/kg dry		2 mg/kg dry		10 mg/kg dry			
Sampling Date	CASNumber		CASNumber		Result		Q		Result		Q		Result		Q		Result		Q	
DilutionFactor	mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry	
ClientMatrix	mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry	
RptUnits	mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry		mg/kg dry	
<b>Volatile Organics, TCL (Target Compound List)</b>																				
1,1,1-Trichloroethane	71-55-6	100	100	100	0.0025	U	0.0025	U	0.0025	U	0.0023	U	0.0023	U	0.0023	U	0.0023	U	0.0023	U
1,1,2-Tetrachloroethane	79-34-5	~	~	~	0.0015	U	0.0014	U	0.0015	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	~	~	~	0.0016	U	0.0015	U	0.0015	U	0.0015	U	0.0015	U	0.0015	U	0.0015	U	0.0015	U
1,1,2-Trichloroethane	79-00-5	~	~	~	0.0016	U	0.0015	U	0.0016	U	0.0015	U	0.0015	U	0.0015	U	0.0015	U	0.0015	U
1,1-Dichloroethane	75-34-3	26	19	19	0.0018	U	0.0017	U	0.0018	U	0.0017	U	0.0017	U	0.0017	U	0.0017	U	0.0017	U
1,1-Dichloroethylene	75-35-4	100	100	100	0.0035	U	0.0032	U	0.0035	U	0.0033	U	0.0033	U	0.0033	U	0.0033	U	0.0033	U
1,2,4-Trichlorobenzene	120-82-1	~	~	~	0.0013	U	0.0012	U	0.0013	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U
1,2-Dibromo-3-chloropropane	96-12-8	~	~	~	0.0035	U	0.0032	U	0.0035	U	0.0033	U	0.0033	U	0.0033	U	0.0033	U	0.0033	U
1,2-Dibromoethane	106-93-4	~	~	~	0.0018	U	0.0017	U	0.0018	U	0.0017	U	0.0017	U	0.0017	U	0.0017	U	0.0017	U
1,2-Dichloroethane	107-06-2	3.1	2.3	2.3	0.0017	U	0.0016	U	0.0017	U	0.0016	U	0.0016	U	0.0016	U	0.0016	U	0.0016	U
1,2-Dichloropropane	78-87-5	~	~	~	0.00058	U	0.00054	U	0.00059	U	0.00054	U	0.00054	U	0.00054	U	0.00054	U	0.00054	U
2-Butanone	78-93-3	100	100	100	0.0086	J,D	0.0063	U	0.0069	J,D	0.0069	J,D	0.0069	J,D	0.0069	J,D	0.0069	J,D	0.0069	J,D
2-Hexanone	591-78-6	~	~	~	0.0023	U	0.0021	U	0.0023	U	0.0021	U	0.0021	U	0.0021	U	0.0021	U	0.0021	U
4-Methyl-2-pentanone	108-10-1	~	~	~	0.0069	U	0.0064	U	0.0070	U	0.0065	U	0.0065	U	0.0065	U	0.0065	U	0.0065	U
Acetone	67-64-1	100	100	100	0.044	B,D	0.021	J,B,D	0.027	B,D	0.013	B,D	0.013	B,D	0.013	B,D	0.013	B,D	0.013	B,D
Benzene	71-43-2	4.8	2.9	2.9	0.0013	U	0.0012	U	0.0013	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U
Bromodichloromethane	75-27-4	~	~	~	0.0016	U	0.0015	U	0.0017	U	0.0015	U	0.0015	U	0.0015	U	0.0015	U	0.0015	U
Bromoform	75-25-2	~	~	~	0.0015	U	0.0014	U	0.0015	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U
Bromomethane	74-83-9	~	~	~	0.0033	U	0.0030	U	0.0033	U	0.0031	U	0.0031	U	0.0031	U	0.0031	U	0.0031	U
Carbon disulfide	75-15-0	~	~	~	0.0017	U	0.0016	U	0.0017	U	0.0016	U	0.0016	U	0.0016	U	0.0016	U	0.0016	U
Carbon tetrachloride	56-23-5	2.4	1.4	1.4	0.0027	U	0.0025	U	0.0028	U	0.0025	U	0.0025	U	0.0025	U	0.0025	U	0.0025	U
Chlorobenzene	108-90-7	100	100	100	0.0092	U	0.0085	U	0.0093	U	0.0086	U	0.0086	U	0.0086	U	0.0086	U	0.0086	U
Chloroethane	75-00-3	~	~	~	0.0020	U	0.0019	U	0.0020	U	0.0019	U	0.0019	U	0.0019	U	0.0019	U	0.0019	U
Chloroform	67-66-3	49	10	10	0.0095	U	0.0088	U	0.0096	U	0.0089	U	0.0089	U	0.0089	U	0.0089	U	0.0089	U
Chloromethane	74-87-3	~	~	~	0.0023	U	0.0022	U	0.0024	U	0.0022	U	0.0022	U	0.0022	U	0.0022	U	0.0022	U
cis-1,2-Dichloroethylene	156-59-2	100	59	59	0.0025	U	0.0023	U	0.0026	U	0.0024	U	0.0024	U	0.0024	U	0.0024	U	0.0024	U
cis-1,3-Dichloropropylene	10061-01-5	~	~	~	0.0092	U	0.0085	U	0.0093	U	0.0086	U	0.0086	U	0.0086	U	0.0086	U	0.0086	U
Dibromochloromethane	124-48-1	~	~	~	0.0018	U	0.0016	U	0.0018	U	0.0017	U	0.0017	U	0.0017	U	0.0017	U	0.0017	U
Dichlorodifluoromethane	75-71-8	~	~	~	0.0022	U	0.0020	U	0.0022	U	0.0021	U	0.0021	U	0.0021	U	0.0021	U	0.0021	U
Ethyl Benzene	100-41-4	41	30	30	0.0092	U	0.0085	U	0.0093	U	0.017	D	0.017	D	0.017	D	0.017	D	0.017	D
Methyl tert-butyl ether (MTBE)	1634-04-4	100	62	62	0.0010	U	0.0093	U	0.0010	U	0.0094	U	0.0094	U	0.0094	U	0.0094	U	0.0094	U
Methylene chloride	75-09-2	100	51	51	0.027	B,D	0.022	J,B,D	0.026	B,D	0.027	B,D	0.027	B,D	0.027	B,D	0.027	B,D	0.027	B,D
o-Xylene	95-47-6	~	~	~	0.0013	U	0.0012	U	0.0013	U	0.015	D	0.015	D	0.015	D	0.015	D	0.015	D
p- & m- Xylenes	1330-20-7/M	~	~	~	0.0014	U	0.0013	U	0.0015	U	0.049	D	0.049	D	0.049	D	0.049	D	0.049	D
Styrene	106-42-5	~	~	~	0.0011	U	0.0010	U	0.0011	U	0.011	U	0.011	U	0.011	U	0.011	U	0.011	U
Tetrachloroethylene	127-18-4	19	5.5	5.5	0.0014	U	0.0013	U	0.0014	U	0.013	U	0.013	U	0.013	U	0.013	U	0.013	U
Toluene	108-88-3	100	100	100	0.0061	U	0.011	D	0.0061	U	0.089	D	0.089	D	0.089	D	0.089	D	0.089	D
trans-1,2-Dichloroethylene	156-60-5	~	~	~	0.0017	U	0.0016	U	0.0017	U	0.0016	U	0.0016	U	0.0016	U	0.0016	U	0.0016	U
trans-1,3-Dichloropropylene	10061-02-6	~	~	~	0.0018	U	0.0017	U	0.0018	U	0.0017	U	0.0017	U	0.0017	U	0.0017	U	0.0017	U
Trichloroethylene	79-01-6	21	10	10	0.0015	U	0.0014	U	0.0015	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U
Trichlorofluoromethane	75-69-4	~	~	~	0.0024	U	0.0022	U	0.0024	U	0.0022	U	0.0022	U	0.0022	U	0.0022	U	0.0022	U
Vinyl Chloride	75-01-4	0.9	0.21	0.21	0.0026	U	0.0024	U	0.0026	U	0.0024	U	0.0024	U	0.0024	U	0.0024	U	0.0024	U
Xylenes, Total	1330-20-7	100	100	100	0.0014	U	0.0013	U	0.0015	U	0.064	D	0.064	D	0.064	D	0.064	D	0.064	D
<b>Semi-Volatiles, EPA TCL List</b>																				
1,2,4-Trichlorobenzene	120-82-1	~	~	~	0.111	U	1.02	U	1.12	U	0.518	U	0.518	U	0.518	U	0.518	U	0.518	U
1,2-Dichlorobenzene	95-50-1	100	100	100	0.0889	U	0.822	U	0.900	U	0.416	U	0.416	U	0.416	U	0.416	U	0.416	U
1,3-Dichlorobenzene	541-73-1	49	17	17	0.0967	U	0.895	U	0.980	U	0.453	U	0.453	U	0.453	U	0.453	U	0.453	U
1,4-Dichlorobenzene	106-46-7	13	9.8	9.8	0.0697	U	0.644	U	0.706	U	0.326	U	0.326	U	0.326	U	0.326	U	0.326	U
2,4,5-Trichlorophenol	95-95-4	~	~	~	0.0552	U	0.511	U	0.559	U	0.258	U	0.258	U	0.258	U	0.258	U	0.258	U
2,4,6-Trichlorophenol	88-06-2	~	~	~	0.0949	U	0.919	U	1.01	U	0.465	U	0.465	U	0.465	U	0.465	U	0.465	U
2,4-Dichlorophenol	120-83-2	~	~	~	0.0830	U	0.767	U	0.840	U	0.388	U	0.388	U	0.388	U	0.388	U	0.388	U
2,4-Dimethylphenol	105-67-9	~	~	~	0.0651	U	0.603	U	0.660	U	0.305	U	0.305	U	0.305	U	0.305	U	0.305	U
2,4-Dinitrophenol	51-28-5	~	~	~	0.171	U	1.58	U	1.73	U	0.798	U	0.798	U	0.798	U	0.798	U	0.798	U
2,4-Dinitrotoluene	121-14-2	~	~	~	0.0889	U	0.822	U	0.900	U	0.416	U	0.416	U	0.416	U	0.416	U	0.416	U
2,6-Dinitrotoluene	606-20-2	~	~	~	0.0967	U	0.895	U	0.980	U	0.453	U	0.453	U	0.453					

SOIL ANALYSIS																	
SampleID		NYSDEC Part 375 Restricted Use Soil Cleanup Objectives - Residential	NYSDEC Part 375 Restricted Use Soil Cleanup Objectives - Residential	SB-04 B (10-11.5) 12F0704-09 6/19/2012 3:00:00 PM 10 Soil mg/kg dry	SB-05 A (0-2) 12F0704-15 6/19/2012 3:00:00 PM 10 Soil mg/kg dry	SB-05 B (6-8) 12F0704-16 6/19/2012 3:00:00 PM 10 Soil %	SB-06 Sample#1 (0-2) 12F0704-01 6/19/2012 3:00:00 PM 2 Soil mg/kg dry	SB-06 Sample (0-2) 12F0704-02 6/19/2012 3:00:00 PM 10 Soil mg/kg dry	SB-06 Sample#2 (7-9) 12F0704-03 6/19/2012 3:00:00 PM 2 Soil mg/kg dry	SB-06 #2 (7-9) 12F0704-04 6/19/2012 3:00:00 PM 10 Soil mg/kg dry							
YorkID		Soil mg/Kg	Soil mg/Kg	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q		
Sampling Date	CASNumber																
DilutionFactor																	
ClientMatrix																	
RptUnits																	
Compound																	
Aldrin	309-00-2	0.097	0.019	0.00257	U	0.00238	U	0.00260	U	NT	U	0.00241	U	NT	U	0.00243	U
alpha-BHC	319-84-6	0.48	0.097	0.00303	U	0.00281	U	0.00307	U	NT	U	0.00284	U	NT	U	0.00287	U
Aroclor 1016	12674-11-2	~	~	0.00962	U	0.00890	U	0.00975	U	NT	U	0.00901	U	NT	U	0.00911	U
Aroclor 1221	11104-28-2	~	~	0.00962	U	0.00890	U	0.00975	U	NT	U	0.00901	U	NT	U	0.00911	U
Aroclor 1232	11141-16-5	~	~	0.00962	U	0.00890	U	0.00975	U	NT	U	0.00901	U	NT	U	0.00911	U
Aroclor 1242	53469-21-9	~	~	0.00963	U	0.00890	U	0.00975	U	NT	U	0.00901	U	NT	U	0.00911	U
Aroclor 1248	12672-29-6	~	~	0.00963	U	0.00890	U	0.00975	U	NT	U	0.00901	U	NT	U	0.00911	U
Aroclor 1254	11097-69-1	~	~	0.00829	U	0.00766	U	0.00839	U	NT	U	0.00775	U	NT	U	0.00784	U
Aroclor 1260	11096-82-5	~	~	0.00829	U	0.00766	U	0.00839	U	NT	U	0.00775	U	NT	U	0.00784	U
beta-BHC	319-85-7	0.36	0.072	0.00253	U	0.00234	U	0.00257	U	NT	U	0.00237	U	NT	U	0.00240	U
Chlordane, total	57-74-9	~	~	0.0161	U	0.0149	U	0.0163	U	NT	U	0.0151	U	NT	U	0.0152	U
delta-BHC	319-86-8	100	100	0.00219	U	0.00203	U	0.00222	U	NT	U	0.00205	U	NT	U	0.00208	U
Dieldrin	60-57-1	0.2	0.039	0.00238	U	0.00220	U	0.00241	U	NT	U	0.00222	U	NT	U	0.00225	U
Endosulfan I	959-98-8	24	4.8	0.00195	U	0.00180	U	0.00197	U	NT	U	0.00182	U	NT	U	0.00184	U
Endosulfan II	33213-65-9	24	4.8	0.00246	U	0.00228	U	0.00249	U	NT	U	0.00230	U	NT	U	0.00233	U
Endosulfan sulfate	1031-07-8	24	4.8	0.00206	U	0.00190	U	0.00209	U	NT	U	0.00193	U	NT	U	0.00195	U
Endrin	72-20-8	11	2.2	0.00244	U	0.00225	U	0.00247	U	NT	U	0.00228	U	NT	U	0.00231	U
Endrin aldehyde	7421-93-4	~	~	0.00270	U	0.00250	U	0.00274	U	NT	U	0.00253	U	NT	U	0.00256	U
Endrin ketone	53494-70-5	~	~	0.00177	U	0.00163	U	0.00179	U	NT	U	0.00165	U	NT	U	0.00167	U
gamma-BHC (Lindane)	58-89-9	1.3	0.28	0.00279	U	0.00258	U	0.00283	U	NT	U	0.00261	U	NT	U	0.00264	U
Heptachlor	76-44-8	2.1	0.42	0.00320	U	0.00296	U	0.00325	U	NT	U	0.00300	U	NT	U	0.00303	U
Heptachlor epoxide	1024-57-3	~	~	0.00177	U	0.00163	U	0.00179	U	NT	U	0.00165	U	NT	U	0.00167	U
Methoxychlor	72-43-5	~	~	0.0104	U	0.00959	U	0.0105	U	NT	U	0.00970	U	NT	U	0.00981	U
Total PCBs	1336-36-3	1	1	0.00829	U	0.00766	U	0.00839	U	NT	U	0.00775	U	NT	U	0.00784	U
Toxaphene	8001-35-2	~	~	0.203	U	0.188	U	0.206	U	NT	U	0.190	U	NT	U	0.193	U
<b>Metals, Target Analyte</b>		<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>		<b>mg/kg dry</b>		<b>mg/kg dry</b>		<b>mg/kg dry</b>		<b>mg/kg dry</b>		<b>mg/kg dry</b>		<b>mg/kg dry</b>	
Aluminum	7429-90-5	~	~	10800		8540		5350		NT		7520		NT		7910	
Antimony	7440-36-0	~	~	0.171	U	0.158	U	0.173	U	NT	U	0.160	U	NT	U	0.161	U
Arsenic	7440-38-2	16	16	3.69		9.15		4.58		NT		7.68		NT		5.27	
Barium	7440-39-3	400	350	46.7		155		302		NT		78.1		NT		55.2	
Beryllium	7440-41-7	72	14	0.010	U	0.009	U	0.010	U	NT	U	0.009	U	NT	U	0.009	U
Cadmium	7440-43-9	4.3	2.5	0.158	U	0.147	U	0.160	U	NT	U	0.148	U	NT	U	0.150	U
Calcium	7440-70-2	~	~	1520		11700		17400		NT		30300		NT		1870	
Chromium	7440-47-3	~	~	15.1		18.0		23.2		NT		17.3		NT		17.6	
Cobalt	7440-48-4	~	~	7.46		6.41		5.28		NT		5.61		NT		8.54	
Copper	7440-50-8	270	270	11.1		260		54.2		NT		53.1		NT		20.5	
Iron	7439-89-6	~	~	20100	E	20900	E	27900	E	NT	E	15400	E	NT	E	22500	E
Lead	7439-92-1	400	400	30.0		240		578		NT		120		NT		44.6	
Magnesium	7439-95-4	~	~	2070		2360		6480		NT		6480		NT		2590	
Manganese	7439-96-5	2000	2000	483		294		303		NT		279		NT		256	
Nickel	7440-02-0	310	140	17.1		24.5		22.0		NT		19.7		NT		21.5	
Potassium	7440-09-7	~	~	603		1130		814		NT		809		NT		1470	
Selenium	7782-49-2	180	36	0.257	U	0.900	U	0.260	U	NT	U	0.241	U	NT	U	0.243	U
Silver	7440-22-4	180	36	0.110	U	0.101	U	0.111	U	NT	U	0.103	U	NT	U	0.104	U
Sodium	7440-23-5	~	~	8.19	U	7.57	U	8.29	U	NT	U	23.2	U	NT	U	7.75	U
Thallium	7440-28-0	~	~	0.232	U	0.214	U	0.234	U	NT	U	0.217	U	NT	U	0.219	U
Vanadium	7440-62-2	~	~	24.9		33.4		22.5		NT		23.6		NT		30.8	
Zinc	7440-66-6	10000	2200	33.5		326		591		NT		102		NT		106	
<b>Mercury by 7470/7471</b>		<b>mg/kg dry</b>	<b>mg/kg dry</b>	<b>mg/kg dry</b>		<b>mg/kg dry</b>		<b>mg/kg dry</b>		<b>mg/kg dry</b>		<b>mg/kg dry</b>		<b>mg/kg dry</b>		<b>mg/kg dry</b>	
Mercury	7439-97-6	0.81	0.81	0.118	U	0.109	U	0.120	U	NT	U	0.111	U	NT	U	0.112	U
Total Solids		%	%	%		%		%		%		%		%		%	
% Solids	solids	~	~	82.1		88.7		81.0		87.5		87.7		88.9		86.7	
NOTES:																	
Any Regulatory Exceedences are color coded by Regulation																	
Q is the Qualifier Column with definitions as follows:																	
U=analyte not detected at or above the level indicated																	
B=analyte found in the analysis batch blank																	
I=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated																	
D=result is from an analysis that required a dilution																	
E=result is estimated and cannot be accurately reported due to levels encountered or interferences																	
NT=this indicates the analyte was not a target for this sample																	
~=this indicates that no regulatory limit has been established for this analyte																	
DISCLAIMER:																	
York Analytical Laboratories, Inc. is providing this information as a convenience to you. York makes no representations or warranties that these data are accurate, complete or represent the latest regulatory authority limits or analytes. York is not responsible for any errors or omissions in these specific regulations. Your use of these data constitute your understanding of these limitations and you agree to hold York harmless from any and all action that may arise from use of said information. As regulations change often, we encourage the user to review the regulatory limits and lists of interest to confirm these data.																	

