

**547 & 549 MYRTLE AVENUE**

**BROOKLYN, NEW YORK**

**BLOCK 1894 LOTS 54 AND 55**

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# **Remedial Action Work Plan**

**NYC BCP Number: 12CBCP029K**

**NYC OER E-Designation Project Number: 12EH-N120K**

**E-Designation E-183**

**CEQR Number 07DCP066K**

**Fort Greene/Clinton Hill Rezoning**

**Prepared for:**

**East Wing Construction**

**316A Himrod Street**

**Brooklyn, NY 11337**

**Prepared by:**



**1808 MIDDLE COUNTY ROAD, RIDGE, NY 11961**

**631.504.6000**

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**DECEMBER 2011**

# CERTIFICATION

I, Ariel Czemerinski, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 547 and 549 Myrtle Avenue, Site No. 12CBCP029K. 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.

Ariel Czemerinski

Name

076508

NYS PE License Number

12/23/2011

Date



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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
BCA	Brownfield Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC BCP	New York City Brownfield Cleanup Program
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
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
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	Underground Storage Tank
VOC	Volatile Organic Compound

## EXECUTIVE SUMMARY

East Wing Construction has enrolled in the New York City Brownfield Cleanup Program (NYC BCP) to investigate and remediate a 5,000-square foot site located at 547-549 Myrtle Avenue 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.

### Site Location and Current Usage

The Site is located at 547 & 549 Myrtle Avenue in the Clinton Hill section of Brooklyn, New York and is identified as Block 1894 and Lots 54 and 55 on the New York City Tax Map. **Figure 1** shows the Site location.. Each lot has 25 feet of frontage on Myrtle Avenue and is 100 feet deep for a total combined lot area of 5,000 square feet. Lot 54 is a corner lot and includes 100 feet of frontage on Emerson Avenue (**Figure 2**). Both lots are currently vacant and are utilized as parking for commercial vans for a building materials facility located across Emerson Street. The area surrounding the subject site consists of a mix of residential and commercial properties.

### Summary of Proposed Redevelopment Plan

The proposed future use of the Site will consist of multi-family residential. Layout of the proposed site development is presented in **Figure 3**. The current zoning designation is R-7A residential with a C2-4 commercial overlay. The proposed use is consistent with existing zoning for the property.

The proposed project consists of the construction of a new 6-story residential building. The project will include a five foot deep first floor/cellar level which will extend to the property boundaries. The cellar level will be used for utility rooms, laundry room, storage, and auxiliary space to 4 apartments on the first floor. Floors 1-6 will be residential apartments. The footprint of the proposed building covers 3,800 sf of the 5,000 sf total lot leaving a 1,200 sf courtyard in the northwest corner of the property. The courtyard will be capped with concrete with no

landscaping or green areas. Approximately 703 cubic yards (1,055 tons) of soil will be excavated for the basement level.

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 implementation of a Citizen Participation Plan.
2. Perform a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Establish Track 4 Soil Cleanup Objectives (SCOs). Excavation and removal of soil/fill exceeding SCOs.
4. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
5. Construction and maintenance of an engineered composite cover consisting of concrete pavement in the courtyard area and the concrete building slab over the remainder of the Site.
6. Installation of a vapor barrier to prevent migration of vapors into the completed building.
7. Demarcation of residual soil/fill.

8. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
9. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media onsite.
10. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
11. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
12. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
13. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
14. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP.
15. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
16. Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including 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 Brownfield Cleanup Program (NYC BCP) 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. This cleanup plan 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 BCP, 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 Health and Safety Plan 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 Kevin Waters and can be reached at 631-504-6000.

**Worker Training.** Workers participating in cleanup of contaminated materials (if encountered) on this project are required to be trained in a 24 or 40-hour hazardous waste operators training course and to take annual refresher training. This pertains to workers performing specific tasks including removing petroleum or industrial 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 the EBC Project Manager Kevin Brussee 631-504-6000 or NYC Office of Environmental Remediation Project Manager Brianna Gribble 212-442-7126.

**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, Monday through Friday.

**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 Brownfield 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 EBC Project Manager Kevin Brussee 631-504-6000 or NYC Office of Environmental Remediation Project Manager Brianna Gribble 212-442-7126, or call 311 and mention the Site is in the NYC Brownfield Cleanup Program.