GROUNDWATER SAMPLES

SampleID YorkID Sampling Date DilutionFactor ClientMatrix RptUnits	NYSDEC TOGS Standards and Guidance Values - GA	Soil ug/L	TWP-05 12F0704-05 6/19/2012 3:00:00 PM		TWP-02 12F0704-10 6/19/2012 3:00:00 PM		TWP-03 12F0704-17 6/19/2012 3:00:00 PM	
			1 Water ug/L		1 Water ug/L		1 Water ug/L	
			Result	Q	Result	Q	Result	Q
<b>Compound</b>		<b>CASNumber</b>						
<b>Volatile Organics, TCL (Target Compound List)</b>								
1,1,1-Trichloroethane	71-55-6	5	0.95	U	0.95	U	0.95	U
1,1,2,2-Tetrachloroethane	79-34-5	5	0.57	U	0.57	U	0.57	U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	5	0.60	U	0.60	U	0.60	U
1,1,2-Trichloroethane	79-00-5	1	0.61	U	0.61	U	0.61	U
1,1-Dichloroethane	75-34-3	5	0.69	U	0.69	U	0.69	U
1,1-Dichloroethylene	75-35-4	5	1.3	U	1.3	U	1.3	U
1,2,4-Trichlorobenzene	120-82-1	5	0.48	U	0.48	U	0.48	U
1,2-Dibromo-3-chloropropane	96-12-8	0.04	1.3	U	1.3	U	1.3	U
1,2-Dibromoethane	106-93-4	5	0.68	U	0.68	U	0.68	U
1,2-Dichloroethane	107-06-2	0.6	0.65	U	0.65	U	0.65	U
1,2-Dichloropropane	78-87-5	1	0.22	U	0.22	U	0.22	U
2-Butanone	78-93-3	50	2.6	U	2.6	U	2.6	U
2-Hexanone	591-78-6	50	0.87	U	0.87	U	0.87	U
4-Methyl-2-pentanone	108-10-1	~	5.6	U	5.6	U	5.6	U
Acetone	67-64-1	~	3.9	J,B	3.5	J,B	3.2	J,B
Benzene	71-43-2	1	0.48	U	0.48	U	0.48	U
Bromodichloromethane	75-27-4	~	0.62	U	0.62	U	0.62	U
Bromoform	75-25-2	50	0.58	U	0.58	U	0.58	U
Bromomethane	74-83-9	~	1.2	U	1.2	U	1.2	U
Carbon disulfide	75-15-0	~	0.64	U	0.64	U	0.64	U
Carbon tetrachloride	56-23-5	5	1.0	U	1.0	U	1.0	U
Chlorobenzene	108-90-7	5	0.35	U	0.35	U	0.35	U
Chloroethane	75-00-3	5	0.76	U	0.76	U	0.76	U
Chloroform	67-66-3	7	0.36	U	0.36	U	0.36	U
Chloromethane	74-87-3	5	0.89	U	0.89	U	0.89	U
cis-1,2-Dichloroethylene	156-59-2	5	0.96	U	0.96	U	0.96	U
cis-1,3-Dichloropropylene	10061-01-5	0.4	0.35	U	0.35	U	0.35	U
Dibromochloromethane	124-48-1	50	0.67	U	0.67	U	0.67	U
Dichlorodifluoromethane	75-71-8	5	0.83	U	0.83	U	0.83	U
Ethyl Benzene	100-41-4	5	0.35	U	0.35	U	0.35	U
Isopropylbenzene	98-82-8	5	0.39	U	0.39	U	0.39	U
Methyl tert-butyl ether (MTBE)	1634-04-4	10	0.38	U	0.38	U	0.38	U
Methylene chloride	75-09-2	5	5.8	J,B	5.5	J,B	5.2	J,B
o-Xylene	95-47-6	5	0.50	U	0.50	U	0.50	U
p- & m- Xylenes	1330-20-7P/M	5	0.55	U	0.55	U	0.55	U
Styrene	100-42-5	5	0.43	U	0.43	U	0.43	U
Tetrachloroethylene	127-18-4	5	0.52	U	0.52	U	0.52	U
Toluene	108-88-3	5	0.23	U	0.23	U	0.23	U
trans-1,2-Dichloroethylene	156-60-5	~	0.65	U	0.65	U	0.65	U
trans-1,3-Dichloropropylene	10061-02-6	0.4	0.68	U	0.68	U	0.68	U
Trichloroethylene	79-01-6	5	0.57	U	0.57	U	0.57	U
Trichlorofluoromethane	75-69-4	5	0.91	U	0.91	U	0.91	U
Vinyl Chloride	75-01-4	2	0.97	U	0.97	U	0.97	U
Xylenes, Total	1330-20-7	5	0.55	U	0.55	U	0.55	U
<b>Semi-Volatiles, EPA TCL List</b>								
1,2,4-Trichlorobenzene	120-82-1	5	1.50	U,EXT-D	1.35	U	1.35	U
1,2-Dichlorobenzene	95-50-1	3	1.87	U,EXT-D	1.68	U	1.68	U
1,3-Dichlorobenzene	541-73-1	3	3.14	U,EXT-D	2.82	U	2.82	U
1,4-Dichlorobenzene	106-46-7	3	3.69	U,EXT-D	3.31	U	3.31	U
2,4,5-Trichlorophenol	95-95-4	1	4.12	U,EXT-D	3.70	U	3.70	U
2,4,6-Trichlorophenol	88-06-2	1	3.74	U,EXT-D	3.36	U	3.36	U
2,4-Dichlorophenol	120-83-2	5	3.53	U,EXT-D	3.17	U	3.17	U
2,4-Dimethylphenol	105-67-9	50	4.21	U,EXT-D	3.78	U	3.78	U
2,4-Dinitrophenol	51-28-5	5	11.0	U,EXT-D	9.85	U	9.85	U
2,6-Dinitrotoluene	121-14-2	5	2.70	U,EXT-D	2.43	U	2.43	U
2,6-Dinitrophenol	606-20-2	5	4.01	U,EXT-D	3.60	U	3.60	U
2-Chloronaphthalene	91-58-7	10	3.99	U,EXT-D	3.58	U	3.58	U
2-Chlorophenol	95-57-8	1	3.90	U,EXT-D	3.50	U	3.50	U
2-Methylnaphthalene	91-57-6	~	3.51	U,EXT-D	3.15	U	3.15	U
2-Methylphenol	95-48-7	1	0.980	U,EXT-D	0.879	U	0.879	U
2-Nitroaniline	88-74-4	5	3.44	U,EXT-D	3.08	U	3.08	U
2-Nitrophenol	88-75-5	1	3.55	U,EXT-D	3.18	U	3.18	U
3,3'-Dichlorobenzidine	91-94-1	5	4.01	U,EXT-D	3.60	U	3.60	U
3- & 4-Methylphenols	100-01-6	~	4.25	U,EXT-D	3.81	U	3.81	U
3-Nitroaniline	99-09-2	5	1.82	U,EXT-D	1.64	U	1.64	U
4,6-Dinitro-2-methylphenol	534-52-1	~	7.66	U,EXT-D	6.87	U	6.87	U
4-Bromophenyl phenyl ether	101-55-3	~	3.94	U,EXT-D	3.53	U	3.53	U
4-Chloro-3-methylphenol	59-50-7	1	4.15	U,EXT-D	3.72	U	3.72	U
4-Chloroaniline	106-47-8	5	4.27	U,EXT-D	3.84	U	3.84	U
4-Chlorophenyl phenyl ether	7005-72-3	~	3.57	U,EXT-D	3.20	U	3.20	U
4-Nitroaniline	100-02-7	5	4.31	U,EXT-D	3.87	U	3.87	U
4-Nitrophenol	56-57-5	1	4.50	U,EXT-D	4.04	U	4.04	U
Acenaphthene	83-32-9	20	3.70	U,EXT-D	3.32	U	3.32	U
Acenaphthylene	208-96-8	~	4.89	U,EXT-D	4.38	U	4.38	U
Anthracene	120-12-7	50	4.18	U,EXT-D	3.75	U	3.75	U
Benzo(a)anthracene	56-55-3	0.002	4.65	U,EXT-D	4.17	U	4.17	U
Benzo(a)pyrene	50-32-8	0.002	5.54	U,EXT-D	4.97	U	4.97	U
Benzo(b)fluoranthene	205-99-2	0.002	4.71	U,EXT-D	4.23	U	4.23	U
Benzo(g,h,i)perylene	191-24-2	~	4.75	U,EXT-D	4.26	U	4.26	U
Benzo(k)fluoranthene	207-08-9	0.002	3.95	U,EXT-D	3.54	U	3.54	U
Benzoic acid	65-85-0	~	9.94	U,EXT-D	8.92	U	8.92	U
Benzyl alcohol	100-51-6	~	4.57	U,EXT-D	4.10	U	4.10	U
Benzyl butyl phthalate	85-68-7	50	2.63	U,EXT-D	2.36	U	2.36	U
Bis(2-chloroethoxy)methane	111-91-1	5	5.54	U,EXT-D	4.97	U	4.97	U
Bis(2-chloroethyl)ether	111-44-4	1	4.71	U,EXT-D	4.23	U	4.23	U
Bis(2-chloroisopropyl)ether	108-60-1	5	4.75	U,EXT-D	4.26	U	4.26	U
Bis(2-ethylhexyl)phthalate	117-81-7	5	2.94	U,EXT-D	2.64	U	2.64	U
Chrysene	218-01-9	0.002	4.75	U,EXT-D	4.26	U	4.26	U
Di-n-butyl phthalate	84-74-2	50	4.71	U,EXT-D	4.23	U	4.23	U
Di-n-octyl phthalate	117-84-0	50	4.75	U,EXT-D	4.26	U	4.26	U
Dibenzo(a,h)anthracene	53-70-3	~	3.54	U,EXT-D	3.18	U	3.18	U
Dibenzofuran	132-64-9	~	3.31	U,EXT-D	2.97	U	2.97	U
Diethyl phthalate	84-66-2	50	2.51	U,EXT-D	2.26	U	2.26	U
Dimethyl phthalate	131-11-3	50	5.54	U,EXT-D	4.97	U	4.97	U
Fluoranthene	206-44-0	50	1.82	U,EXT-D	1.64	U	1.64	U
Fluorene	86-73-7	50	3.69	U,EXT-D	3.31	U	3.31	U
Hexachlorobenzene	118-74-1	0.04	3.38	U,EXT-D	3.03	U	3.03	U
Hexachlorobutadiene	87-68-3	0.5	3.78	U,EXT-D	3.39	U	3.39	U
Hexachlorocyclopentadiene	77-47-4	5	3.94	U,EXT-D	3.53	U	3.53	U
Hexachloroethane	67-72-1	5	4.15	U,EXT-D	3.72	U	3.72	U
Indeno(1,2,3-cd)pyrene	193-39-5	0.002	3.14	U,EXT-D	2.82	U	2.82	U
Isophorone	78-59-1	50	3.69	U,EXT-D	3.31	U	3.31	U
N-nitroso-di-n-propylamine	621-64-7	~	2.94	U,EXT-D	2.64	U	2.64	U
N-Nitrosodiphenylamine	86-30-6	50	4.14	U,EXT-D	3.71	U	3.71	U
Naphthalene	91-20-3	10	4.41	U,EXT-D	3.96	U	3.96	U
Nitrobenzene	98-95-3	0.4	2.25	U,EXT-D	2.02	U	2.02	U
Pentachlorophenol	87-86-5	1	4.30	U,EXT-D	3.86	U	3.86	U
Phenanthrene	85-01-8	50	4.12	U,EXT-D	3.70	U	3.70	U
Phenol	108-95-2	1	3.74	U,EXT-D	3.36	U	3.36	U
Pyrene	129-00-0	50	2.70	U,EXT-D	2.43	U	2.43	U
<b>Metals, Dissolved - Target Analyte (TAL)</b>								
Aluminum	7429-90-5	~	115	U	12	U	7	U
Antimony	7440-36-0	~	2	U	2	U	2	U
Arsenic	7440-38-2	25	1	U	1	U	1	U
Barium	7440-39-3	1000	83	U	43	U	75	U
Beryllium	7440-41-7	~	0.9	U	0.9	U	0.9	U
Cadmium	7440-43-9	~	1	U	1	U	1	U
Calcium	7440-70-2	50	193000	U	318000	U	157000	U
Chromium	7440-47-3	50	0.9	U	0.9	U	0.9	U
Cobalt	7440-48-4	~	1	U	1	U	1	U
Copper	7440-50-8	200	2	U	2	U	2	U
Iron	7439-89-6	~	166	U	62	U	25	U
Lead	7439-92-1	25	1	U	1	U	1	U
Magnesium	7439-95-4	35000	13900	U	17600	U	15000	U
Manganese	7439-96-5	~	1510	U	756	U	102	U
Nickel	7440-02-0	~	0.8	U	0.8	U	0.8	U
Potassium	7440-09-7	~	11700	U	16500	U	16400	U
Selenium	7782-49-2	10	2	U	2	U	2	U
Silver	7440-22-4	50	1	U	1	U	1	U
Sodium	7440-23-5	~	29000	U	33000			



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APPENDIX 1

Citizen Participation Plan

## APPENDIX 1

### CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and Fin USA, LLC 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, Fin USA, LLC 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, Hannah Moore, 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 in the nearest public library that maintains evening and weekend hours. 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. Fin USA, LLC will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Brooklyn Public Library – Greenpoint Branch

107 Norman Ave, Brooklyn, NY 11222

718-349-8504

Call for Hours of Operation

**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 Fin USA, LLC, reviewed and approved by OER prior to distribution and mailed by Fin USA, LLC. 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.

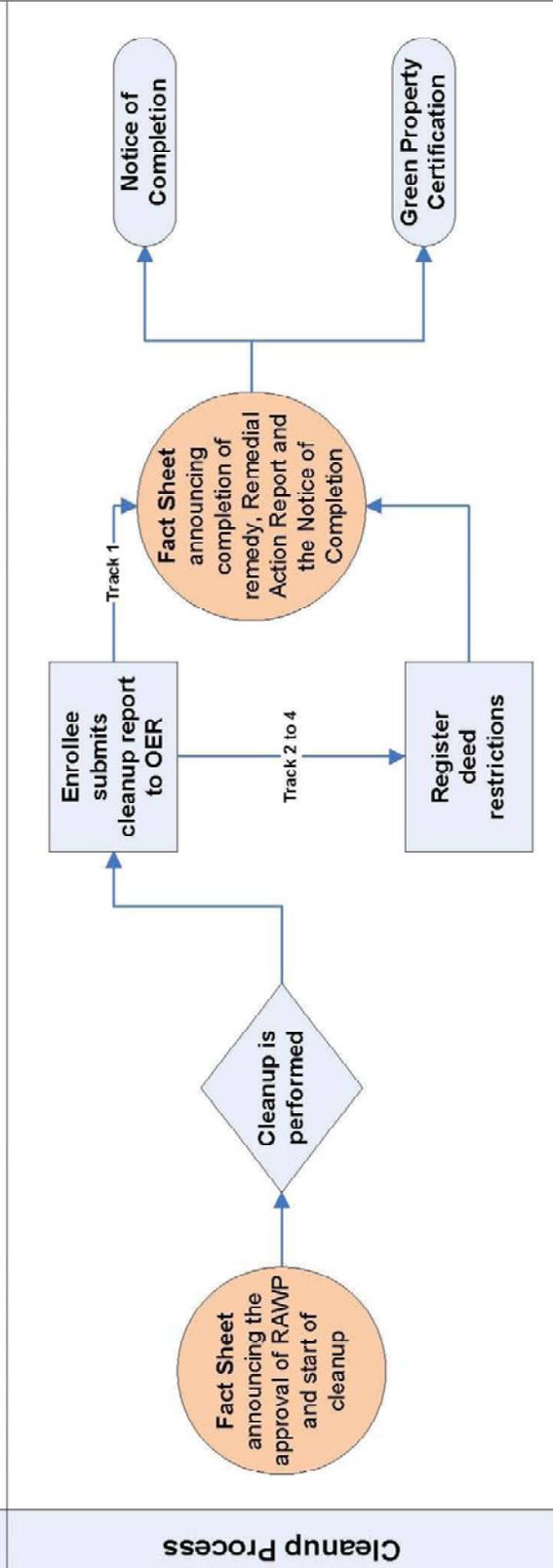
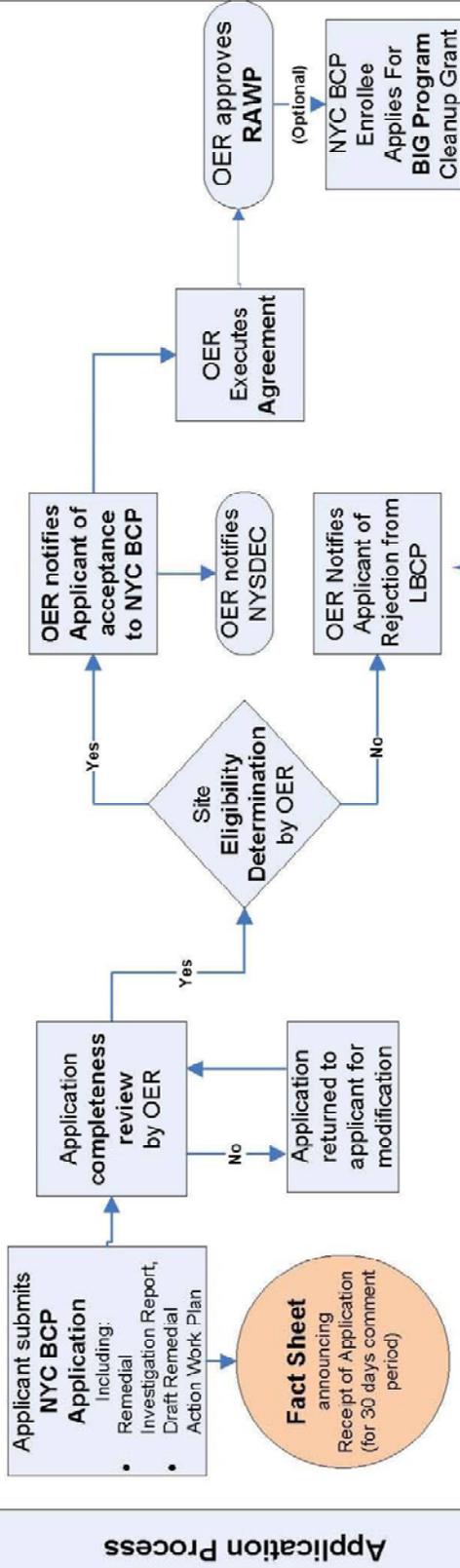
- **Public Notice announcing the approval of the RAWP and the start of remediation**

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.

## Flow Chart For NYC Brownfield Cleanup Program (NYC BCP)



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## APPENDIX 2

### Sustainability Statement

## APPENDIX 2

### 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.

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.

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.

**Storm-water Retention.** Storm-water retention improves water quality by lowering the rate of combined storm-water 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 storm-water 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.** Fin USA, LLC 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.** Fin USA, LLC 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.

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### APPENDIX 3

#### Soil/Materials Management Plan

## **APPENDIX 3**

### **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 7. 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 Brooklyn, 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 established in this plan may be reused on-Site. The soil cleanup objectives for on-Site reuse are listed in the RAWP. ‘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.

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.

Approximately 0 cubic yards of soil is anticipated to be imported to the Site for use as clean cover. All imported soil will be uncontaminated, clean soil that meets the lesser of the appropriate NYSDEC 6 NYCRR Part 375-6.8(a) Restricted Residential Use SCOs and the NYSDEC 6 NYCRR Part 375-6.8 groundwater protection SCOs.

The imported uncontaminated, clean soil cover will be from an approved source/facility and will be evaluated by the PE to ensure:

1. That the material is properly maintained at the source and will not be comingled with any other material prior to importing and grading the clean soil material at the Site;
2. That the material does not include any solid waste, including construction and demolition material, as it's prohibited;
3. That screening for evidence of contamination by visual, olfactory and PID soil screening practices prior to testing at the source as well as upon importing to the Site for grading is completed; and
4. That a maximum five-part composite sample will be collected from the segregated stockpile at the source at a minimum frequency of one sample per 250 cubic yards and analyzed for the following 6 NYCRR Part 375 parameters:
  - VOCs by EPA Method 8260C (rev. 2006)
  - SVOCs by EPA Method 8270D (rev. 2007)
  - Pesticides by EPA Method 8081B (rev. 2000)
  - PCBs by EPA Method 8082A (rev. 2000)
  - TAL Metals by EPA Method 6010C (rev. 2007)

Upon receipt of the segregated stockpile analytical results collected at the source, a Clean Soil Sampling Report will be submitted to OER for review/approval prior to importing. The report will include the following:

1. Summary of number of samples collected and analyzed, tabulated data and comparison to the selected Site Use SCOs;
2. Analytical data sheets and chain of custody documentation;
3. Summary of the quantity;
4. Photographs from the segregated stockpile at the source with sample point locations identified;
5. An affidavit from the source/facility on company letterhead stating that the segregated stockpile has been properly maintained at the source and complies with the requirements listed above; and
6. A copy of source/facility NYSDEC permit;

A highly visible demarcation barrier (i.e. orange geo-synthetic material or equivalent) will be installed beneath the clean soil/fill surface cover. Upon importing and grading the OER approved clean soil cover on top of a highly visible demarcation barrier, the following documentation will be presented in the RAR:

1. Copies of purchase invoices;
2. Truck transportation slips from the source to the Site;
3. Confirmation of OER approved clean soil cover material imported and graded at the site on top of highly visible demarcation barrier;
4. Site plan depicting all areas where the OER approved clean soil cover has been placed; and
5. Photographs documenting the importing and grading of the OER approved clean soil cover across the site with the underlying highly visible demarcation barrier (i.e. orange geo-synthetic material or equivalent).

## 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 STORM-WATER POLLUTION PREVENTION**

Applicable laws and regulations pertaining to storm-water 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.

245-247 Driggs Avenue

Brooklyn, NY

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## APPENDIX 4

### Construction Health and Safety Plan

*\*All information located within this document is privileged, confidential and/or proprietary\**

-- FINAL --

**CONSTRUCTION HEALTH & SAFETY PLAN**

for

**Remedial Action Plan (RAP)**

at

**245-247 Driggs Avenue, Brooklyn, NY, 11222**

**Block 2699, Lots 15 and 17**



Prepared for:

FIN USA, LLC

Prepared by:



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July 2013

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Figure 1	Site Location Map
Figure 2	Site Location Plan
Appendix A	MSDS Sheets

## 1.0 GENERAL SITE INFORMATION

Site Location: 245-247 Driggs Avenue  
City/Town: Brooklyn/New York  
County: Kings County  
State: New York

### 1.1 Site Description, Background and Known Contaminants

On behalf of the FIN USA, LLC (the Client), GRANT engineering (GRANT) of Manhattan, New York has prepared this Construction Health and Safety Plan (CHASP) in conjunction with the Remedial Action Plan (RAP) for the parcel located 245-247 Driggs Avenue in the Greenpoint section of Brooklyn, New York (hereinafter referred to as the “Site”). The Site is comprised of Block 2699, Lots 15 and 17. See **Figure 1** for the Site Location Plan. The Site is 4084-square feet and is bounded by Driggs Avenue to the north, Engbert Avenue, residential property at 565 Graham Avenue to the south, Graham Avenue to the east, and Eckford Street, residential property at 253 Driggs Avenue to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is used for mixed residential and commercial use and contains one (1), 3-floor residential building, and a vacated construction site trailer.

The CHASP and RAP have been prepared prior to the start of any soil disturbance and construction activities. Proper implementation of the CHASP and RAP will minimize contaminant exposure pathways (e.g., dermal contact, ingestion and inhalation) for future occupants of the dwellings at the Site.

The CHASP and RAP have been generated following the completion of a Phase II Site Investigation Report (SIR) prepared by GRANT dated August 21, 2012. Additionally, a Phase I Environmental Site Assessment (ESA) was prepared by GRANT dated May 23, 2012.

A Phase I ESA was conducted by GRANT, dated May 23, 2012, as part of a due diligence to support a potential development of the Site by FIN USA. It is understood that the Site has historically been utilized for residential purposes (Lot 15) and mixed commercial purposes (Lot 17).

The Phase I did not identify any RECs associated with the historic usage of the Site or surrounding properties, however the Site was listed on the New York City Department of City Planning (NYCDCP) list of e-designated properties. Therefore, the Mayor’s Office of Environmental Remediation (MOER) is required to review and approve environmental investigation and environmental mitigation measures in order for a Certificate of Occupancy (COO) to be issued by New York City Department of Buildings (NYCDOB).

GRANT performed the following scope of work for the Site Investigation dated August 2012:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed six (6) soil borings (SB-01 to SB-06) across the entire Site, and collected six (6) soil samples for chemical analysis from the soil borings to evaluate soil quality.
3. Installed two (3) groundwater monitoring wells (TWP-02, TWP-03, TWP-06) throughout the Site to establish groundwater flow and collected two (3) groundwater samples.
4. Installed four (4) soil vapor probes (SVP-01 through SVP-04) throughout the Site and collected four (4) samples for chemical analysis.

### Summary of Environmental Findings

1. Depth to groundwater ranges from eleven (11) to twelve (12) feet at the Site.
2. Groundwater flow is generally from east to west towards the East River, however locally beneath the Site it was measured to flow towards the northeast.
3. Bedrock was not encountered during the RI.
4. The stratigraphy of the site, from the surface down, consists of ten (10) feet of fill material underlain by five (5) feet of medium-fine brown sand believed to be native soil.
5. Soil/fill samples collected during the RI showed no elevated levels of VOCs, PCBs or pesticides. However, the RI did show elevated levels of SVOCs and metals above the Track 2 Restricted Residential SCOs limits in samples SB-03A, SB-03B, SB-05A and SB-05B.

Additionally the following was found:

- a. SB-02A showed elevated levels of barium at 800ppm and lead at 1620ppm above the 400ppm Track 2 Restricted Residential limit. It is recommended that sampling of area be conducted during remedial activities.
  - b. SB-03 found a layer of tar at approximately ten (10) ftbg, which is indicative of site being backfilled with construction fill and not due to any onsite combustion activities.
6. Groundwater samples collected during the RI showed low levels of chlorinated VOCs including dibromo-3-chloropropane, 1,2-Dichloroethane, methylene chloride, and 1,3 dichloropropylene (below 6 ppb) were detected in groundwater above the NYSDEC TOGS groundwater standards of 0.04, 0.6, 5 and 0.4 ppb, respectively. Several SVOCs were identified above the NYSDEC TOGS guidance values in all the three (3) groundwater samples (TWP-02, TWP-03, and TWP-06), however they remain relatively low levels. Groundwater sample TWP-06 collected during the RI showed several metals above the NYSDEC TOGS groundwater standards. The metals included barium at 2340 ppb above the limit of 1000 ppb, chromium at 287 above 50 ppb, copper at 204 ppb above 200 ppb, lead at 1100 ppb above 25 ppb, and mercury at 1.8 ppb above 0.7 ppb.

Pesticides and PCBs were not tested for in groundwater laboratory analysis.

7. Soil vapor samples collected during the RI were compared to DOH Matrix 1 and 2 standards. 1,1,1 – Trichloroethane was reported in the four (4) soil vapor samples (SVP-01 – SVP-04) at 1.8, 2.4, 2.0 and 1.9 ppb, respectively, below the DOH Matrix 2 of 100 ppm which warrants a No Further Action.

Carbon tetrachloride was reported in the four (4) soil vapor samples (SVP-01 – SVP-04) at 1.3, 1.9, 1.5 and 1.5 ppb, respectively, below the DOH Matrix 1 of 5 ppm which warrants a No Further Action.

Tetrachloroethylene was reported in the four (4) soil vapor samples (SVP-01 – SVP-04) at 140, 66, 49 and 59 ppb, respectively. SVP-02 through SVP-04 were below the DOH Matrix 2 of 100 ppm which warrants a No Further Action, however SVP-01 was above 100 ppb limit which warrants a the point be monitored/mitigated.

Trichloroethylene was reported in the four (4) soil vapor samples (SVP-01 – SVP-04) at 25, 1.6, 1.3, and 1.3 ppb, respectively. SVP-02 through SVP-04 were below the DOH Matrix 1 of 5 ppm which warrants a No Further Action, however, SVP-01 was above the 5 ppb limit which warrants the point be monitored/ mitigated.

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.

## ***1.2 Description of Proposed Construction***

Proposed construction at the Site includes:

- One (1) proposed five (5)-story residential building to be constructed at 245-247 Driggs Avenue in the Greenpoint section of Brooklyn, New York (hereinafter referred to as the “Site”). The Site is comprised of Block 2699, Lots 15 and 17. The footprint of the planned residential structure will comprise the northern half of the Site.
- Soil disturbance is anticipated as part of the proposed excavation for construction of the basement for the proposed new residential building to depths of 14 feet below grade (ftbg). Exterior work consisting of concrete repairs (sidewalk, curb, etc.) will be performed as needed. Additional soil disturbance will be performed due to a proposed garden is to be installed on the southwestern portion of the property.

### 1.3 Personnel

The following is a list of the names and job functions of key site safety personnel assigned to this project:

Senior Project Manager	To be determined (Consultant)
Senior Project Engineer	To be determined (Consultant)
Site Inspector / Site Safety Officer (SSO)	To be determined (Consultant)
Project Engineer	To be determined (Consultant)
Equipment Operator	To be determined (Subcontractor)
Laborer	To be determined (Subcontractor)

The SSO will be responsible overall for field implementation of the CHASP. The SSO and subcontractor personnel will be certified for the Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations (HAZWOPER) training, with a current 8 hour OSHA annual refresher. Additional training and/or certification will be necessary depending upon specific safety concerns not covered by the annual refresher (e.g. confined space).

The SSO will be authorized to administer the CHASP. The SSO's primary operational responsibilities include personal and environmental monitoring, selection and monitoring of personal protective equipment, assignment of protection levels, coordination/review of work permits and observation of work activities. The SSO will be authorized to stop work in the event of an imminent health or safety risk exists. The SSO will review the essential safety requirements with all on-site personnel and will facilitate the daily safety meetings.

Specific responsibilities for SSO (and/or SS) would include among others:

- Monitoring workers for signs of stress, such as cold stress, heat stress, and fatigue;
- Re-evaluating site conditions on an on-going basis. Coordinating protective measures including engineering controls, work practices and personal protective equipment;
- Assisting the SS in the preparation, presentation and documentation of daily safety meetings;
- Conducting and preparing reports of daily safety inspections of work processes, site conditions, equipment conditions, and submitting to SS. Discussing any necessary corrective actions with the SS and reviewing new procedures;
- Initiating revisions of the CHASP as necessary for new tasks or modifications of existing operations and submitting to the SS for approval;
- Performing air monitoring as required by the RAP / CHASP;
- Assisting the SS in incident investigations;
- Preparing permits for special operations (hot work, confined spaces, line breaking, etc);
- Maintaining site safety records;
- Conducting inspections of all fire extinguishers, first-aid kits and eye washes/emergency showers on a regular basis; and
- Informing subcontractors of the elements of the CHASP.

## 2.0 SITE HAZARDS

### Contaminant/Waste Characteristics:

General Forms:  solid  liquid  sludge  Gas/vapor

### Contaminant/Waste Classes:

corrosive  radioactive  reactive  toxic  
 ignitable  volatile  unknown  construction/medical

### Possible contaminant/wastes present:

Chemical	Exposure limits	Routes of entry	Symptoms of over-exposure
Acetone	NIOSH TWA 250 ppm OSHA TWA 1000 ppm	Inhalation, skin absorption	Irritation eyes, skin, nose, respiratory system; bone marrow complications
Benzene	NIOSH TWA 0.1 ppm ST 1 ppm OSHA TWA 1 ppm ST 5 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]
Ethenylbenzene	NIOSH TWA 40 ppm OSHA TWA 100 ppm	Inhalation.	Irritating to the eyes, the skin and the respiratory tract, aspiration into the lungs with the risk of chemical pneumonitis, central nervous system. Exposure at high levels may result in unconsciousness.
Lead	NIOSH TWA 250 ppm OSHA TWA 1000 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Blood and bone marrow damage, central nervous system depression, kidney damage, anemia, nerve disease, abdominal cramps and reproductive damage.
Mercury	NIOSH TWA 0.05 ppm OSHA TWA 0.05 ppm	Inhalation of its vapor and through the skin, also as a vapor	Central nervous system and kidneys, resulting in irritability, emotional instability, tremor, mental and memory disturbances, speech disorders. May cause inflammation and discoloration of the gums. Possibly causes toxic effects upon human reproduction.
MTBE	TLV: 50 ppm as TWA; A3; (ACGIH 2004). MAK: 50 ppm, 180 mg/m <sup>3</sup> ;	inhalation and ingestion.	Irritating to the skin, aspiration into the lungs may result in chemical pneumonitis. Exposure far above the OEL could cause lowering of consciousness.

Chemical	Exposure limits	Routes of entry	Symptoms of over-exposure
Naphthalene	NIOSH TWA 15 ppm OSHA TWA 10 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	The substance may cause effects on the blood, resulting in lesions of blood cells (haemolysis) . See Notes. The effects may be delayed. Exposure by ingestion may result in death. Medical observation is indicated.
Tetrachloroethene	NIOSH 75 ppm OSHA 75 ppm IDLH 1000 ppm	Inhalation, Ingestion	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, central nervous system depression; [potential occupational carcinogen]
Toluene	NIOSH TWA 100 ppm OSHA TWA 200 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, central nervous system damage and erratic heart beat
Xylene	NIOSH TWA 100 ppm ST 150 ppm OSHA TWA 100 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system, possible reproductive damage
Vinyl Chloride	NIOSH REL: CA 1 ppm OSHA TWA	Inhalation, skin and or eye contact of liquid	Weak abdominal pain, enlarged liver, pallor or cyan of extremities, liquid frostbite, gastrointestinal bleeding

**Notes:**

C= Value should never be exceeded at any time  
ACGIH TLV= Threshold limit value  
PEL=Permissible Exposure Limit (OSHA)  
TWA=Time Weighted Average  
NIOSH=National Institute for Occupational Safety and Health

OSHA= Occupational Safety and Health Administration  
STEL=Short Term Exposure Limit  
IDLH=Immediately Dangerous to Life and Health  
NA= Not Available

**Safety hazards:**

- |   |  |
|---|--|
| <input type="checkbox"/> Poison ivy/oak   | <input type="checkbox"/> Stacked drums                             |
| <input checked="" type="checkbox"/> Wet or slippery surfaces                                    | <input type="checkbox"/> Ticks                                     |
| <input checked="" type="checkbox"/> Darkness  | <input type="checkbox"/> Infectious waste                          |
| <input checked="" type="checkbox"/> Surface debris (broken glass, sharp objects)                | <input checked="" type="checkbox"/> Excavations                    |
| <input checked="" type="checkbox"/> Excessive noise   | <input checked="" type="checkbox"/> Above or underground utilities |
| <input checked="" type="checkbox"/> hoses, tools, etc. on ground (slip, trip, fall)             | <input type="checkbox"/> Unstable building structures              |
| <input type="checkbox"/> Confined spaces (Confined Space Entry Program Required if applicable). |  |

MSDS Sheets for contaminants that may be encountered on site are included as Appendix A.

### 3.0 SITE OPERATIONS

**Tasks to be performed:**

- Soil excavation and on-site staging;
- Dewatering activities as necessary during excavation;
- Excavated materials handling, including transportation and off-site disposal;
- Truck loading and unloading activities;
- Construction of a seven-story multi-use building (foundation construction, framing, concrete pouring, etc);
- Collection, sorting, and disposal of any scattered concrete and solid waste debris material on the ground in accordance with all applicable local, state, and federal regulations;
- Underground Storage Tanks (USTs) removal, if encountered;
- Application of engineering controls, including the use of an impervious (i.e., concrete slab foundation, impermeable bituminous asphalt pavement, concrete sidewalks and curbs) and/or a 24-inch soil cover media consisting of clean fill and a vegetative top soil to cap the entire Site; and
- Installation of a vapor barrier and/or sub-slab vapor depressurization system underneath the floor slab to prevent the migration and intrusion of VOCs from soils and groundwater at the Site and/or surrounding area.
- 

**Work Zone Map**

Figures 1 and 2 indicate the perimeter of the Site which is also the work zone. Note that the exclusion zones will be in the immediate vicinity (minimum 25 feet radius) of the active work area and will be maintained only when the possibility of a hazardous situation exists. The support zone and personnel decontamination area will also move with the work zone.

**Locations of Safety Equipment:**

Safety Item	Safety Note	Location
Eye wash	Required for all intrusive activities	Personal eye wash in each first aid kit
First Aid Kit	Required for all activities	Support Zone

#### 4.0 PERSONAL PROTECTION

Level of Protection (L.O.P.) to be employed for each site task.

TASK	INITIAL L.O.P.	UPGRADE L.O.P.
Soil excavation and staging	D	Modified D/ C
Excavated materials handling, and T&D	D	Modified D/ C
Unloading and loading activities	D	Modified D/ C
USTs removal, if encountered	D	Modified D/ C
Engineering controls application	D	Modified D/ C

Level D:

- steel toe/steel shank safety shoes
- rubber overboots or disposable boot covers (Modified Level D \*)
- Polyethylene coated Tyvek coveralls (Modified Level D \*)
- Nitrile Outer gloves (Modified Level D \*)
- Latex Inner gloves
- Face Shield (Modified Level D \*)
- hard hat \*      Yes       No \_\_\_
- safety glasses \*      Yes       No \_\_\_

Level C:

- steel toe/shank safety shoes
- rubber overboots or disposable boot covers
- full-face respirator with GMCH cartridges
- Polyethylene coated Tyvek coveralls
- Nitrile outer gloves
- Latex inner gloves
- hard hat \*      Yes       No \_\_\_

Level B\*: (Level B upgrade not planned for this site; if conditions exist that warrant this level of PPE, then work will be terminated until appropriate further actions to remediate conditions are determined)

- \_\_\_ steel toe/shank safety shoes
- \_\_\_ Rubber overboots or disposable boot covers
- \_\_\_ Pressure-demand SCBA
- \_\_\_ Saranex (or equal) coveralls
- \_\_\_ Nitrile outer gloves
- \_\_\_ Latex inner gloves

Hard hat    Yes \_\_\_    No \_\_\_

Other safety equipment:

- hearing protection \*
- tick spray
- Reflective Vests

- cooler(s)
- sunscreen
- Safety Cones
- Gatorade and cups (hot work only)

\* **Hearing protection, hard hat and safety glasses required while working near drilling equipment. Additional Modified Level D items such as: rubber overboots, PVC coated Tyvek coveralls, Nitrile Outer gloves and Face Shields will be required when investigating unknown waste materials if encountered.**

## 5.0 AIR MONITORING

Air monitoring shall be performed in accordance with the NYSDEC DER-10 Regulations. Real-time monitoring for VOCs and particulates (i.e. dust) is required at the perimeter of each designated work area during earth disturbance activities at the site.

### 5.1 Monitoring Instruments

Instrument (make/model)	Purpose and Frequency	Response Ranges	Field Check Gas
HNU Systems Model PI-101 Photoionization Detector (PID) (or equivalent)	Breathing zone monitoring for total ionizable volatile organic compounds. Continuous Monitoring.	0 to 20 units 0 to 200 units 0 to 2,000 units by operator selection	The instrument is field checked with 100 ppm Isobutylene to read 55 ppm (benzene equivalent) at a 9.8 span setting.
DR4000	Continuous Ambient Air Monitoring during excavation and intrusive activities to monitor SVOC and metals in dust particulates	TBD	.TBD

**NOTE:**

Continuous monitoring shall be performed for level C protection.  
Soils shall be screened with the PID for contamination during investigative activities.

### 5.2 Air Quality Action Levels

#### A. L.O.P. Action Levels:

Contaminant	Range	L.O.P.
Organic Vapors	Background to 5 ppm above background*	Level D
	5 ppm to 10 ppm above background*	Level C
	Greater than 10 ppm above background*	Level B

\* Concentrations above background sustained for one minute or longer

## **6.0 DECONTAMINATION**

All personnel and portable equipment used on site shall be thoroughly decontaminated before leaving the site.

### ***6.1 Decontamination of Personnel***

Non-disposable clothing such as boots, goggles and hard hats shall be washed, as appropriate, using an Liqui-Nox and water solution and scrub brushes.

#### **Decontamination Procedure:**

1. Wash and rinse boots and gloves in an Liqui-Nox and water solution
2. Rinse again paying special attention to the soles of the boots
3. Remove tapes
4. Remove boots
5. Remove outer gloves
6. Remove coveralls
7. Remove outer surgical gloves (if present)
8. Remove respirator
9. Remove inner surgical gloves
10. Wash hands, arms and face

### ***6.2 Decontamination of Equipment and Instruments***

#### **Small Equipment and Instruments:**

All reusable equipment shall be scrubbed with Liqui-Nox and water prior to removal from the site. If this method is not sufficient to decontaminate, steam cleaning will used, if applicable. When feasible, electronic instruments should be wrapped in plastic for protection to avoid washing instruments with water. Remember to allow intake ports, vents, etc. of the instruments for proper operation of the instrument.

#### **Heavy Equipment:**

Heavy equipment should be decontaminated prior to leaving the site. This should include manual removal of gross contamination with shovels or other tools. A steam cleaning station will be set up for decontamination of heavy equipment at the site or an area designated by the Field Operations Manager if necessary. Because decontamination at the steam cleaning station poses the possibility of a splash, the task should be performed using modified Level D personal protective equipment. Face shields are recommended during steam-cleaning operations if conducted.