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

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

**Soil Chemical Testing and Screening.** All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical

testing of soils on the Site, excavated soil will be screened continuously using hand-held instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

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

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

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

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

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

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

**Final Report.** The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for you to review in the public document repositories located at Williamsburg Public Library.

**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. Requirements that the property owner must comply with are defined in the property's deed. 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

East Wing Construction has enrolled in the New York City Brownfield Cleanup Program (NYC BCP) to investigate and remediate a property located at 547-549 Myrtle Avenue in the Clinton Hill section of Brooklyn, New York (the Site). A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides a remedial alternatives analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

### 1.1 SITE LOCATION AND CURRENT USAGE

The Site is located at 547 & 549 Myrtle Avenue in the Clinton Hill section of Brooklyn, New York and is identified as Block 1894 and Lots 54 and 55 on the New York City Tax Map. **Figure 1** shows the Site location. Each lot has 25 feet of frontage on Myrtle Avenue and is 100 feet deep for a total combined lot area of 5,000 square feet. Lot 54 is a corner lot and includes 100 feet of frontage on Emerson Avenue (**Figure 2**). Both lots are currently vacant and are utilized as parking for commercial vans for a building materials facility located across Emerson Street. The area surrounding the subject site consists of a mix of residential and commercial properties.

The elevation of the property ranges from approximately 39 to 43 feet above the National Geodetic Vertical Datum (NGVD) feet. The topography of the property approximates street level for the first 65 feet and then rises steeply (4 ft increase in elevation) toward the rear of the lot.

The depth to groundwater beneath the site, as determined from field measurements, is approximately 38-40 feet below grade. Based on regional groundwater contour maps, groundwater flow is expected to be northwest toward Navy Basin.

## **1.2 PROPOSED REDEVELOPMENT PLAN**

The proposed future use of the Site will consist of multi-family residential. Layout of the proposed site development is presented in **Figure 3**. Architectural plans are provided in **Attachment A**. The current zoning designation is R-7A residential with a C2-4 commercial overlay. The proposed use is consistent with existing zoning for the property.

The proposed project consists of the construction of a new 6-story residential building. The project will include a five foot deep first floor/cellar level. The cellar level will be used for utility rooms, laundry room, storage, and auxiliary space to 4 apartments on the first floor. Floors 1-6 will be residential apartments. The footprint of the proposed building covers 3,800 sf of the 5,000 sf total lot leaving a 1,200 sf courtyard in the northwest corner of the property. The courtyard will be capped with concrete with no landscaping or green areas. Approximately 844 cubic yards (1,250 tons) of soil will be excavated for the basement level.

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

## **1.3 DESCRIPTION OF SURROUNDING PROPERTY**

The area surrounding the subject site consists of a mix of residential and commercial properties. Many of the properties have older tenement style 3 and 4 story buildings with retail space on the first floor with residential apartments on the upper floors. There is a new 6-story residential building located adjacent to the Subject property to the west. A summary of the uses of the surrounding/adjacent properties is described below. **Figure 4** shows the surrounding land usage.

## 1.4 REMEDIAL INVESTIGATION

A remedial investigation was performed and the results are documented in a companion document called “*Remedial Investigation Report, 547-549 Myrtle Avenue, Brooklyn, NY*”, dated November 2011 (RIR).

The subject properties were both developed between prior to 1887 with 3-story residential buildings with first floor storefronts. Historic use of these properties include laundry supplies, groceries/provisions, a trucking company out of a portion of the Lot 54 property on Emerson Place, a club and a church. The building on Lot 54 was demolished in 2007. Lot 55 has been vacant since approximately 1965. Adjacent property use includes a woodworking shop, a furniture store, a coal yard, a leather business and an autobody shop.

The following areas of concern were identified for the site.

- Historic fill below surface grade.

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

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed 8 soil borings across the entire project Site, and collected 11 soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installed 3 groundwater monitoring wells throughout the Site and collected 3 groundwater samples for chemical analysis to evaluate groundwater quality;
4. Installed 3 soil vapor probes and collected 3 soil gas samples for chemical analysis.

### **Summary of Environmental Findings**

1. Elevation of the property ranges from 39 to 43 feet.
2. Depth to groundwater ranges from 38 to 40 feet at the Site. Groundwater flow is generally northwest toward Navy Basin.