### ***6.3 Disposal of Contaminated Material***

It is anticipated that during the course of the site activities, approximately 5,500 tons of contaminated material will be excavated and disposed offsite at appropriate disposal facilities, including personal protective equipment (PPE).

Contaminated soils will either be directly loaded onto lined trucks for immediate offsite disposal or will be stockpiled onsite at a designated area over top a liner and covered in accordance with the Remedial

Action Plan for this Site until load out for transportation and disposal to appropriate disposal facility. Erosion and Sediment Control measures will be installed around stockpiles of soil materials to prevent offsite migration of contaminated materials. Contaminated soils will be sampled and analyzed for waste classification purposes to determine whether or not facility acceptance criteria are met. Contaminated soil will be field screened with a photoionization detector (PID) for VOCs prior to appropriate subsequent off-site disposal

**6.4 Decontamination Equipment and Supply Checklist**

- Wash tubs/buckets
- Water sprayers
- Scrub brushes
- Liqui-Nox
- Deionized water
- Plastic garbage bags
- Disposable wipes
- Poly sheeting
- 55-gallon drums (if needed)

## 7.0 EMERGENCY RESPONSE

### 7.1 *Communication*

Team members will always work in groups of two or more while on site. Visual contact distance among team members must be maintained at all times. Hand signals will be used on-site to ensure safety during high noise instances. Should an emergency occur, other team members will be alerted via hand signals, air horns, whistles or other devices.

**CONTINUOUS HORN/WHISTLE BLAST:** is the emergency signal to indicate the onset of an emergency requiring that personnel vacate the Exclusion Zone immediately and meet at the designated area discussed in Section 7.2 below.

### 7.2 *Evacuation*

In the event of an emergency, such as fire, explosion, toxic gas release etc, personnel will leave the site and congregate at the corner of Graham Avenue and Driggs Avenue.

### 7.3 *Personnel Injury or Exposure*

In the event of an injury within the Exclusion Zone, all equipment within the zone, if not needed for response to the emergency, will be shut down. On-site personnel trained in First Aid and CPR will initiate first response treatment of the injured person(s). An eyewash station and water sprayer shall be available in the CRZ or support zone. All other personnel will assemble at the decontamination line. The on-site Safety Officer and the Field Operations Manager will evaluate the nature and extent of the injury. The victim will be decontaminated to the extent possible before moving to the Support Zone.

If necessary, emergency personnel will be contacted for medical aid and emergency transportation to the **Northside Medical Care**. No persons will re-enter the Exclusion Zone until the cause of the injury or symptoms have been determined.

#### **First aid for Personnel exposure:**

Skin contact: Flush with water

Inhalation: Move person to fresh air; provide respiration and transport to **Northside Medical Care** if signs of injury or exposure persist.

Ingestion: Decon and transport to **Northside Medical Care**.

### 7.4 *Emergency Decontamination Procedures*

If decontamination procedures can be performed without aggravating injuries or delaying life-saving treatment, protective clothing will be washed, and rinsed or cut off from the injured personnel. If decontamination cannot be done, for instance due to signs of acute exposure being exhibited, the victim will be wrapped in blankets, plastic or rubber to reduce contamination of other on-site personnel and rescue workers, and transported to **Northside Medical Care**. Emergency and off-site medical personnel will be alerted to the risk of potential exposure to contamination while handling the injured.

### 7.5 *Emergency Information*

Emergency Service:	Phone Number:
Ambulance	911
Emergency Room ( <b>Northside Medical Care</b> )	911 or <b>(718) 383-4600</b>
Police	911
Fire Department	911

If a field employee becomes injured or ill while on the job, transport to **Northside Medical Care**. Also, contact management. State that the injury or illness is an "on the job injury" and provide Material Safety Data Sheet for compounds involved.

Poison Control Center	(800) 962-1253
Office of Site Safety and Health	(609) 984-9779
USEPA Emergency Response	(800) 424-8802

GRANT engineering (main number)	(212) 464-8689
Program Director (TBD)	( )
Project Manager (TBD)	( )
RI Task Leader (TBD)	( ) ____-____

### 7.6 *General Emergency Procedures*

In the event of an emergency, the following initial procedures shall be implemented to ensure that the appropriate parties are notified and the scene of the emergency is secured:

- 1) Notify the appropriate local authorities (Police, Fire, Ambulance, etc.)
- 2) Notify the appropriate officials (Case Manager, HazMat Team, etc.)
- 3) Cordon off the emergency scene to the extent possible using caution tape, cones, drums, etc. Berger personnel will also prevent pedestrians from entering the emergency scene until local authorities arrive on-site.

### 7.7 *Update of Emergency Response Plan*

The Emergency Response Plan shall be periodically reviewed and amended as necessary to keep it current with new or changing site conditions or information. Additionally, if an emergency occurs on-site, the incident will be reviewed to determine if the response measures employed were effective and make modifications as necessary.

**Route to the Hospital:** A map indicating the fastest route from the Site to **Northside Medical Care** will be provided to all personnel before commencement of the RAP. Personnel will also be provided with written instructions for accessing the hospital from the site. The designated route is as follows:

Route #1: Project Site to Northside Medical Care, 0.3 mi, 2 minutes Travel Time

1. Head west on Driggs Ave toward Eckford St (0.2 mi)
2. Turn right onto Lorimer St (0.1 mi)
3. Turn right onto Nassau Ave (49)
4. Arrive at Northside Medial Care, 66 Nassau Avenue, New York, NY 11222

## **8.0 GENERAL REQUIREMENTS**

### **8.1 Training**

All activities outlined in Section 3.0 are anticipated to be conducted under the initial Level of Protection (L.O.P.) of Level D, and will not require OSHA HAZWOPER trained workers, except for HAZWOPER trained Site Safety Officer (SSO) or Site Supervisor (SS). In the event that any exposure limits outlined in Section 2.0 are exceeded, work activities will be temporarily suspended until readings have returned below exposure limits. In the event that an upgrade of L.O.P. is deemed necessary, only OSHA HAZWOPER trained personnel will be allowed to continue the work activities within exclusion zones.

SS, SSO, and any personnel engaged in exclusion zone activities must have completed a minimum of 40 hours of environmental safety and health OSHA (HAZWOPER) training with a current 8 hour OSHA annual refresher. On-site managers and supervisors directly responsible for and/or who supervise personnel engaging in field activities shall have completed additional training in the supervision of those activities. A site safety meeting shall be conducted prior to the start of on-site activities, and/or before each day's work as deemed necessary. Those not having completed the 40-hour training requirement are not to enter the exclusion zone.

### **8.2 Medical Surveillance**

All personnel who are potentially exposed to hazardous substances must be enrolled in the medical surveillance program (MSP) and must have had an up-to-date physical. Those not enrolled in the MSP are not to enter the exclusion zone.

### **8.3 General Safety Rules**

The following is a list of general safety rules in effect at the site.

- a. There will be no eating, drinking, or smoking in the exclusion or contamination reduction zone.
- b. All personnel must pass through the contamination reduction zone to enter or exit the exclusion zone.
- c. At a minimum, an emergency deluge shower/spray is to be located on the clean side of the contamination reduction area (for Level C and above).
- d. All personnel shall wash hands, arms and face before eating, smoking or drinking and at the end of the workday.
- e. All supplied breathing air shall be certified as grade D or better.
- f. Where practical and necessary, all tools/equipment will be sparking proof, explosion resistant, and/or bonded and grounded.
- g. Fire extinguishers will be on-site for use on equipment or small fires only.
- h. An adequate supply of cool drinking water (at least 1 gallon per person) with an ample supply of disposable cups shall be present during each day of site operations, and be readily available to site personnel.

#### **8.4 Other Safety Precautions and Hazardous Operations**

##### **Utility Clearance**

If excavation will take place in area of utilities, all utilities will be cleared prior to site excavation activity.

##### **Confined Space Operations**

No confined space operations are anticipated for the tasks covered under this remedial investigation.

Confined Spaces are identified at: **None**

Confined Space Entry Permits are required: Yes  No  NA

##### **Site Security**

All personnel shall be briefed (at safety meeting and site visit) prior to entering and working at the Site; all work areas and limited entry areas will be barricaded and marked at their perimeter and entry points during active field work.

A Site map indicating all planned work areas is presented as Figure 2 in this report and will be made available to all site personnel.

##### **Hot Work**

Permit-required hot work is not anticipated for this project. However, if such work becomes necessary, the on-site Safety Officer will issue hot work permits.

## FIGURES

- Figure 1**      Site Location Map  
**Figure 2**      Site Location Plan



**Project Site Location:  
247-245 Driggs Avenue  
Block 2966, Lots 17 & 15**



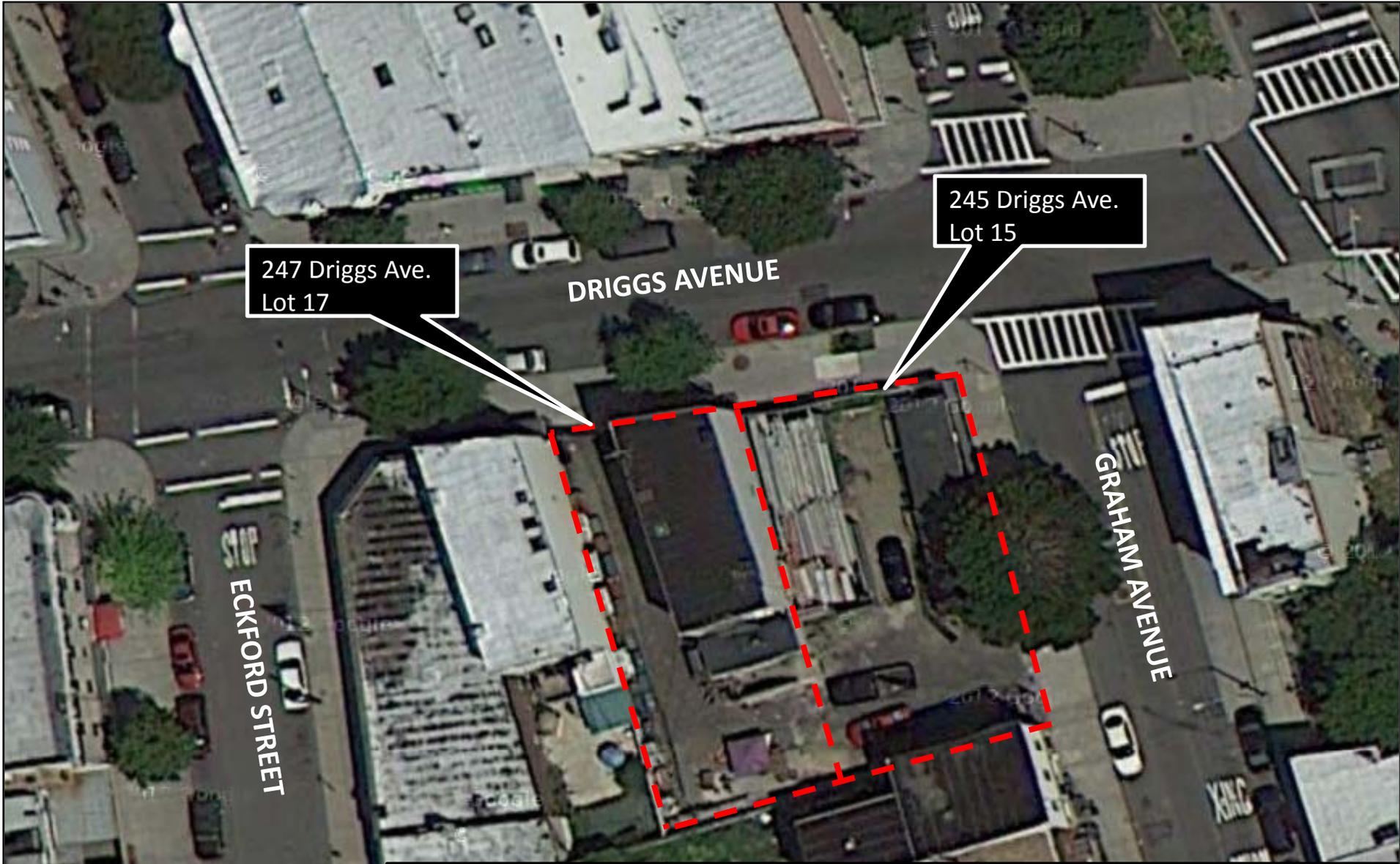
Approximate Site Location



FIN USA, LLC

247-245 Driggs Ave, Brooklyn  
Health and Safety Plan

Figure 1: Site Map



Existing  
Property Line



**GRANT**  
engineering

**FIN USA, LLC**

247-245 Driggs Ave, Brooklyn  
Health and Safety Plan

Figure 2: Site Location Plan

## **APPENDICES**

### **Appendix A**    MSDS Sheets

# NIOSH Pocket Guide to Chemical Hazards

<b>m-Xylene</b>		CAS 108-38-3	
$C_6H_4(CH_3)_2$		RTECS <a href="#">ZE2275000</a>	
<b>Synonyms &amp; Trade Names</b> 1,3-Dimethylbenzene; meta-Xylene; m-Xylol		DOT ID & Guide 1307 <a href="#">130</a>	
<b>Exposure Limits</b>	NIOSH REL: TWA 100 ppm (435 mg/m <sup>3</sup> ) ST 150 ppm (655 mg/m <sup>3</sup> )		
	OSHA PEL†: TWA 100 ppm (435 mg/m <sup>3</sup> )		
IDLH 900 ppm See: <a href="#">95476</a>		Conversion 1 ppm = 4.34 mg/m <sup>3</sup>	
<b>Physical Description</b> Colorless liquid with an aromatic odor.			
MW: 106.2	BP: 282°F	FRZ: -54°F	Sol: Slight
VP: 9 mmHg	IP: 8.56 eV		Sp.Gr: 0.86
Fl.P: 82°F	UEL: 7.0%	LEL: 1.1%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
<b>Incompatibilities &amp; Reactivities</b> Strong oxidizers, strong acids			
<b>Measurement Methods</b> NIOSH <a href="#">1501</a> , <a href="#">3800</a> ; OSHA <a href="#">1002</a> See: <a href="#">NMAM</a> or <a href="#">OSHA Methods</a>			
<b>Personal Protection &amp; Sanitation</b> Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		<b>First Aid</b> ( <a href="#">See procedures</a> ) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
<a href="#">Important additional information about respirator selection</a>			
<b>Respirator Recommendations</b> NIOSH/OSHA <b>Up to 900 ppm:</b> (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 <b>Emergency or planned entry into unknown concentrations or IDLH conditions:</b> (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 <b>Escape:</b> (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			
<b>Exposure Routes</b> inhalation, skin absorption, ingestion, skin and/or eye contact			
<b>Symptoms</b> Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis			
<b>Target Organs</b> Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys			
See also: <a href="#">INTRODUCTION</a> See ICSC CARD: <a href="#">0085</a> See MEDICAL TESTS: <a href="#">0243</a>			

# International Chemical Safety Cards

**m-XYLENE**

ICSC: 0085



meta-Xylene  
1,3-Dimethylbenzene  
m-Xylol  
 $C_6H_4(CH_3)_2 / C_8H_{10}$   
Molecular mass: 106.2

ICSC # 0085  
CAS # 108-38-3  
RTECS # [ZE2275000](#)  
UN # 1307  
EC # 601-022-00-9



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
<b>EXPLOSION</b>	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
<b>EXPOSURE</b>		STRICT HYGIENE!	
<b>•INHALATION</b>	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
<b>•SKIN</b>	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
<b>•EYES</b>	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants and strong acids .	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III
<b>SEE IMPORTANT INFORMATION ON BACK</b>		
<p><b>ICSC: 0085</b> <span style="float: right;">Prepared in the context of cooperation between the International Programme on Chemical Safety &amp; the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</span></p>		

## International Chemical Safety Cards

### m-XYLENE

**ICSC: 0085**

<b>I M P O R T A N T D A T A</b>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.</p> <p><b>PHYSICAL DANGERS:</b> As a result of flow, agitation, etc., electrostatic charges can be generated.</p> <p><b>CHEMICAL DANGERS:</b> Reacts with strong acids and strong oxidants .</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001). BEI specified by (ACGIH 2001). EU OEL: 50 ppm as TWA; 100 ppm as STEL (skin) (EU 2000). OSHA PEL: TWA 100 ppm (435 mg/m<sup>3</sup>) NIOSH REL: TWA 100 ppm (435 mg/m<sup>3</sup>) ST 150 ppm (655 mg/m<sup>3</sup>) NIOSH IDLH: 900 ppm</p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation, through the skin and by ingestion.</p> <p><b>INHALATION RISK:</b> A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> The substance is irritating to the eyes and the skin . The substance may cause effects on the central nervous system . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> The liquid defats the skin. The substance may have effects on the central nervous system .Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.</p>
<b>PHYSICAL PROPERTIES</b>	<p>Boiling point: 139°C Melting point: -48°C Relative density (water = 1): 0.86 Solubility in water: none Vapour pressure, kPa at 20°C: 0.8</p>	<p>Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 27°C c.c. Auto-ignition temperature: 527°C Explosive limits, vol% in air: 1.1-7.0 Octanol/water partition coefficient as log Pow: 3.20</p>

<b>ENVIRONMENTAL DATA</b>	The substance is toxic to aquatic organisms.	
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**NOTES**

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0084 o-Xylene and 0086 p-Xylene.

NFPA Code: H 2; F 3; R 0;  
Transport Emergency Card: TEC (R)-30S1307-III

**ADDITIONAL INFORMATION**

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**ICSC: 0085**

**m-XYLENE**

(C) IPCS, CEC, 1994

**IMPORTANT LEGAL NOTICE:**

Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

# NIOSH Pocket Guide to Chemical Hazards

<b>Toluene</b>		CAS 108-88-3	
$C_6H_5CH_3$		RTECS <a href="#">XS5250000</a>	
<b>Synonyms &amp; Trade Names</b> Methyl benzene, Methyl benzol, Phenyl methane, Toluol		DOT ID & Guide 1294 <a href="#">130</a>	
<b>Exposure Limits</b>	NIOSH REL: TWA 100 ppm (375 mg/m <sup>3</sup> ) ST 150 ppm (560 mg/m <sup>3</sup> )		
	OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)		
IDLH 500 ppm See: <a href="#">108883</a>		Conversion 1 ppm = 3.77 mg/m <sup>3</sup>	
<b>Physical Description</b> 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.			
<b>Incompatibilities &amp; Reactivities</b> Strong oxidizers			
<b>Measurement Methods</b> NIOSH <a href="#">1500</a> , <a href="#">1501</a> , <a href="#">3800</a> , <a href="#">4000</a> ; OSHA <a href="#">111</a> See: <a href="#">NMAM</a> or <a href="#">OSHA Methods</a>			
<b>Personal Protection &amp; Sanitation</b> Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		<b>First Aid (See procedures)</b> Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
<a href="#">Important additional information about respirator selection</a>			
<b>Respirator Recommendations</b> NIOSH <b>Up to 500 ppm:</b> (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 <b>Emergency or planned entry into unknown concentrations or IDLH conditions:</b> (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 <b>Escape:</b> (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			
<b>Exposure Routes</b> inhalation, skin absorption, ingestion, skin and/or eye contact			
<b>Symptoms</b> 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			
<b>Target Organs</b> Eyes, skin, respiratory system, central nervous system, liver, kidneys			
See also: <a href="#">INTRODUCTION</a> See ICSC CARD: <a href="#">0078</a> See MEDICAL TESTS: <a href="#">0232</a>			

# International Chemical Safety Cards

**TOLUENE**

ICSC: 0078

   	
<p>Methylbenzene Toluol C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub> / C<sub>7</sub>H<sub>8</sub> Molecular mass: 92.1</p>	
<p>ICSC # 0078 CAS # 108-88-3 RTECS # <a href="#">XS5250000</a> UN # 1294 EC # 601-021-00-3</p>	

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
<b>EXPLOSION</b>	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
<b>EXPOSURE</b>		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
<b>•INHALATION</b>	Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
<b>•SKIN</b>	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
<b>•EYES</b>	Redness. Pain.	Safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. (Extra personal protection: self-contained breathing apparatus).	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-20 S: 2-16-25-29-33 UN Hazard Class: 3 UN Packing Group: II
<b>SEE IMPORTANT INFORMATION ON BACK</b>		
<p><b>ICSC: 0078</b></p> <p>Prepared in the context of cooperation between the International Programme on Chemical Safety &amp; the Commission of the European Communities (C) IPCS CEC 2002. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>		

## International Chemical Safety Cards

### TOLUENE

**ICSC: 0078**

<b>I M P O R T A N T D A T A</b>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.</p> <p><b>PHYSICAL DANGERS:</b> The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.</p> <p><b>CHEMICAL DANGERS:</b> Reacts violently with strong oxidants causing fire and explosion hazard.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 50 ppm; 188 mg/m<sup>3</sup> (as TWA) (skin) (ACGIH 1993-1994). OSHA PEL: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak) NIOSH REL: TWA 100 ppm (375 mg/m<sup>3</sup>) ST 150 ppm (560 mg/m<sup>3</sup>) NIOSH IDLH: 500 ppm</p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation, through the skin and by ingestion.</p> <p><b>INHALATION RISK:</b> A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> The substance irritates the eyes and the respiratory tract. Exposure could cause central nervous system depression. Exposure at high levels may result in cardiac dysrhythmia, unconsciousness and death.</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system , resulting in decreased learning ability and psychological disorders. Animal tests show that this substance possibly causes toxic effects upon human reproduction.</p>
<b>PHYSICAL PROPERTIES</b>	<p>Boiling point: 111°C Melting point: -95°C Relative density (water = 1): 0.87 Solubility in water: none Vapour pressure, kPa at 20°C: 2.9 Relative vapour density (air = 1): 3.2</p>	<p>Relative density of the vapour/air-mixture at 20°C (air = 1): 1.06 Flash point: c.c. 4°C Auto-ignition temperature: 480°C Explosive limits, vol% in air: 1.1-7.1 Octanol/water partition coefficient as log Pow: 2.69</p>
<b>ENVIRONMENTAL DATA</b>		

**NOTES**

Depending on the degree of exposure, periodic medical examination is indicated.