3. The stratigraphy of the site, from the surface down, consists of urban fill (brick, wood, and stone in a brown silty-sand matrix) to approximately 3 to 8 below grade. A native brown fine sand with a trace amount of silt is present immediately below the urban fill layer throughout the site.
4. Soil/fill samples collected during the RI indicated that no samples exceeded Track 1 Unrestricted SCOs for VOCs. Several PAH SVOCs exceeded Track 1 Restricted Residential SCOs including Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene.. The maximum observed detection of Benzo(a)anthracene concentration was 16,700 ug/kg and Dibenzo(a,h)anthracene of 3,190ug/kg, both located in the 0-2' sampling interval at B6. Other maximum exceedence values included Benzo(a) pyrene of 13,300ug/kg, Benzo(b)flouoranthene of 12,000ug/kg, Benzo(k)fluoranthene of 10,700ug/kg, Chrysene of 15,400ug/kg, and Indeno(1,2,3-cd)pyrene of 5,880ug/kg, all present in the 0-5' sampling interval at B4. Elevated Metals in several shallow soil samples (0-5 feet depth) exceeded Track 1 Unrestricted SCOs for barium, lead, mercury silver and zinc. Only one deep sample exceeded Track 1 Unrestricted SCOs for lead and for zinc. No PCBs were detected in soil samples. All Pesticides were below Track 1 SCOs with the exception of 4,4 DDT (ranging from 15.8ug/kg – 222ug/kg) in the shallow (0-5') and deeper samples (6-8'). There were also slight exceedences in 4,4-DDD and 4,4 – DDE (8.49ug/kg and 9.12ug/kg, respectively) in one shallow sample and a slight exceedence of alpha chlordane (97.9ug/kg) in a shallow sample. Overall, soil results were unremarkable and showed no contaminant source area on this property. The site contains historic fill that exhibits low levels of contaminants that are consistent or below observations for historic fill on most other sites in NYC.
5. Groundwater samples collected during the RI showed no VOCs, SVOCs, Pesticides, and PCBs above 6NYCRR Part 703.5 Class GA Groundwater Quality Standards (GQS). Trace concentration of TCE was found in an upgradient well and below the GQS, but was not found in onsite or downgradient wells at the site. Marginal exceedences of GQS were observed for arsenic, selenium and nickel. However, soil

results for these parameters showed no exceedence of Track 1 SCOs or Part 375 Groundwater Protection Standards for these parameters. High concentrations of sodium, magnesium and manganese suggest a saline intrusion influence, possibly caused by well-documented historical over-pumping of groundwater for water supply in the first half of the 20<sup>th</sup> century. High concentrations of zinc were observed at the site up to 12,600mg/L in the groundwater. The majority of zinc samples exceeded Track 1 SCOs in soil however do not exceed Restricted Residential SCOs for soil in all samples. Groundwater results showed no sources of contamination on the property but did show brackish water quality due to non site-related factors.

Soil vapor samples collected during the RI showed VOCs in soil vapor with highest concentrations for acetone (maximum 1600 ug/m<sup>3</sup>), methylene chloride (maximum 110 ug/m<sup>3</sup>) and 1,1,1-TCA (maximum 120 ug/m<sup>3</sup>). Other VOCs included BTEX-associated compounds at concentrations typically below 25 ug/m<sup>3</sup>. TCE was not detected and PCE was observed in one sample in trace concentration (3.1 ug/m<sup>3</sup>) and well below NYS DOH monitor level. PCE was not observed in soil or groundwater onsite and no source areas for any of the compounds observed in soil vapor were identified on the property. For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

## **2.0 REMEDIAL ACTION OBJECTIVES**

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

### **Soil**

- Prevent direct contact with contaminated soil.

### **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 exceedance of applicable standards, criteria and guidance values (SCGs). A remedy is then developed based on the following nine 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; and
- Land use.

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:

Two remedial action alternatives are considered in this alternatives analysis. Alternative 1 is a Track 1 alternative that involves removal of all soil impacted above unrestricted Track 1 SCOs. Alternative 2 removes all impacted soil above site specific cleanup objectives.