Transport Emergency Card: TEC (R)-31  
NFPA Code: H 2; F 3; R 0;

**ADDITIONAL INFORMATION**

**ICSC: 0078**

**TOLUENE**

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LEGAL  
NOTICE:**

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# NIOSH Pocket Guide to Chemical Hazards

<b>Tetrachloroethylene</b>		CAS 127-18-4	
$\text{Cl}_2\text{C}=\text{CCl}_2$		RTECS <a href="#">KX3850000</a>	
<b>Synonyms &amp; Trade Names</b> Perchloroethylene, Perchloroethylene, Perk, Tetrachloroethylene		DOT ID & Guide 1897 <a href="#">160</a>	
<b>Exposure Limits</b>	NIOSH REL: Ca Minimize workplace exposure concentrations. <a href="#">See Appendix A</a>		
	OSHA PEL†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3-hours)		
IDLH Ca [150 ppm] See: <a href="#">127184</a>		Conversion 1 ppm = 6.78 mg/m <sup>3</sup>	
<b>Physical Description</b> Colorless liquid with a mild, chloroform-like odor.			
MW: 165.8	BP: 250°F	FRZ: -2°F	Sol: 0.02%
VP: 14 mmHg	IP: 9.32 eV		Sp.Gr: 1.62
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.			
<b>Incompatibilities &amp; Reactivities</b> Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash			
<b>Measurement Methods</b> NIOSH <a href="#">1003</a> ; OSHA <a href="#">1001</a> See: <a href="#">NMAM</a> or <a href="#">OSHA Methods</a>			
<b>Personal Protection &amp; Sanitation</b> Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash, Quick drench		<b>First Aid (<a href="#">See procedures</a>)</b> Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
<a href="#">Important additional information about respirator selection</a> <b>Respirator Recommendations</b> NIOSH <b>At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:</b> (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 <b>Escape:</b> (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			
<b>Exposure Routes</b> inhalation, skin absorption, ingestion, skin and/or eye contact			
<b>Symptoms</b> Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]			
<b>Target Organs</b> Eyes, skin, respiratory system, liver, kidneys, central nervous system			
<b>Cancer Site</b> [in animals: liver tumors]			
See also: <a href="#">INTRODUCTION</a> See ICSC CARD: <a href="#">0076</a> See MEDICAL TESTS: <a href="#">0179</a>			

# International Chemical Safety Cards

## TETRACHLOROETHYLENE

ICSC: 0076








National Institute for  
Occupational Safety and Health

1,1,2,2-Tetrachloroethylene  
Perchloroethylene  
Tetrachloroethene  
 $C_2Cl_4 / Cl_2C=CCl_2$   
Molecular mass: 165.8

ICSC # 0076  
CAS # 127-18-4  
RTECS # [KX3850000](#)  
UN # 1897  
EC # 602-028-00-4





TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: all extinguishing agents allowed.
<b>EXPLOSION</b>			
<b>EXPOSURE</b>		STRICT HYGIENE! PREVENT GENERATION OF MISTS!	
<b>•INHALATION</b>	Dizziness. Drowsiness. Headache. Nausea. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
<b>•SKIN</b>	Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
<b>•EYES</b>	Redness. Pain.	Safety goggles, face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>	Abdominal pain (further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
<p>Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours).</p>	<p>Separated from metals ( see Chemical Dangers ), food and feedstuffs . Keep in the dark. Ventilation along the floor.</p>	<p>Do not transport with food and feedstuffs. Marine pollutant. Xn symbol N symbol R: 40-51/53 S: (2-)23-36/37-61 UN Hazard Class: 6.1 UN Packing Group: III</p>
<b>SEE IMPORTANT INFORMATION ON BACK</b>		
<p><b>ICSC: 0076</b> <span style="float: right;">Prepared in the context of cooperation between the International Programme on Chemical Safety &amp; the Commission of the European Communities (C) IPCS CEC 2001. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</span></p>		

# International Chemical Safety Cards

## TETRACHLOROETHYLENE

**ICSC: 0076**

<p><b>I M P O R T A N T A D V A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.</p> <p><b>PHYSICAL DANGERS:</b> The vapour is heavier than air.</p> <p><b>CHEMICAL DANGERS:</b> On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (hydrogen chloride, phosgene, chlorine). The substance decomposes slowly on contact with moisture producing trichloroacetic acid and hydrochloric acid. Reacts with metals such as aluminium, lithium, barium, beryllium.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 25 ppm; RET(STEL): 100 ppm; (ACGIH 1999). OSHA PEL: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3-hours) NIOSH REL: Ca Minimize workplace exposure concentrations. <a href="#">See Appendix A</a> NIOSH IDLH: Potential occupational carcinogen 150 ppm</p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation and by ingestion.</p> <p><b>INHALATION RISK:</b> A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> The substance irritates the eyes, the skin and the respiratory tract. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure at high levels may result in unconsciousness.</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys. This substance is probably carcinogenic to humans.</p>
<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point: 121°C Melting point: -22°C Relative density (water = 1): 1.6 Solubility in water, g/100 ml at 20°C: 0.015</p>	<p>Vapour pressure, kPa at 20°C: 1.9 Relative vapour density (air = 1): 5.8 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.09 Octanol/water partition coefficient as log Pow: 2.9</p>

<b>ENVIRONMENTAL DATA</b>	The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.	
<b>NOTES</b>		
<p>Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient. Do NOT use in the vicinity of a fire or a hot surface, or during welding. An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.</p> <p style="text-align: right;">Transport Emergency Card: TEC (R)-722 NFPA Code: H2; F0; R0;</p>		
<b>ADDITIONAL INFORMATION</b>		
<b>ICSC: 0076</b>	<b>TETRACHLOROETHYLENE</b>	
(C) IPCS, CEC, 2001		
<b>IMPORTANT LEGAL NOTICE:</b>	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

# International Chemical Safety Cards

## NAPHTHA (PETROLEUM), HEAVY ALKYLATE

ICSC: 1382



Low boiling point modified naphtha  
Aliphatic HC's, iso-paraffins

ICSC # 1382  
CAS # 64741-65-7  
RTECS #  
UN # 1268  
EC # 649-275-00-4  
March 15, 2001 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Flammable.	NO open flames, NO sparks, and NO smoking.	Water spray, alcohol-resistant foam, powder, carbon dioxide.
<b>EXPLOSION</b>	Above 44°C explosive vapour/air mixtures may be formed.	Above 44°C use a closed system, ventilation, and explosion-proof electrical equipment.	In case of fire: keep drums, etc., cool by spraying with water.
<b>EXPOSURE</b>		PREVENT GENERATION OF MISTS!	
<b>•INHALATION</b>	Dizziness. Headache. Drowsiness. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
<b>•SKIN</b>	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
<b>•EYES</b>	Redness.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>	Cough. Diarrhoea. Sore throat. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Refer for medical attention. See Notes.
<b>SPILLAGE DISPOSAL</b>	<b>STORAGE</b>	<b>PACKAGING &amp; LABELLING</b>	
Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. (Extra personal protection: filter respirator for organic vapours of low boiling compounds.)	Fireproof. Separated from strong oxidants. Well closed.	Note: H, P T symbol R: 45-65 S: 53-45 UN Hazard Class: 3 UN Packing Group: III	

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 1382**

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

# International Chemical Safety Cards

## NAPHTHA (PETROLEUM), HEAVY ALKYLATE

**ICSC: 1382**

<p><b>I M P O R T A N T A T A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS LIQUID</p> <p><b>PHYSICAL DANGERS:</b> The vapour is heavier than air and may travel along the ground; distant ignition possible.</p> <p><b>CHEMICAL DANGERS:</b> Reacts with strong oxidants, causing fire and explosion hazard.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV not established. MAK not established.</p>	<p><b>at: 3.16 g/kg(25);</b> The substance can be absorbed into the body by inhalation of its vapour and by ingestion.</p> <p><b>INHALATION RISK:</b> No indication can be given about the rate in which a harmful concentration in the air is reached on evaporation of this substance at 20° C.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> The vapour is slightly irritating to the eyes . The substance may cause effects on the central nervous system . Exposure to high concentration of vapours may result in unconsciousness. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis.</p> <p>The liquid defats the skin. See Notes.</p>
<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point: 172-215°C Melting point: &lt;-30°C Density: 0.75-0.79 g/cm<sup>3</sup> Solubility in water: none</p>	<p>Vapour pressure, kPa at 20°C: 0.1-0.2 Flash point: &gt;= 44°C c.c. Auto-ignition temperature: 355 °C Explosive limits, vol% in air: 0.6-8.0</p>
<p><b>ENVIRONMENTAL DATA</b></p>	<p>The substance is toxic to aquatic organisms.</p>	
<p><b>NOTES</b></p>		
<p>This is a mixture of C9-C14 iso- and n-paraffins. Neither the concentration of aromatics nor of hexane is greater than 0.1 % by volume. Note P: the EU classification as carcinogen (R45) does not apply if it can be shown that the benzene content is below 0.1% by volume. Depending on the raw material and the production processes, the composition and physical properties of this solvent can vary considerably. The symptoms of chemical pneumonitis do not become manifest until a few hours or even a few days have passed. Isopar G / L / M, Shellsol T / TK / TD, Soltrol 100 / 130, among others, are trade names.</p>		
<p>Transport Emergency Card: TEC (R)-30G35</p> <p>NFPA Code: H1; F3; R0;</p>		



**ADDITIONAL INFORMATION**

**ICSC: 1382**

**NAPHTHA (PETROLEUM), HEAVY ALKYLATE**

(C) IPCS, CEC, 1994

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# International Chemical Safety Cards

## NAPHTHA (PETROLEUM), HYDROTREATED HEAVY

ICSC: 1380








Low boiling point hydrogen treated naphtha  
Catalytic Reformer Feed

ICSC # 1380  
CAS # 64742-48-9  
RTECS #  
UN # 3295  
EC # 649-327-00-6  
March 15, 2001 Peer reviewed




TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Flammable.	NO open flames, NO sparks, and NO smoking.	Water spray, alcohol-resistant foam, powder, carbon dioxide.
<b>EXPLOSION</b>	Above 40°C explosive vapour/air mixtures may be formed.	Above 40°C use a closed system, ventilation, and explosion-proof electrical equipment.	In case of fire: keep drums, etc., cool by spraying with water.
<b>EXPOSURE</b>		PREVENT GENERATION OF MISTS!	
<b>•INHALATION</b>	Dizziness. Headache. Drowsiness. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
<b>•SKIN</b>	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
<b>•EYES</b>	Redness.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>	Cough. Diarrhoea. Sore throat. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Refer for medical attention. See Notes.
<b>SPILLAGE DISPOSAL</b>	<b>STORAGE</b>	<b>PACKAGING &amp; LABELLING</b>	
Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. (Extra personal protection: filter respirator for organic vapours of low	Fireproof. Separated from strong oxidants. Well closed.	Note: H, P T symbol R: 45-65 S: 53-45 UN Hazard Class: 3 UN Packing Group: III	

boiling compounds.)

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 1380**

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# International Chemical Safety Cards

## NAPHTHA (PETROLEUM), HYDROTREATED HEAVY

**ICSC: 1380**

<p><b>I M P O R T A N T D A T A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS LIQUID</p> <p><b>PHYSICAL DANGERS:</b></p> <p><b>CHEMICAL DANGERS:</b> Reacts with strong oxidants, causing fire and explosion hazard.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV not established. MAK not established.</p>	<p><b>at: 3.16 g/kg(25);</b> The substance can be absorbed into the body by inhalation of its vapour and by ingestion.</p> <p><b>INHALATION RISK:</b> No indication can be given about the rate in which a harmful concentration in the air is reached on evaporation of this substance at 20° C.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> The vapour is slightly irritating to the eyes . The substance may cause effects on the central nervous system . Exposure to high concentration of vapours may result in unconsciousness. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis.</p> <p>The liquid defats the skin. See Notes.</p>
<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point: 155-217°C Melting point: &lt; 0°C Density: 0.76-0.79 g/cm<sup>3</sup> Solubility in water: none</p>	<p>Vapour pressure, kPa at 20°C: 0.1-0.3 Flash point: 40-62 °C c.c. Auto-ignition temperature: 255-270 °C Explosive limits, vol% in air: 0.7-6.0</p>
<p><b>ENVIRONMENTAL DATA</b></p>	<p>The substance is toxic to aquatic organisms.</p>	
<p><b>NOTES</b></p>		
<p>This is a mixture of C9-C13 naphthenes, iso- and n-paraffins. Neither the concentration of aromatics nor of hexane is greater than 0.1% by volume. Note P: the EU classification as carcinogen (R45) does not apply if it can be shown that the benzene content is below 0.1% by volume. Depending on the raw material and the production processes, the composition and physical properties of this solvent can vary considerably. The symptoms of chemical pneumonitis do not become manifest until a few hours or even a few days have passed. Exxsol D40 / D60, Shellsol D40 / D60, Hydrosol P 150 / 180, among others, are trade names.</p>		



Transport Emergency Card: TEC (R)-30G35

**ADDITIONAL INFORMATION**

**ICSC: 1380**

**NAPHTHA (PETROLEUM), HYDROTREATED HEAVY**

(C) IPCS, CEC, 1994

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LEGAL  
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# International Chemical Safety Cards

## NAPHTHALENE

ICSC: 0667






Naphthene  
C<sub>10</sub>H<sub>8</sub>  
Molecular mass: 128.18



ICSC # 0667  
 CAS # 91-20-3  
 RTECS # QJ0525000  
 UN # 1334 (solid); 2304 (molten)  
 EC # 601-052-00-2  
 April 21, 2005 Peer reviewed






TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Combustible.	NO open flames.	Powder, water spray, foam, carbon dioxide.
<b>EXPLOSION</b>	Above 80°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
<b>EXPOSURE</b>		PREVENT DISPERSION OF DUST!	
<b>•INHALATION</b>	Headache. Weakness. Nausea. Vomiting. Sweating. Confusion. Jaundice. Dark urine.	Ventilation (not if powder), local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
<b>•SKIN</b>	MAY BE ABSORBED! (Further see Inhalation).	Protective gloves.	Rinse skin with plenty of water or shower.
<b>•EYES</b>		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>	Abdominal pain. Diarrhoea. Convulsions. Unconsciousness. (Further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer for medical attention.
SPILLAGE DISPOSAL		STORAGE	PACKAGING & LABELLING
Personal protection: filter respirator for organic gases and vapours. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.		Separated from strong oxidants, food and feedstuffs. Store in an area without drain or sewer access.	Do not transport with food and feedstuffs. Marine pollutant. Xn symbol N symbol R: 22-40-50/53 S: 2-36/37-46-60-61

UN Hazard Class: 4.1  
UN Packing Group: III

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0667**

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

# International Chemical Safety Cards

## NAPHTHALENE

**ICSC: 0667**

<p><b>I M P O R T A N T I N F O R M A T I O N</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> WHITE SOLID IN VARIOUS FORMS , WITH CHARACTERISTIC ODOUR.</p> <p><b>PHYSICAL DANGERS:</b> Dust explosion possible if in powder or granular form, mixed with air.</p> <p><b>CHEMICAL DANGERS:</b> On combustion, forms irritating and toxic gases. Reacts with strong oxidants .</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 10 ppm as TWA; 15 ppm as STEL; (skin); A4 (not classifiable as a human carcinogen); (ACGIH 2005). MAK: skin absorption (H); Carcinogen category: 2; Germ cell mutagen group: 3B; (DFG 2004). OSHA PEL<sup>±</sup>: TWA 10 ppm (50 mg/m<sup>3</sup>) NIOSH REL: TWA 10 ppm (50 mg/m<sup>3</sup>) ST 15 ppm (75 mg/m<sup>3</sup>) NIOSH IDLH: 250 ppm See: <a href="#">91203</a></p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation, through the skin and by ingestion.</p> <p><b>INHALATION RISK:</b> A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. See Notes.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> The substance may cause effects on the blood , resulting in lesions of blood cells (haemolysis) . See Notes. The effects may be delayed. Exposure by ingestion may result in death. Medical observation is indicated.</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> The substance may have effects on the blood , resulting in chronic haemolytic anaemia. The substance may have effects on the eyes , resulting in the development of cataract. This substance is possibly carcinogenic to humans.</p>
<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point: 218°C</p> <p>Sublimation slowly at room temperature</p> <p>Melting point: 80°C</p> <p>Density: 1.16 g/cm<sup>3</sup></p> <p>Solubility in water, g/100 ml at 25°C: none</p>	<p>Vapour pressure, Pa at 25°C: 11</p> <p>Relative vapour density (air = 1): 4.42</p> <p>Flash point: 80°C c.c.</p> <p>Auto-ignition temperature: 540°C</p> <p>Explosive limits, vol% in air: 0.9-5.9</p> <p>Octanol/water partition coefficient as log Pow: 3.3</p>
<p><b>ENVIRONMENTAL DATA</b></p>	<p>The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.</p>	
<p><b>NOTES</b></p>		
<p>Some individuals may be more sensitive to the effect of naphthalene on blood cells.</p> <p>Transport Emergency Card: TEC (R)-41S1334 (solid); 41GF1-II+III (solid); 41S2304 (molten)</p> <p style="text-align: right;">NFPA Code: H2; F2; R0;</p>		

**ADDITIONAL INFORMATION**

**ICSC: 0667**

**NAPHTHALENE**

(C) IPCS, CEC, 1994

**IMPORTANT  
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NOTICE:**

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# International Chemical Safety Cards

## METHYL TERT-BUTYL ETHER

ICSC: 1164



tert-Butyl methyl ether  
 MTBE  
 Methyl-1,1-dimethylethyl ether  
 2-Methoxy-2-methyl propane  
 $(\text{CH}_3)_3\text{COCH}_3 / \text{C}_5\text{H}_{12}\text{O}$   
 Molecular mass: 88.2

ICSC # 1164  
 CAS # 1634-04-4  
 RTECS # [KN5250000](#)  
 UN # 2398  
 EC # 603-181-00-X



April 11, 2000 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Highly flammable.	NO open flames, NO sparks, and NO smoking. NO contact with oxidants.	Powder, AFFF, foam, carbon dioxide.
<b>EXPLOSION</b>	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
<b>EXPOSURE</b>			
<b>•INHALATION</b>	Drowsiness. Dizziness. Headache. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
<b>•SKIN</b>	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
<b>•EYES</b>	Redness.	Safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>	Abdominal pain. Nausea. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Refer for medical attention.
<b>SPILLAGE DISPOSAL</b>	<b>STORAGE</b>	<b>PACKAGING &amp; LABELLING</b>	

Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Personal protection: filter respirator for organic gases and vapours.	Fireproof. Separated from strong oxidants, strong acids.	F symbol Xi symbol R: 11-38 S: 2-9-16-24 UN Hazard Class: 3 UN Packing Group: II
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**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 1164**

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

# International Chemical Safety Cards

## METHYL TERT-BUTYL ETHER

**ICSC: 1164**

<b>I M P O R T A N T A C T I O N</b>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.</p> <p><b>PHYSICAL DANGERS:</b> The vapour is heavier than air and may travel along the ground; distant ignition possible.</p> <p><b>CHEMICAL DANGERS:</b> Reacts violently with strong oxidants causing fire hazard. The substance decomposes on contact with acids.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 50 ppm as TWA; A3; (ACGIH 2004). MAK: 50 ppm, 180 mg/m<sup>3</sup>; Peak limitation category: I(1.5); Carcinogen category: 3B; Pregnancy risk group: C; (DFG 2004).</p>	<p><b>at: 3.16 g/kg(25);</b> The substance can be absorbed into the body by inhalation and by ingestion.</p> <p><b>INHALATION RISK:</b> A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> The substance is irritating to the skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure far above the OEL could cause lowering of consciousness.</p>
	<p><b>PHYSICAL PROPERTIES</b></p> <p>Boiling point: 55°C Melting point: -109°C Relative density (water = 1): 0.7 Solubility in water, g/100 ml at 20°C: 4.2 Vapour pressure, kPa at 20°C: 27 Relative vapour density (air = 1): 3.0</p>	<p>Relative density of the vapour/air-mixture at 20°C (air = 1): 1.5 Flash point: -28°C c.c. Auto-ignition temperature: 375°C Explosive limits, vol% in air: 1.6-15.1 Octanol/water partition coefficient as log Pow: 1.06</p>
<b>ENVIRONMENTAL DATA</b>	<p>It is strongly advised not to let the chemical enter into the environment because it persists in the environment.</p>	
<b>NOTES</b>		



Much less likely to form peroxides than other ethers. Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.

Transport Emergency Card: TEC (R)-30GF1-I+II

**ADDITIONAL INFORMATION**

**ICSC: 1164**

**METHYL TERT-BUTYL ETHER**

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# International Chemical Safety Cards

**MERCURY**

ICSC: 0056



Quicksilver  
Liquid silver  
Hg  
Atomic mass: 200.6

ICSC # 0056  
CAS # 7439-97-6  
RTECS # [OV4550000](#)  
UN # 2809  
EC # 080-001-00-0



April 22, 2004 Peer reviewe

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
<b>EXPLOSION</b>	Risk of fire and explosion.		In case of fire: keep drums, etc., cool by spraying with water.
<b>EXPOSURE</b>		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
<b>•INHALATION</b>	Abdominal pain. Cough. Diarrhoea. Shortness of breath. Vomiting. Fever or elevated body temperature.	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
<b>•SKIN</b>	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
<b>•EYES</b>		Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>		Do not eat, drink, or smoke during work. Wash hands before eating.	Refer for medical attention.
<b>SPILLAGE DISPOSAL</b>	<b>STORAGE</b>	<b>PACKAGING &amp; LABELLING</b>	
Evacuate danger area in case of a large	Provision to contain effluent from fire	Special material. Do not transport with	

<p>spill! Consult an expert! Ventilation. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Chemical protection suit including self-contained breathing apparatus.</p>	<p>extinguishing. Separated from food and feedstuffs . Well closed.</p>	<p>food and feedstuffs. T symbol N symbol R: 23-33-50/53 S: 1/2-7-45-60-61 UN Hazard Class: 8 UN Packing Group: III</p>
<b>SEE IMPORTANT INFORMATION ON BACK</b>		
<p><b>ICSC: 0056</b></p> <p style="font-size: small;">Prepared in the context of cooperation between the International Programme on Chemical Safety &amp; the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>		

# International Chemical Safety Cards

## MERCURY

**ICSC: 0056**

<b>I M P O R T A N T D A T A</b>	<p><b>PHYSICAL STATE; APPEARANCE:</b> ODOURLESS, HEAVY AND MOBILE SILVERY LIQUID METAL.</p> <p><b>PHYSICAL DANGERS:</b></p> <p><b>CHEMICAL DANGERS:</b> Upon heating, toxic fumes are formed. Reacts violently with ammonia and halogens causing fire and explosion hazard. Attacks aluminium and many other metals forming amalgams.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 0.025 mg/m<sup>3</sup> as TWA; (skin); A4; BEI issued; (ACGIH 2004). MAK: 0.1 mg/m<sup>3</sup>; Sh; Peak limitation category: II(8); Carcinogen category: 3B; (DFG 2003). OSHA PEL<sup>†</sup>: C 0.1 mg/m<sup>3</sup> NIOSH REL: Hg Vapor: TWA 0.05 mg/m<sup>3</sup> skin Other: C 0.1 mg/m<sup>3</sup> skin NIOSH IDLH: 10 mg/m<sup>3</sup> (as Hg) See: <a href="#">7439976</a></p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation of its vapour and through the skin , also as a vapour!</p> <p><b>INHALATION RISK:</b> A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> The substance is irritating to the skin. Inhalation of the vapours may cause pneumonitis. The substance may cause effects on the central nervous system and kidneys. The effects may be delayed. Medical observation is indicated.</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> The substance may have effects on the central nervous system and kidneys , resulting in irritability, emotional instability, tremor, mental and memory disturbances, speech disorders. May cause inflammation and discoloration of the gums. Danger of cumulative effects. Animal tests show that this substance possibly causes toxic effects upon human reproduction.</p>
<b>PHYSICAL PROPERTIES</b>	<p>Boiling point: 357°C Melting point: -39°C Relative density (water = 1): 13.5 Solubility in water: none</p>	<p>Vapour pressure, Pa at 20°C: 0.26 Relative vapour density (air = 1): 6.93 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.009</p>
<b>ENVIRONMENTAL DATA</b>	<p>The substance is very toxic to aquatic organisms. In the food chain important to humans, bioaccumulation takes place, specifically in fish.</p>	
<b>NOTES</b>		



Depending on the degree of exposure, periodic medical examination is indicated. No odour warning if toxic concentrations are present. Do NOT take working clothes home.

Transport Emergency Card: TEC (R)-80GC9-II+III

**ADDITIONAL INFORMATION**

**ICSC: 0056**

**MERCURY**

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# NIOSH Pocket Guide to Chemical Hazards

<b>Lead</b>		CAS 7439-92-1	
<b>Pb</b>		RTECS <a href="#">OF7525000</a>	
<b>Synonyms &amp; Trade Names</b> Lead metal, Plumbum		DOT ID & Guide	
<b>Exposure Limits</b>	NIOSH REL*: TWA 0.050 mg/m <sup>3</sup> <a href="#">See Appendix C</a> [*Note: The REL also applies to other lead compounds (as Pb) -- <a href="#">see Appendix C.</a> ]		
	OSHA PEL*: [1910.1025] TWA 0.050 mg/m <sup>3</sup> <a href="#">See Appendix C</a> [*Note: The PEL also applies to other lead compounds (as Pb) -- <a href="#">see Appendix C.</a> ]		
IDLH 100 mg/m <sup>3</sup> (as Pb) See: <a href="#">7439921</a>		<b>Conversion</b>	
<b>Physical Description</b> A heavy, ductile, soft, gray solid.			
MW: 207.2	BP: 3164°F	MLT: 621°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 11.34
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form.			
<b>Incompatibilities &amp; Reactivities</b> Strong oxidizers, hydrogen peroxide, acids			
<b>Measurement Methods</b> NIOSH <a href="#">7082</a> , <a href="#">7105</a> , <a href="#">7300</a> , <a href="#">7700</a> , <a href="#">7701</a> , <a href="#">7702</a> , <a href="#">9100</a> , <a href="#">9105</a> ; OSHA <a href="#">ID121</a> , <a href="#">ID125G</a> , <a href="#">ID206</a> See: <a href="#">NMAM</a> or <a href="#">OSHA Methods</a>			
<b>Personal Protection &amp; Sanitation</b> Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily		<b>First Aid (<a href="#">See procedures</a>)</b> Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
<a href="#">Important additional information about respirator selection</a> <b>Respirator Recommendations</b> NIOSH/OSHA <b>Up to 0.5 mg/m<sup>3</sup>:</b> (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator <b>Up to 1.25 mg/m<sup>3</sup>:</b> (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 <b>Up to 2.5 mg/m<sup>3</sup>:</b> (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 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 <b>Up to 50 mg/m<sup>3</sup>:</b> (APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode <b>Up to 100 mg/m<sup>3</sup>:</b> (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode <b>Emergency or planned entry into unknown concentrations or IDLH conditions:</b> (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 <b>Escape:</b> (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			
<b>Exposure Routes</b> inhalation, ingestion, skin and/or eye contact			

**Symptoms** Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension

**Target Organs** Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue

See also: [INTRODUCTION](#) See ICSC CARD: [0052](#) See MEDICAL TESTS: [0127](#)

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# International Chemical Safety Cards

**LEAD**

ICSC: 0052

	
<p>Lead metal Plumbum Pb Atomic mass: 207.2 (powder)</p>	
<p>ICSC # 0052 CAS # 7439-92-1 RTECS # <a href="#">OF7525000</a></p>	

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
<b>EXPLOSION</b>	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
<b>EXPOSURE</b>	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	PREVENT DISPERSION OF DUST! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
<b>•INHALATION</b>		Local exhaust or breathing protection.	Fresh air, rest.
<b>•SKIN</b>		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
<b>•EYES</b>		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give plenty of water to drink. Refer for medical attention.



**NOTES**

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home.  
Transport Emergency Card: TEC (R)-51S1872

**ADDITIONAL INFORMATION**

**ICSC: 0052**

**LEAD**

(C) IPCS, CEC, 1994

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# International Chemical Safety Cards

**ETHYLENE**

ICSC: 0475



Ethene  
 $C_2H_4 / CH_2=CH_2$   
 Molecular mass: 28.0  
 (cylinder)

ICSC # 0475  
 CAS # 74-85-1  
 RTECS # [KU5340000](#)

UN # 1962  
 EC # 601-010-00-3

March 25, 1996 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Extremely flammable.	NO open flames, NO sparks, and NO smoking.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out; in other cases extinguish with water spray.
<b>EXPLOSION</b>	Gas/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Use non-sparking handtools.	In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.
<b>EXPOSURE</b>			
<b>•INHALATION</b>	Drowsiness. Unconsciousness.	Ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
<b>•SKIN</b>			
<b>•EYES</b>			
<b>•INGESTION</b>			

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Ventilation. Remove all ignition sources and turn off gas at source if possible. Personal protection: chemical protection suit including self-contained breathing apparatus.	Fireproof. Separated from strong oxidants.	F+ symbol R: 12-67 S: 2-9-16-33-46 UN Hazard Class: 2.1

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0475**

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# International Chemical Safety Cards

**ETHYLENE**

**ICSC: 0475**

<p><b>I M P O R T A N T D A T A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS COMPRESSED GAS , WITH CHARACTERISTIC ODOUR.</p> <p><b>PHYSICAL DANGERS:</b> The gas is lighter than air. As a result of flow, agitation, etc., electrostatic charges can be generated.</p> <p><b>CHEMICAL DANGERS:</b> The substance may polymerize to form aromatic compounds under the influence of temperatures above 600°C. Reacts with strong oxidants causing fire and explosion hazard.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 200 ppm as TWA; A4 (not classifiable as a human carcinogen); (ACGIH 2005). MAK: Carcinogen category: 3B; (DFG 2005).</p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation.</p> <p><b>INHALATION RISK:</b> On loss of containment this gas can cause suffocation by lowering the oxygen content of the air in confined areas.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> Exposure could cause lowering of consciousness.</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b></p>
<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point: -104°C Melting point: -169.2°C Solubility in water: none Vapour pressure, kPa at 15°C: 8100</p>	<p>Relative vapour density (air = 1): 0.98 Flash point: Flammable Gas Auto-ignition temperature: 490°C Explosive limits, vol% in air: 2.7-36.0</p>
<p><b>ENVIRONMENTAL DATA</b></p>		
<p><b>NOTES</b></p>		
<p>High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death. Check oxygen content before entering area. Card has been partly updated in October 2004 and 2005. See sections Occupational Exposure Limits, EU classification, Emergency Response.</p> <p style="text-align: right;">Transport Emergency Card: TEC (R)-20S1962</p> <p style="text-align: right;">NFPA Code: H1; F4; R2;</p>		
<p><b>ADDITIONAL INFORMATION</b></p>		
<p><b>ICSC: 0475</b></p>	<p>(C) IPCS, CEC, 1994</p>	<p><b>ETHYLENE</b></p>

**IMPORTANT  
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# NIOSH Pocket Guide to Chemical Hazards

<b>Benzene</b>		CAS 71-43-2	
C <sub>6</sub> H <sub>6</sub>		RTECS <a href="#">CY1400000</a>	
<b>Synonyms &amp; Trade Names</b> Benzol, Phenyl hydride		<b>DOT ID &amp; Guide</b> 1114 <a href="#">130</a>	
<b>Exposure Limits</b>	NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm <a href="#">See Appendix A</a>		
	OSHA PEL: [1910.1028] TWA 1 ppm ST 5 ppm <a href="#">See Appendix F</a>		
IDLH Ca [500 ppm] See: <a href="#">71432</a>		<b>Conversion</b> 1 ppm = 3.19 mg/m <sup>3</sup>	
<b>Physical Description</b> Colorless to light-yellow liquid with an aromatic odor. [Note: A solid below 42°F.]			
MW: 78.1	BP: 176°F	FRZ: 42°F	Sol: 0.07%
VP: 75 mmHg	IP: 9.24 eV		Sp.Gr: 0.88
Fl.P: 12°F	UEL: 7.8%	LEL: 1.2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
<b>Incompatibilities &amp; Reactivities</b> Strong oxidizers, many fluorides & perchlorates, nitric acid			
<b>Measurement Methods</b> NIOSH <a href="#">1500</a> , <a href="#">1501</a> , <a href="#">3700</a> , <a href="#">3800</a> ; OSHA <a href="#">12</a> , <a href="#">1005</a> See: <a href="#">NMAM</a> or <a href="#">OSHA Methods</a>			
<b>Personal Protection &amp; Sanitation</b> Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Eyewash, Quick drench		<b>First Aid (<a href="#">See procedures</a>)</b> Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
<a href="#">Important additional information about respirator selection</a> <b>Respirator Recommendations</b> NIOSH <b>At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:</b> (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 <b>Escape:</b> (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			
<b>Exposure Routes</b> inhalation, skin absorption, ingestion, skin and/or eye contact			
<b>Symptoms</b> Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]			
<b>Target Organs</b> Eyes, skin, respiratory system, blood, central nervous system, bone marrow			
<b>Cancer Site</b> [leukemia]			
See also: <a href="#">INTRODUCTION</a> See ICSC CARD: <a href="#">0015</a> See MEDICAL TESTS: <a href="#">0022</a>			

# International Chemical Safety Cards

**BENZENE**

ICSC: 0015

	
<p>Cyclohexatriene Benzol C<sub>6</sub>H<sub>6</sub> Molecular mass: 78.1</p>	
<p>ICSC # 0015 CAS # 71-43-2 RTECS # <a href="#">CY1400000</a> UN # 1114 EC # 601-020-00-8</p>	

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
<b>EXPLOSION</b>	Vapour/air mixtures are explosive. Risk of fire and explosion: see Chemical Dangers.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
<b>EXPOSURE</b>		<b>AVOID ALL CONTACT!</b>	
<b>•INHALATION</b>	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
<b>•SKIN</b>	MAY BE ABSORBED! Dry skin. Redness. Pain. (Further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
<b>•EYES</b>	Redness. Pain.	Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>	Abdominal pain. Sore throat. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
<p>Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. (Extra personal protection: complete protective clothing including self-contained breathing apparatus).</p>	<p>Fireproof. Separated from food and feedstuffs oxidants and halogens .</p>	<p>Do not transport with food and feedstuffs.                      Note: E                      F symbol                      T symbol                      R: 45-11-48/23/24/25                      S: 53-45                      UN Hazard Class: 3                      UN Packing Group: II</p>
<b>SEE IMPORTANT INFORMATION ON BACK</b>		
<p><b>ICSC: 0015</b></p>	<p>Prepared in the context of cooperation between the International Programme on Chemical Safety &amp; the Commission of the European Communities (C) IPCS CEC 2003. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>	

# International Chemical Safety Cards

## BENZENE

**ICSC: 0015**

<p><b>I</b></p> <p><b>M</b></p> <p><b>P</b></p> <p><b>O</b></p> <p><b>R</b></p> <p><b>T</b></p> <p><b>A</b></p> <p><b>N</b></p> <p><b>T</b></p> <p><b>D</b></p> <p><b>A</b></p> <p><b>T</b></p> <p><b>A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b>                      COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.</p> <p><b>PHYSICAL DANGERS:</b>                      The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.</p> <p><b>CHEMICAL DANGERS:</b>                      Reacts violently with oxidants, nitric acid, sulfuric acid and halogens causing fire and explosion hazard. Attacks plastic and rubber.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b>                      TLV: 0.5 ppm as TWA; 2.5 ppm as STEL; (skin); A1; BEI issued; (ACGIH 2003).                      MAK: H;                      Carcinogen category: 1; Germ cell mutagen group: 3A;                      (DFG 2002).                      OSHA PEL: 1910.1028 TWA 1 ppm ST 5 ppm <a href="#">See Appendix F</a>                      NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm <a href="#">See Appendix A</a>                      NIOSH IDLH: Potential occupational carcinogen 500 ppm</p>	<p><b>ROUTES OF EXPOSURE:</b>                      The substance can be absorbed into the body by inhalation , through the skin and by ingestion .</p> <p><b>INHALATION RISK:</b>                      A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b>                      The substance is irritating to the eyes , the skin and the respiratory tract . Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system , resulting in lowering of consciousness . Exposure far above the occupational exposure limit value may result in unconsciousness and death .</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b>                      The liquid defats the skin. The substance may have effects on the bone marrow and immune system , resulting in a decrease of blood cells. This substance is carcinogenic to humans.</p>
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<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point: 80°C                  Melting point: 6°C                  Relative density (water = 1): 0.88                  Solubility in water, g/100 ml at 25°C: 0.18                  Vapour pressure, kPa at 20°C: 10                  Relative vapour density (air = 1): 2.7</p> <p>Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2                  Flash point: -11°C c.c.                  Auto-ignition temperature: 498°C                  Explosive limits, vol% in air: 1.2-8.0                  Octanol/water partition coefficient as log Pow: 2.13</p>
<p><b>ENVIRONMENTAL DATA</b></p>	<p>The substance is very toxic to aquatic organisms.</p> 
<p><b>NOTES</b></p>	
<p>Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient.</p> <p style="text-align: right;">Transport Emergency Card: TEC (R)-30S1114/30GF1-II                  NFPA Code: H2; F3; R0.</p>	
<p><b>ADDITIONAL INFORMATION</b></p>	
<p> </p>	
<p><b>ICSC: 0015</b></p>	<p style="text-align: right;"><b>BENZENE</b></p> <p style="text-align: center;">(C) IPCS, CEC, 2003</p>
<p><b>IMPORTANT LEGAL NOTICE:</b></p>	<p>Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>

# International Chemical Safety Cards

## ANTHRACENE

ICSC: 0825



Anthracin  
 Paranaphthalene  
 $C_{14}H_{10} / (C_6H_4CH)_2$   
 Molecular mass: 178.2

ICSC # 0825

CAS # 120-12-7

RTECS # [CA9350000](#)

March 24, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Combustible.	NO open flames.	Powder, water spray, foam, carbon dioxide.
<b>EXPLOSION</b>	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	In case of fire: keep drums, etc., cool by spraying with water.
<b>EXPOSURE</b>		PREVENT DISPERSION OF DUST!	
<b>•INHALATION</b>	Cough. Sore throat.	Ventilation (not if powder), local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
<b>•SKIN</b>	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
<b>•EYES</b>	Redness. Pain.	Safety spectacles, face shield, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>	Abdominal pain.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place Do NOT let this chemical enter the environment. (Extra personal protection: P2 filter respirator for harmful particles).	Separated from strong oxidants. Well closed.	R: S:

**SEE IMPORTANT INFORMATION ON BACK**

Prepared in the context of cooperation between the International Programme on Chemical Safety & the