- Alternative 1 - Track 1, remediation of all soils above bedrock to unrestricted use criteria. This alternative will remove all of the historic fill which is present at a depth or 3 to at least 8 feet across the site. Since the planned excavation for the new building's basement level is to a depth of 5 feet on 3,800 sf of the 5,000 sf site, over excavation of the

basement level and planned 1,200 sf courtyard area will be required under this alternative. Installation of a vapor barrier will also be required to prevent the potential migration of vapors into the building.

- Alternative 2 - Track 4. Remediation of all soils to site specific criteria. This alternative will include excavation to a maximum depth of 5 feet for the planned 3,800 sf basement. It will leave some historic fill material below the basement foundation in some areas of the site and will leave historic fill below the courtyard area. This alternative will require an engineered cap for the basement and courtyard area to eliminate potential exposure to remaining soil/fill and installation of a vapor barrier to prevent migration of vapors into the building. It will also include the establishment of use restrictions including prohibitions on sensitive site uses, such as farming or vegetable gardening, to eliminate future exposure pathways, the establishment of a Site Management Plan to ensure long-term management of these Institutional Controls including the performance of periodic inspections and certification that the controls are performing as they were intended. A deed restriction will also be required to memorialize the remedial action and the Engineering and Institutional Controls to ensure that future owners of the site continue to maintain these controls as required.

### 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** will be protective of human health and the environment by eliminating the historic fill at the site which contains elevated levels of metals, SVOCs and pesticides. The potential for human and environmental exposure to these constituents on-site will be eliminated by excavation of all soils to a depth of at least 5-8 feet with parameters in excess of unrestricted criteria,

disposing of excavated materials off-site and backfilling as needed with certified clean fill/topsoil, virgin mined materials, or OER approved recycled materials.

The Track 1 alternative will result in excavation of all soil with contaminant concentration above Track 1 SCOs and would:

- Eliminate the risk of ingestion exposures or other direct contact with contaminated on-Site soils consistent with remedial action objectives;
- Eliminate the risk of leaching into groundwater and ingestion exposures or direct contact with groundwater with contamination derived from the Site consistent with remedial action objectives; and
- Prevent migration of off-Site derived vapors into occupied structures and eliminate associated inhalation exposures consistent with remedial action objectives.

**Alternative 2** will be protective of human health by meeting site specific cleanup objectives for remaining soils. The potential for human and environmental exposure to the elevated levels of metals, SVOCs and pesticides present in the fill on-site will be eliminated by excavation of all soils with parameters in excess of site specific criteria, disposing of excavated materials off-site and backfilling as needed with certified clean fill/topsoil.

The Track 4 alternative would:

- Establish Track 4 Site Specific SCOs and removal of soils that exceed these SCOs;
- Placement of a final cover over the site consisting of a 4-inch concrete building slab and a 4-inch concrete cap in the courtyard area to eliminate any potential exposures to remaining soils that exceed unrestricted SCOs;
- Establish use restrictions to ensure that future ingestion or other exposures are eliminated;
- Prevent migration of off-Site derived vapors into occupied structures and eliminate associated inhalation exposures consistent with remedial action objectives.
- Establish a Site Management Plan to ensure long term management of Institutional and Engineering Controls to ensure that all Engineering and Institutional controls are inspected periodically and requires certification that the remedy continues to perform as it was designed, thus ensuring that the protections achieved for public health and the environment remain in perpetuity;
- Place a deed restriction to memorialize these controls in order to decrease the risk of future exposures with contaminated media consistent with remedial action objectives to memorialize the remedial action and the existence of Engineering and Institutional

Controls and will ensure that these controls will be appropriately managed by future site owners.

**Both Alternatives:** During remedial and construction activity workers and area residents may be exposed to impacted soil and vapors. Worker exposure to soil and vapors will be minimized through implementation of a Health and Safety Plan. Exposures to area residents from dust and/or vapors will be minimized through the use of engineering controls and through implementation of a Community Air Monitoring Plan (CAMP).

### 3.2 BALANCING CRITERIA

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

Alternative 1 will achieve compliance with the remedial goals, SCGs and RAOs for soil through removal to Track 1 unrestricted cleanup levels. SCGs for groundwater will not be achieved since saline groundwater is migrating onto the Site from off-Site sources. Alternative 2 also provides protection for soil vapor migration through the use of engineering controls.