**ICSC: 0825**

Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

# International Chemical Safety Cards

## ANTHRACENE

**ICSC: 0825**

<p><b>I M P O R T A N T  D A T A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> WHITE CRYSTALS OR FLAKES.</p> <p><b>PHYSICAL DANGERS:</b> Dust explosion possible if in powder or granular form, mixed with air.</p> <p><b>CHEMICAL DANGERS:</b> The substance decomposes on heating, under influence of strong oxidants producing acrid, toxic fume, causing fire and explosion hazard.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV not established.</p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation.</p> <p><b>INHALATION RISK:</b> Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> The substance slightly irritates the skin and the respiratory tract.</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> Repeated or prolonged contact with skin may cause dermatitis under the influence of UV light.</p>
<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point: 342°C Melting point: 218°C Density: 1.25-1.28 g/cm<sup>3</sup> Solubility in water, g/100 ml at 20 °C: 0.00013 Vapour pressure, Pa at 25°C: 0.08</p>	<p>Relative vapour density (air = 1): 6.15 Flash point: 121°C Auto-ignition temperature: 538°C Explosive limits, vol% in air: 0.6-? Octanol/water partition coefficient as log Pow: 4.5 (calculated)</p>
<p><b>ENVIRONMENTAL DATA</b></p>	<p>The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.</p>	
<p><b>NOTES</b></p>		
<p>Green oil, Tetra-olive N2G are trade names.</p>		<p>NFPA Code: H0; F1; R;</p>
<p><b>ADDITIONAL INFORMATION</b></p>		
<p><b>ICSC: 0825</b> <span style="float: right;"><b>ANTHRACENE</b></span></p> <p style="text-align: center;">(C) IPCS, CEC, 1994</p>		



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NOTICE:**

collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

# NIOSH Pocket Guide to Chemical Hazards

<b>Acetone</b>		CAS 67-64-1	
$(\text{CH}_3)_2\text{CO}$		RTECS <a href="#">AL3150000</a>	
<b>Synonyms &amp; Trade Names</b> Dimethyl ketone, Ketone propane, 2-Propanone		DOT ID & Guide 1090 <a href="#">127</a>	
<b>Exposure Limits</b>	NIOSH REL: TWA 250 ppm (590 mg/m <sup>3</sup> )		
	OSHA PEL†: TWA 1000 ppm (2400 mg/m <sup>3</sup> )		
IDLH 2500 ppm [10%LEL] See: <a href="#">67641</a>		Conversion 1 ppm = 2.38 mg/m <sup>3</sup>	
<b>Physical Description</b> Colorless liquid with a fragrant, mint-like odor.			
MW: 58.1	BP: 133°F	FRZ: -140°F	Sol: Miscible
VP: 180 mmHg	IP: 9.69 eV		Sp.Gr: 0.79
Fl.P: 0°F	UEL: 12.8%	LEL: 2.5%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
<b>Incompatibilities &amp; Reactivities</b> Oxidizers, acids			
<b>Measurement Methods</b> NIOSH <a href="#">1300</a> , <a href="#">3800</a> ; OSHA <a href="#">69</a> See: <a href="#">NMAM</a> or <a href="#">OSHA Methods</a>			
<b>Personal Protection &amp; Sanitation</b> Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		<b>First Aid</b> ( <a href="#">See procedures</a> ) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
<a href="#">Important additional information about respirator selection</a>			
<b>Respirator Recommendations</b> NIOSH <b>Up to 2500 ppm:</b> (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 <b>Emergency or planned entry into unknown concentrations or IDLH conditions:</b> (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 <b>Escape:</b> (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			
<b>Exposure Routes</b> inhalation, ingestion, skin and/or eye contact			
<b>Symptoms</b> Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis			
<b>Target Organs</b> Eyes, skin, respiratory system, central nervous system			
See also: <a href="#">INTRODUCTION</a> See ICSC CARD: <a href="#">0087</a> See MEDICAL TESTS: <a href="#">0002</a>			

# International Chemical Safety Cards

**ACETONE**

ICSC: 0087



2-Propanone  
 Dimethyl ketone  
 Methyl ketone  
 $C_3H_6O / CH_3COCH_3$   
 Molecular mass: 58.1

ICSC # 0087  
 CAS # 67-64-1  
 RTECS # [AL3150000](#)  
 UN # 1090  
 EC # 606-001-00-8



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, alcohol-resistant foam, water in large amounts, carbon dioxide.
<b>EXPLOSION</b>	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
<b>EXPOSURE</b>			
<b>•INHALATION</b>	Sore throat. Cough. Confusion. Headache. Dizziness. Drowsiness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
<b>•SKIN</b>	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
<b>•EYES</b>	Redness. Pain. Blurred vision. Possible corneal damage.	Safety spectacles, or face shield. Contact lenses should not be worn.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>	Nausea. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Then wash away with plenty of water. (Extra personal protection: self-contained breathing apparatus).	Fireproof. Separated from strong oxidants.	F symbol R: 11 S: 2-9-16-23-33 UN Hazard Class: 3 UN Packing Group: II
<b>SEE IMPORTANT INFORMATION ON BACK</b>		
<p><b>ICSC: 0087</b></p> <p style="text-align: center;">Prepared in the context of cooperation between the International Programme on Chemical Safety &amp; the Commission of the European Communities (C) IPCS CEC 2002. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>		

# International Chemical Safety Cards

## ACETONE

**ICSC: 0087**

<b>I M P O R T A N T D A T A</b>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.</p> <p><b>PHYSICAL DANGERS:</b> The vapour is heavier than air and may travel along the ground; distant ignition possible.</p> <p><b>CHEMICAL DANGERS:</b> The substance can form explosive peroxides on contact with strong oxidants such as acetic acid, nitric acid, hydrogen peroxide. Reacts with chloroform and bromoform under basic conditions, causing fire and explosion hazard. Attacks plastic.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 750 ppm; 1780 mg/m<sup>3</sup> (ACGIH 1993-1993). OSHA PEL: TWA 1000 ppm (2400 mg/m<sup>3</sup>) NIOSH REL: TWA 250 ppm (590 mg/m<sup>3</sup>) NIOSH IDLH: 2500 ppm LEL</p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation and through the skin.</p> <p><b>INHALATION RISK:</b> A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C on dispersing however much faster.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> The vapour irritates the eyes and the respiratory tract. The substance may cause effects on the central nervous system, liver, kidneys and gastrointestinal tract.</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the blood and bone marrow.</p>		
<b>PHYSICAL PROPERTIES</b>	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;">                     Boiling point: 56°C                      Melting point: -95°C                      Relative density (water = 1): 0.8                      Solubility in water: miscible                      Vapour pressure, kPa at 20°C: 24                      Relative vapour density (air = 1): 2.0                 </td> <td style="width: 50%; border: none; vertical-align: top;">                     Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2                      Flash point: -18°C c.c.                      Auto-ignition temperature: 465°C                      Explosive limits, vol% in air: 2.2-13                      Octanol/water partition coefficient as log Pow: -0.24                 </td> </tr> </table>		Boiling point: 56°C Melting point: -95°C Relative density (water = 1): 0.8 Solubility in water: miscible Vapour pressure, kPa at 20°C: 24 Relative vapour density (air = 1): 2.0	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2 Flash point: -18°C c.c. Auto-ignition temperature: 465°C Explosive limits, vol% in air: 2.2-13 Octanol/water partition coefficient as log Pow: -0.24
Boiling point: 56°C Melting point: -95°C Relative density (water = 1): 0.8 Solubility in water: miscible Vapour pressure, kPa at 20°C: 24 Relative vapour density (air = 1): 2.0	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2 Flash point: -18°C c.c. Auto-ignition temperature: 465°C Explosive limits, vol% in air: 2.2-13 Octanol/water partition coefficient as log Pow: -0.24			
<b>ENVIRONMENTAL DATA</b>				
<b>NOTES</b>				

Use of alcoholic beverages enhances the harmful effect.

Transport Emergency Card: TEC (R)-30  
NFPA Code: H 1; F 3; R 0;

**ADDITIONAL INFORMATION**

**ICSC: 0087**

**ACETONE**

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# NIOSH Pocket Guide to Chemical Hazards

<b>Vinyl chloride</b>		CAS 75-01-4	
CH <sub>2</sub> =CHCl		RTECS <a href="#">KU9625000</a>	
<b>Synonyms &amp; Trade Names</b> Chloroethene, Chloroethylene, Ethylene monochloride, Monochloroethene, Monochloroethylene, VC, Vinyl chloride monomer (VCM)		DOT ID & Guide 1086 <a href="#">116P</a>	
<b>Exposure Limits</b>	NIOSH REL: Ca <a href="#">See Appendix A</a>		
	OSHA PEL: [1910.1017] TWA 1 ppm C 5 ppm [15-minute]		
IDLH Ca [N.D.] See: <a href="#">IDLH INDEX</a>		Conversion 1 ppm = 2.56 mg/m <sup>3</sup>	
<b>Physical Description</b> Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations. [Note: Shipped as a liquefied compressed gas.]			
MW: 62.5	BP: 7°F	FRZ: -256°F	Sol(77°F): 0.1%
VP: 3.3 atm	IP: 9.99 eV	RGasD: 2.21	
Fl.P: NA (Gas)	UEL: 33.0%	LEL: 3.6%	
Flammable Gas			
<b>Incompatibilities &amp; Reactivities</b> Copper, oxidizers, aluminum, peroxides, iron, steel [Note: Polymerizes in air, sunlight, or heat unless stabilized by inhibitors such as phenol. Attacks iron & steel in presence of moisture.]			
<b>Measurement Methods</b> NIOSH <a href="#">1007</a> ; OSHA <a href="#">4</a> , <a href="#">75</a> See: <a href="#">NMAM</a> or <a href="#">OSHA Methods</a>			
<b>Personal Protection &amp; Sanitation</b> Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		<b>First Aid</b> ( <a href="#">See procedures</a> ) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
<a href="#">Important additional information about respirator selection</a> <b>Respirator Recommendations</b> NIOSH <b>At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:</b> (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 <b>Escape:</b> (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			
<b>Exposure Routes</b> inhalation, skin, and/or eye contact (liquid)			
<b>Symptoms</b> Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]			
<b>Target Organs</b> Liver, central nervous system, blood, respiratory system, lymphatic system			
<b>Cancer Site</b> [liver cancer]			
See also: <a href="#">INTRODUCTION</a> See ICSC CARD: <a href="#">0082</a> See MEDICAL TESTS: <a href="#">0241</a>			

# International Chemical Safety Cards

VINYL CHLORIDE

ICSC: 0082

   	
<p>Chloroethene Chloroethylene VCM C<sub>2</sub>H<sub>3</sub>Cl / H<sub>2</sub>C=CHCl Molecular mass: 62.5 (cylinder)</p>	
<p>ICSC # 0082 CAS # 75-01-4 RTECS # <a href="#">KU9625000</a> UN # 1086 (stabilized) EC # 602-023-00-7</p>	
	

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out; in other cases extinguish with powder, carbon dioxide.
<b>EXPLOSION</b>	Gas/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.
<b>EXPOSURE</b>		<b>AVOID ALL CONTACT!</b>	<b>IN ALL CASES CONSULT A DOCTOR!</b>
<b>•INHALATION</b>	Dizziness. Drowsiness. Headache. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
<b>•SKIN</b>	ON CONTACT WITH LIQUID: FROSTBITE.	Protective gloves. Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes.
<b>•EYES</b>	Redness. Pain.	Safety goggles, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
<b>•INGESTION</b>		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! Ventilation. Remove all ignition sources. (Extra personal protection: complete protective clothing including self-contained breathing apparatus).	Fireproof. Separated from incompatible materials (see Chemical Dangers). Cool. Store only if stabilized.	Note: D F+ symbol T symbol R: 45-12 S: 53-45 UN Hazard Class: 2.1
<b>SEE IMPORTANT INFORMATION ON BACK</b>		
<p><b>ICSC: 0082</b></p> <p style="text-align: center;">Prepared in the context of cooperation between the International Programme on Chemical Safety &amp; the Commission of the European Communities (C) IPCS CEC 2000. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>		

## International Chemical Safety Cards

### VINYL CHLORIDE

**ICSC: 0082**

<p><b>I</b></p> <p><b>M</b></p> <p><b>P</b></p> <p><b>O</b></p> <p><b>R</b></p> <p><b>T</b></p> <p><b>A</b></p> <p><b>N</b></p> <p><b>T</b></p> <p><b>D</b></p> <p><b>A</b></p> <p><b>T</b></p> <p><b>A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS COMPRESSED LIQUEFIED GAS , WITH CHARACTERISTIC ODOUR.</p> <p><b>PHYSICAL DANGERS:</b> The gas is heavier than air, and may travel along the ground; distant ignition possible. Vinyl chloride monomer vapours are uninhibited and may form polymers in vents or flame arresters of storage tanks, resulting in blockage of vents.</p> <p><b>CHEMICAL DANGERS:</b> The substance can under specific circumstances form peroxides, initiating explosive polymerization. The substance will polymerize readily due to heating and under the influence of air, light, and on contact with a catalyst, strong oxidizing agents and metals such as copper and aluminium, with fire or explosion hazard. The substance decomposes on burning producing toxic and corrosive fumes ( hydrogen chloride , phosgene ). Attacks iron and steel in the presence of moisture.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 1 ppm; A1 (ACGIH 1999). OSHA PEL: 1910.1017 TWA 1 ppm C 5 ppm 15-minute NIOSH REL: Ca <a href="#">See Appendix A</a> NIOSH IDLH: Potential occupational carcinogen No data</p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation.</p> <p><b>INHALATION RISK:</b> A harmful concentration of this gas in the air will be reached very quickly on loss of containment.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> The substance irritates the eyes. The liquid may cause frostbite. The substance may cause effects on the central nervous system . Exposure could cause lowering of consciousness. Medical observation is indicated.</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> The substance may have effects on the liver, spleen, blood and peripheral blood vessels, and tissue and bones of the fingers. This substance is carcinogenic to humans.</p>
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<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point: -13°C                  Melting point: -154°C                  Relative density (water = 1): (liquid) 0.9                  Density: (vapour) at 15°C 8 g/l                  Solubility in water: none</p>	<p>Relative vapour density (air = 1): 2.2                  Flash point: -78°C c.c.                  Auto-ignition temperature: 472°C                  Explosive limits, vol% in air: 3.6-33                  Octanol/water partition coefficient as log Pow: 0.6</p>
<p><b>ENVIRONMENTAL DATA</b></p>	<p>This substance may be hazardous to the environment; special attention should be given to ground water .</p> 	
<p style="text-align: center;"><b>NOTES</b></p>		
<p>Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient. Do NOT use in the vicinity of a fire or a hot surface, or during welding. An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.</p> <p style="text-align: right;">Transport Emergency Card: TEC (R)-150                  NFPA Code: H 2; F 4; R 2;</p>		
<p style="text-align: center;"><b>ADDITIONAL INFORMATION</b></p>		
<p> </p>		
<p><b>ICSC: 0082</b></p>	<p>(C) IPCS, CEC, 2000</p>	<p><b>VINYL CHLORIDE</b></p>
<p><b>IMPORTANT LEGAL NOTICE:</b></p>	<p>Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>	

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## APPENDIX 5

Warranty, Product, and Installation Information for Vapor Barrier System

# LIMITED WARRANTY

Raven Industries, Inc. warrants its products to be free from defects in materials and workmanship at the time of purchase. The sole remedy for a breach of this limited warranty is repair or replacement, at the sole discretion of Raven, of the product. Replacement or repair of products will only be provided if written notification of the defect is received by Raven within 30 days of purchase. This warranty does not extend to damage done through alterations, mishandling or misuse of the product.

**THE WARRANTIES CONTAINED HEREIN ARE EXPRESSLY AGREED TO BE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. EXPRESSLY EXCLUDED AND DISCLAIMED ARE THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES BEYOND THE DESCRIPTION ON THE FACE HEREOF.**

**RAVEN INDUSTRIES, INC. SHALL NOT IN ANY EVENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES BY REASON OF ANY WARRANTY CLAIM.**

**Shipping Damage:** All merchandise is carefully packaged to reduce the possibility of damage during shipment. Please report damaged merchandise directly to the carrier who delivered your shipment. Raven is not responsible for damage caused by shipping.

**Returned Goods:** All sales are final. Only merchandise containing a manufacturing defect will be considered for return. Written permission and authorization for return of any defective merchandise must be obtained before returning merchandise for any cause. Items returned without such written permission will be refused. All returns are subject to Raven Industries inspection, audited disposition at time of receipt.

The parties agree that the enforceability, interpretation, and construction of this agreement shall be governed by South Dakota law.

## PRODUCT DESCRIPTION

VaporBlock Plus<sup>™</sup> is a seven-layer co-extruded barrier made from state-of-the-art polyethylene and barrier resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission. VaporBlock Plus is a highly resilient underslab / vertical wall barrier designed to restrict naturally occurring gases such as radon and/or methane from migrating through the ground and concrete slab. VaporBlock Plus is more than 50 times less permeable than typical high-performance polyethylene vapor retarders against Methane, Radon and other harmful VOC's.

VaporBlock Plus is one of the most effective underslab barriers in the building industry today far exceeding ASTM E-1745 (Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs) Class A, B and C requirements. Available in 6 (Class C) and 20 (Class A) mil thicknesses designed to meet the most stringent requirements. VaporBlock Plus is produced within the strict guidelines of our ISO 9001:2000 Certified Management System.

## PRODUCT USE

VaporBlock Plus resists gas and moisture migration into the building envelop when properly installed. It can be installed as a passive or active control system extending across the entire building including floors, walls and crawl spaces. When installed as a passive system it is recommended to also include a ventilated system with sump(s) that could be converted to an active control system with properly designed ventilation fans.

VaporBlock Plus works to protect your flooring and other moisture-sensitive furnishings in the building's interior from moisture and water vapor migration, greatly reducing condensation, mold and degradation.

## SIZE & PACKAGING

VaporBlock Plus 6 is available in 12' x 200' rolls and VaporBlock Plus 20 in 10' x 150' rolls to maximize coverage. All rolls are folded on heavy-duty cores for ease in handling and installation. Other custom sizes with factory welded seams are available based on minimum volume requirements. Installation instructions and ASTM E-1745 classifications accompany each roll.

PRODUCT	PART NUMBER
---------	-------------

VaporBlock Plus 6	..... VBP 6
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VaporBlock Plus 20	.... VBP 20
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## COMMON APPLICATIONS

- Radon Barrier
- Methane Barrier
- VOC's Barrier
- Under-Slab Vapor Retarder
- Foundation Wall Vapor Retarder



## TECHNICAL DATA SHEET

PROPERTIES	TEST METHOD	VAPORBLOCK PLUS 6		VAPORBLOCK PLUS 20	
		English	Metric	English	Metric
APPEARANCE		White/Black		White/Gold	
THICKNESS, NOMINAL		6 mil	0.15 mm	20 mil	0.51 mm
WEIGHT		28 lbs/MSF	139 g/m <sup>2</sup>	102 lbs/MSF	498 g/m <sup>2</sup>
CLASSIFICATION	ASTM E 1745	CLASS C		CLASS A, B & C	
TENSILE STRENGTH 1" (2.54 cm) Average MD & TD (New Material)	ASTM E 154 Section 9 (D882)	22 lbs	98 N	58 lbs	258 N
PUNCTURE RESISTANCE	ASTM D 1709 *Method B	800 g		2600 g	
MAXIMUM USE TEMPERATURE		180°F	82°C	180°F	82°C
PERMEANCE (New Material)	ASTM E 154 Section 7  ASTM E 96 Procedure B	0.090 U.S. Perms	0.060 Metric Perms	0.025 U.S. Perms	0.016 Metric Perms
**RADON DIFFUSION COEFFICIENT		N/A		< 0.25 x 10 <sup>-12</sup> m <sup>2</sup> /s	
METHANE PERMEABILITY	ASTM D 1434	N/A		< 5 x 10 <sup>-10</sup> m <sup>2</sup> /d·atm	

\*Method B conditioned at 65% humidity for 14 days.

\*\*SP Technical Research Institute of Sweden.

### VaporBlock<sup>®</sup> Plus<sup>™</sup> Placement

All instructions on architectural or structural drawings should be reviewed and followed.

Detailed installation instructions accompany each roll of VaporBlock<sup>®</sup> Plus<sup>™</sup> and can also be located on our website.

ASTM E-1643 also provides general installation information for vapor retarders.



VaporBlock<sup>®</sup> Plus<sup>™</sup> is a seven-layer co-extruded barrier made using high quality virgin-grade polyethylene and barrier resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. NO WARRANTIES ARE MADE AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and we disclaim all liability for resulting loss or damage.