Alternative 2 will achieve compliance with the remedial goals, SCGs and RAOs for soil through removal to Track 4 site specific soil cleanup levels. Removal of large amounts of historic fill from the building footprint will remove a substantial amount of lightly and moderately contaminated material. SCGs for groundwater will not be achieved since saline groundwater is migrating onto the Site from off-Site sources. Alternative 2 also provides protection for soil vapor migration through the use of engineering controls.

#### 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.

The potential for short-term adverse impacts and risks to the workers, the community, and the environment during the implementation of Alternative's 1 or 2 is minimal. Short-term exposure to on-site workers during excavation and loading activities will be addressed with a HASP and mitigated through the use of personal protective equipment, monitoring and engineering controls. Potential short-term exposure to the surrounding community will be addressed through the use of odor and dust-suppression techniques and through the implementation of a CAMP which will require air monitoring activities during all excavation and soil disturbance activities.

Other potential impacts to the community under Alternatives 1 or 2, such as construction-related noise, vibrations and traffic, will be controlled and regulated under the terms of the NYC Department of Buildings issued building permit which can place a Stop Work Order on the property for unsafe conditions, community impacts or violation of the terms and conditions of the permit. Decontamination procedures of equipment, including trucks transporting soil to off-site disposal facilities will minimize the potential for impacted soil to be dispersed beyond the Site boundary. A truck traffic plan would also be prepared to minimize disturbance to the local roads and community under these alternatives.

### **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.

Both Alternative 1 and Alternative 2 achieve long term effectiveness and permanence by permanently removing and/or eliminating the exposure to Site contaminants or historic fill materials.

Under both Alternatives, risk from soil impacts is eliminated. Both Alternative 1 and Alternative 2 will continue to meet RAOs for soil , providing a permanent long-term solution for the Site.

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

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

Alternative 1 will permanently eliminate the toxicity, mobility, and volume of contaminants from on-site soil by meeting Track 1 SCOs. Alternative 2 will remove a large fraction of impacted fill present on the property and will provide engineering and institutional controls to ensure that there are no pathways for exposure to remaining materials. Both alternatives also address the mobility of vapors from off-site sources from entering the building under future use scenarios through the use of engineering controls.

### **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 Alternatives 1 and 2 are readily available and have been proven effective in remediating the contaminants associated with the Site. Excavation and capping for the remediation of soils are both "low tech" and reliable methods

which have a long and proven track record on the remediation of hazardous waste and petroleum spill sites.

However, if Alternative 1 were to fail to meet unrestricted SCOs additional excavation beyond 5 feet would be required. Since sloping is not feasible, additional shoring would likely be required to excavate beyond a depth of six feet.

### **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.

Costs associated with Alternative 1 are estimated at approximately \$200,000. This cost estimate includes the following elements and assumptions:

- Excavate to a depth of 8 ft within an 5,000 sf area for development purposes;
- Disposal of 1,481 cy (2,222 tons) of excavated soil as nonhazardous;
- Backfilling 355 cy of OER approved materials;
- Shoring using sheet piling;
- Installation of a vapor barrier beneath the building's basement slab foundation as a preventive measure.
- HASP and CAMP monitoring for the duration of the remedial activities.

Costs associated with Alternative 2 are estimated at approximately \$75,000. This cost estimate includes the following elements and assumptions:

- Excavate to a depth of 5 ft within an 3,800 sf area;
- Disposal of 703 cy (1,055 tons) of excavated soil as nonhazardous;
- Backfilling with certified or virgin materials;

- Installation of a vapor barrier beneath the building's basement slab foundation as a preventive measure.
- Capping the site with a 4-inch concrete basement slab and a 4-inch concrete cap in the courtyard area.
- HASP and CAMP monitoring for the duration of the remedial activities.

### **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. No questions regarding the Site have been raised regarding remedial options to date. This RAWP will be subject to a 30-day public comment period to determine if the community has any comments on the presented remedial alternatives and selected remedy. If no comments are received regarding the selected remedy, it will be considered to be acceptable to the community.

### **Land use**

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

The proposed redevelopment of the Site is compatible with its current R7A. Following remediation the Site will meet either unrestricted or restricted residential use objectives which is appropriate for its planned multi-tenant residential use.