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**ISO 9001:2000**  
 CERTIFIED MANAGEMENT SYSTEM

# VaporBlock® Plus™

UNDERSLAB VAPOR RETARDER / GAS BARRIER

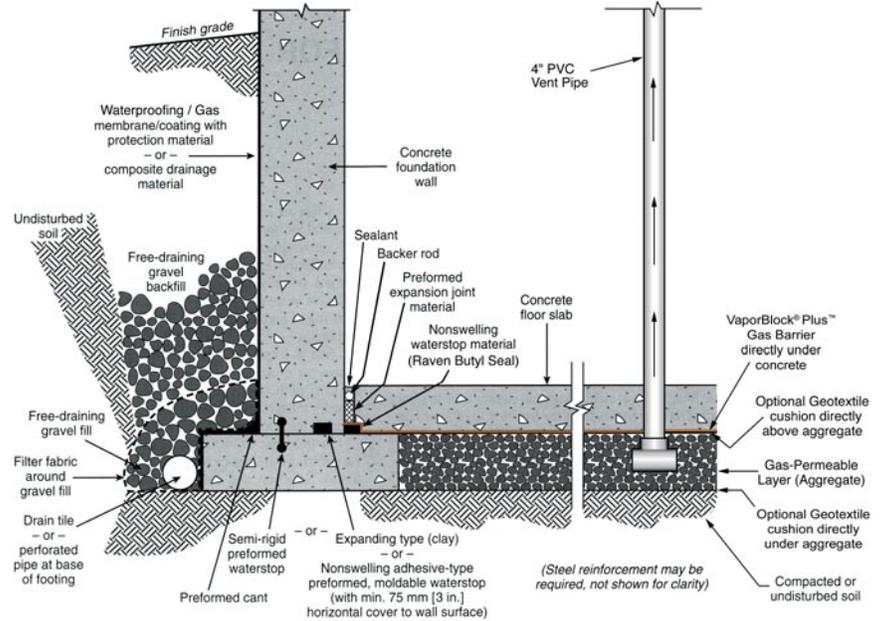
## INSTALLATION GUIDELINES

**Please Note:** Read these instructions thoroughly before installation to ensure proper use of VaporBlock® Plus™. ASTM E 1465, ASTM E 2121 and, ASTM E 1643 also provide valuable information regarding the installation of vapor / gas barriers. When installing this product, contractors shall conform to all applicable local, state and federal regulations and laws pertaining to residential and commercial building construction.

- When VaporBlock Plus gas barrier is used as part of an active control system for radon or other gas, a ventilation system will be required.
- If designed as a passive system, it is recommended to install a ventilation system that could be converted to an active system if needed.

### Materials List:

VaporBlock® Plus™ Vapor / Gas Barrier  
 VaporBond Plus 4" Foil Seaming Tape  
 Butyl Seal 2-Sided Tape  
 VaporBoot Plus Pipe Boots 12/Box (recommended)  
 VaporBoot Tape (optional)



Elements of a moisture/gas-resistant floor system. General illustration only. (Note: This example shows multiple options for waterstop placement.)

## VaporBlock® Plus™ PLACEMENT

- 1.1. Level and tamp or roll granular base as specified. A base for a gas-reduction system may require a 4" to 6" gas permeable layer of clean coarse aggregate as specified by your architectural or structural drawings after installation of the recommended gas collection system. In this situation, a cushion layer consisting of a non-woven geotextile fabric placed directly under VaporBlock Plus will help protect the barrier from damage due to possible sharp coarse aggregate.
- 1.2. Unroll VaporBlock Plus running the longest dimension parallel with the direction of the pour and pull open all folds to full width. (Fig. 1)
- 1.3. Lap VaporBlock Plus over the footings and seal with Raven Butyl Seal tape at the footing-wall connection. Overlap joints a minimum of 6" and seal overlap with Raven VaporBond Tape. When used as a gas barrier, overlap joints a minimum of 12" and seal in-between overlap with 2-sided Raven Butyl Seal Tape then seal overlap with VaporBond Plus Tape. (Fig. 2)

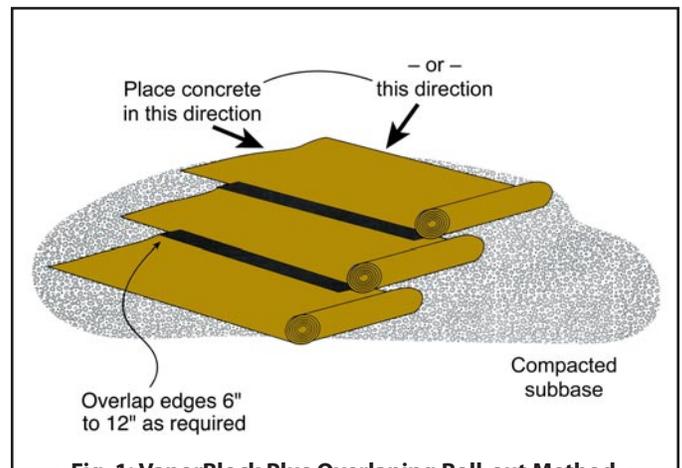


Fig. 1: VaporBlock Plus Overlapping Roll-out Method

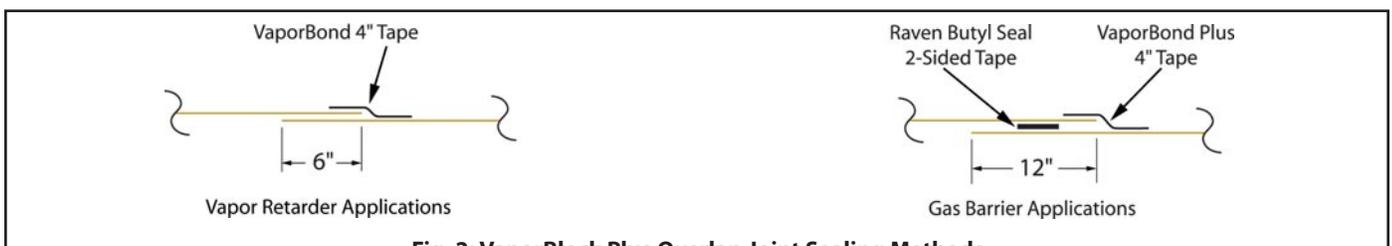


Fig. 2: VaporBlock Plus Overlap Joint Sealing Methods

# SINGLE PENETRATION PIPE BOOT INSTALLATION

1.4. Seal around all plumbing, conduit, support columns or other penetrations that come through the **VaporBlock Plus** membrane. Pipes four inches or smaller can be sealed with Raven VaporBoot Plus preformed pipe boots. VaporBoot Plus preformed pipe boots are formed in steps for 1", 2", 3" and 4" PVC pipe or IPS size and are sold in units of 12 per box (Fig. 3 & 5).

Pipe boots may also be fabricated from excess **VaporBlock Plus** membrane (Fig. 4 & 6) and sealed with VaporBoot Tape or VaporBond Plus Tape (sold separately).

*Reminder Note: All holes or penetrations through the membrane will need a patch cut to a minimum of 12" from the opening in all directions.*

To fabricate pipe boots from **VaporBlock Plus** excess material (see Fig. 4 & 6 for A-F):

- A) Cut a square large enough to overlap 12" in all directions.
- B) Mark where to cut opening on the center of the square and cut four to eight slices about 3/8" less than the diameter of the pipe.
- C) Force the square over the pipe leaving the tightly stretched cut area around the bottom of the pipe with approximately a 1/2" of the boot material running vertically up the pipe.  
*(no more than a 1/2" of stretched boot material is recommended)*

D) Once boot is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape inbetween the two layers. Secure boot down firmly over the membrane taking care not to have any large folds or creases.

E) Use VaporBoot Tape or VaporBond Plus Tape to secure the boot to the pipe.

VaporBoot Tape (option) – fold tape in half lengthwise, remove half of the release liner and wrap around the pipe allowing 1" extra for overlap sealing. Peel off the second half of the release liner and work the tape outward gradually forming a complete seal.

VaporBond Plus Tape (option) - Tape completely around the pipe overlapping the to get a tight seal against the pipe.

F) Complete the process by taping over the boot perimeter edge with VaporBond Plus Tape to create a monolithic membrane between the surface of the slab and gas/moisture sources below and at the slab perimeter. (Fig. 4 & 6)

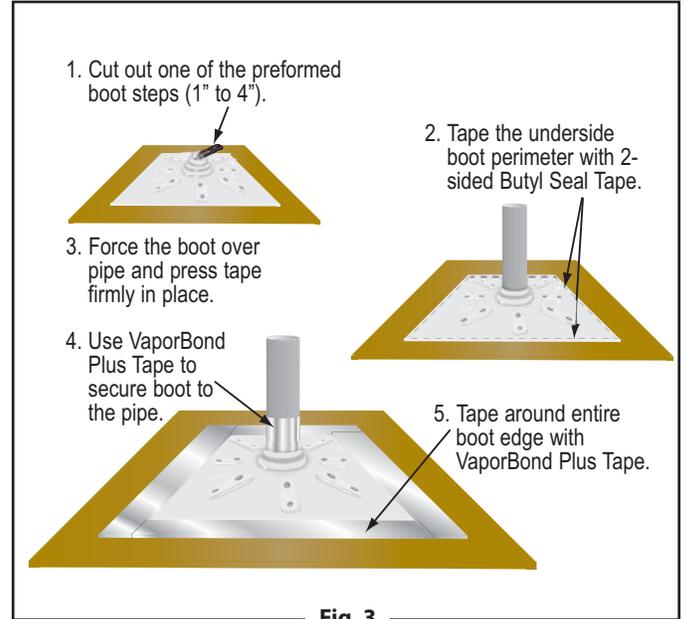


Fig. 3

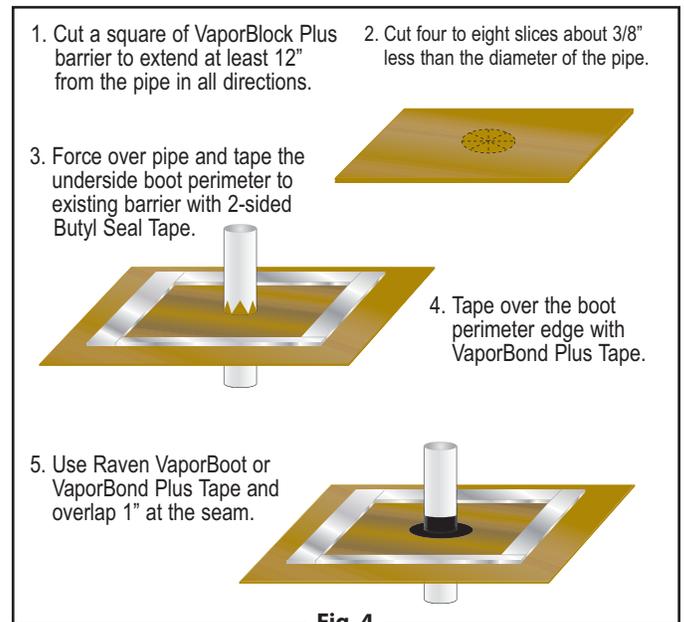


Fig. 4

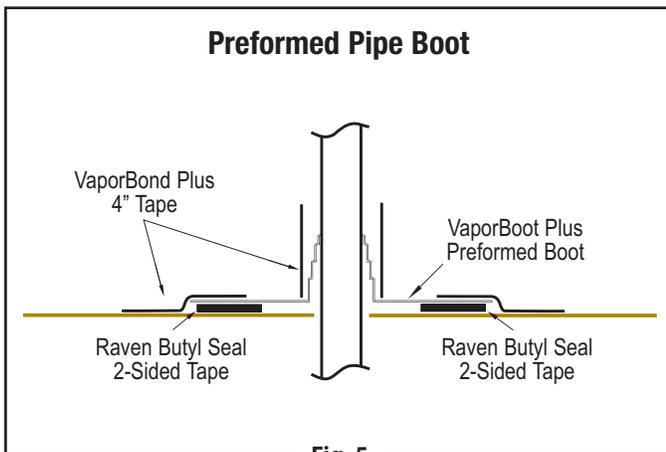


Fig. 5

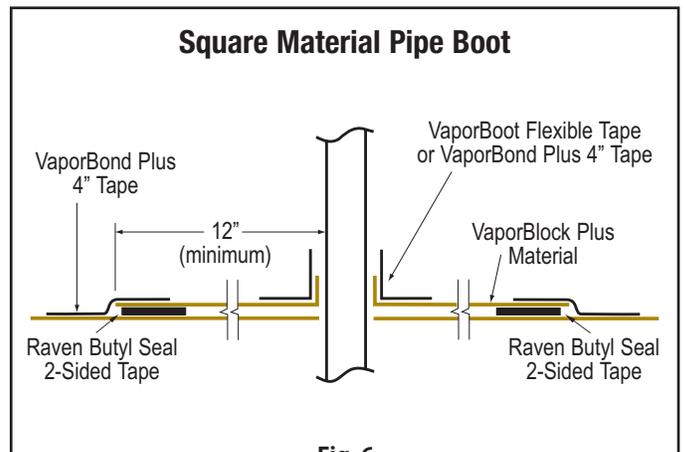


Fig. 6

# MULTIPLE PENETRATION PIPE BOOT INSTALLATION

1.5. For side-by-side multiple penetrations;

- A) Cut a patch large enough to overlap 12" in all directions (Fig. 7) of penetrations.
- B) Mark where to cut openings and cut four to eight slices about 3/8" less than the diameter of the penetration for each.
- C) Slide patch material over penetration to achieve a tight fit.
- D) Once patch is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in-between the two layers. (Fig. 8)
- E) After applying Raven Butyl Seal Tape between the patch and membrane, tape around each of the penetrations and the patch with VaporBond Plus 4" foil tape. (Fig. 9) For additional protection apply an acceptable polyurethane elastomeric sealant around the penetrations. (Fig. 10)

1.6. Holes or openings through **VaporBlock Plus** are to be repaired by cutting a piece of **VaporBlock Plus** 12" larger in all directions from the opening. Seal the patch to the barrier with 2-sided Raven Butyl Seal Tape and seal the edges of the patch with VaporBond Plus Tape.

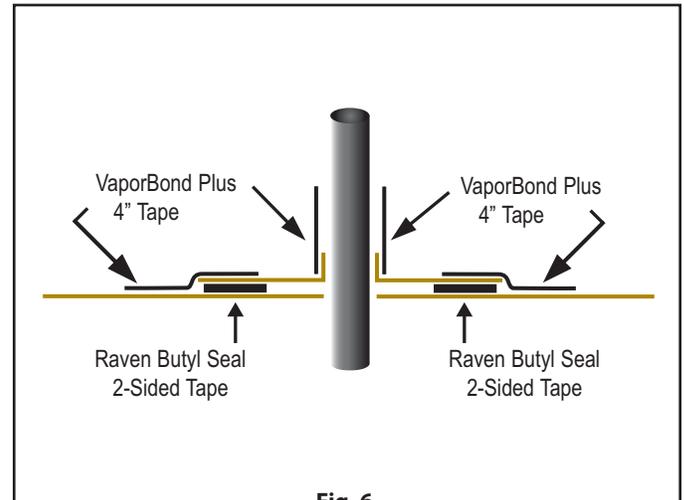


Fig. 6

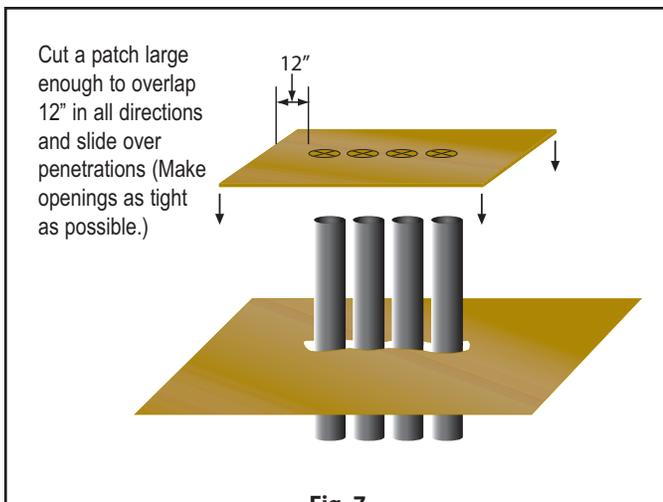


Fig. 7

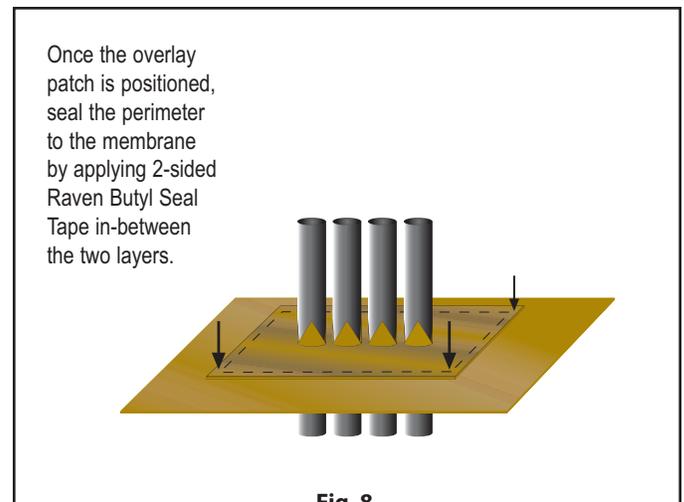


Fig. 8

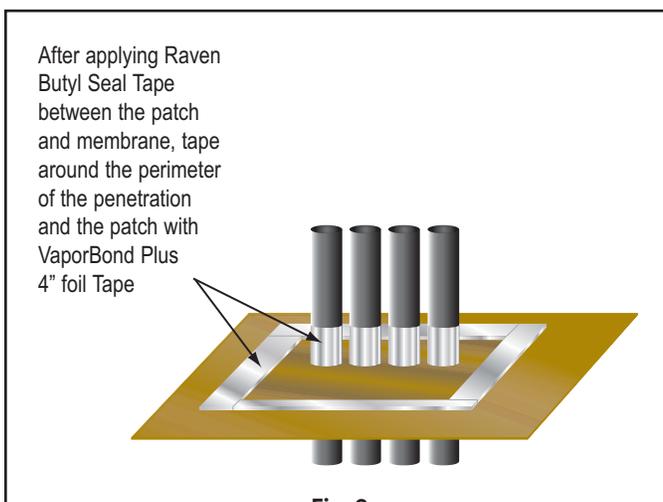


Fig. 9

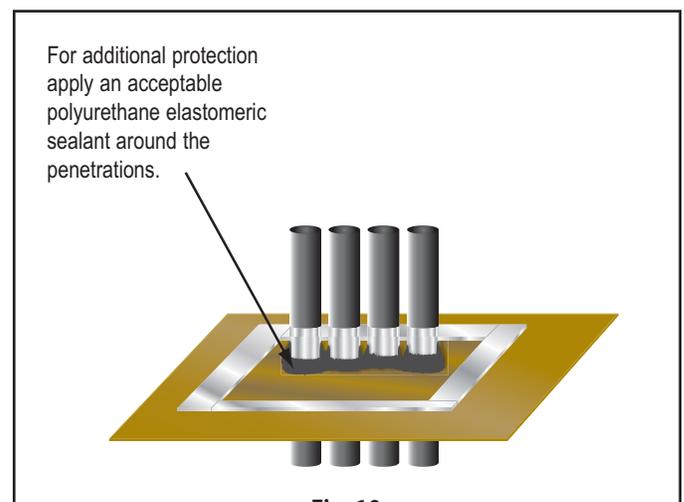


Fig. 10

- 2.1. When installing reinforcing steel and utilities, in addition to the placement of concrete, take precaution to protect **VaporBlock Plus**. Carelessness during installation can damage the most puncture-resistant membrane. Sheets of plywood cushioned with geotextile fabric temporarily placed on **VaporBlock Plus** provide for additional protection in high traffic areas including concrete buggies.
- 2.2. Use only brick-type or chair-type reinforcing bar supports to protect **VaporBlock Plus** from puncture.
- 2.3. Avoid driving stakes through **VaporBlock Plus**. If this cannot be avoided, each individual hole must be repaired.
- 2.4. If a cushion or blotter layer is required in the design between **VaporBlock Plus** and the slab, additional care should be given if sharp crushed rock is used. Washed rock will provide less chance of damage during placement. Care must be taken to protect blotter layer from precipitation before concrete is placed.



Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. NO WARRANTIES ARE MADE AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage.



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