Engineering controls for an engineered composite cap will be required under Alternative 2. Engineering controls for a vapor barrier will be required under both Alternatives.

### **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.

Sustainability considerations under Alternatives 1 and 2 could consist of disposal of affected soil with OER approval at a facility which recycles it for use in asphalt or other construction materials following processing to remove or stabilize contaminants. Alternatives 1 and 2 would also seek to utilize recycled materials such as recycled concrete aggregate (RCA) for backfilling where feasible. See sustainability statement in **Attachment B**.

## 4.0 REMEDIAL ACTION

### 4.1 SUMMARY OF PREFERRED REMEDIAL ACTION

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

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and implementation of a Citizen Participation Plan (**Attachment C**).
  2. Perform a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
  3. Establish Track 4 Soil Cleanup Objectives (SCOs). Excavation and removal of soil/fill exceeding SCOs.
  4. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
- 
1. Construction and maintenance of an engineered composite cover consisting of concrete pavement in the courtyard area and the concrete building slab over the remainder of the Site.
  2. Demarcation of residual soil/fill.
  3. Installation of a vapor barrier beneath the building slab.
  4. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.

5. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media onsite.
6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
7. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
8. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
9. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
10. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP.
11. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
12. Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including 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 SCOs for this Site are listed in Table 1. Site Specific SCOs are provided in Table 2. Track 4 SCOs are already achieved at this property prior to the removal of soil/fill for development purposes. Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in **Attachment D**. The location of planned excavations is shown in **Figure 5**.

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 total quantity of soil/fill expected to be excavated for disposal purposes and disposed off-Site is 1,055 tons. The proposed disposal locations for Site-derived impacted materials will be reported to OER when they are identified and prior to the start of remedial action.

### End-Point Sampling

Removal actions under this plan will be performed in conjunction with remedial end-point sampling where hot spots are encountered. 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. Hotspot end-point sampling frequency will consist of the following:

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 exceedance is identified) utilizing the following methodology:

Soil analytical methods will include one or more of the following:

- 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.

## Quality Assurance/Quality Control

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

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

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

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

Prepare field blanks by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers. Trip blanks will be used whenever samples are transported to the laboratory for analysis of VOCs. Trip blanks will not be used for samples to be analyzed for metals, SVOCs or pesticides. One blind duplicate sample will be prepared and submitted for analysis every 20 samples.

## 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 **Attachment D**. The estimated quantity of recycled concrete aggregate materials to be imported into the Site for backfill is 60 tons. The estimated quantity of onsite soil/fill expected to be reused/relocated on Site is 60 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 Engineering Control Systems:

- composite cover system consisting of a concrete covered courtyard area and the concrete building slab;
- vapor barrier beneath the basement slab and on the foundation sidewalls.

#### 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 is comprised of:

- concrete covered courtyard area;
- concrete building slabs;
- vapor barrier beneath basement slab.

An engineered composite site cover will be placed over the entire footprint of the Site. The composite cover will consist of the concrete building foundation slab and extended sidewalk on the north side of the building. A site map depicting the proposed distribution of each component of the composite site cover is provided as **Figure 5**.

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 Management Plan 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**

The potential intrusion of soil vapor will be prevented with a combination of building slab, and a vapor barrier. A high density polyethylene vapor barrier liner (HPDE) will be installed prior pouring the building's concrete slab. The vapor barrier will consist of a 20 mil HDPE geomembrane liner manufactured by GSE Lining Technologies of North America, or equivalent equal. The vapor barrier will extend throughout the area occupied by the footprint of the new building which is to be constructed at the site. The specifications for installation will be provided to the construction management company and the foundation contractor or installer of the liner. The specifications state that all vapor barrier seams, penetrations, and repairs will be sealed either by the tape method or weld method, according to the manufacturer's recommendations and instructions.

The extent of the proposed vapor barrier membrane is provided in **Figure 6**. Installation details (penetrations, joints, etc.) with respect to the proposed building foundation, footings, slab, and sidewalls are provided in **Figure 7**. Product specification sheets are provided in **Attachment F**. The Remedial Action Report will include photographs (maximum of two photos per page) of the installation process, PE/RA certified letter (on company letterhead) from primary contractor responsible for installation oversight and field inspections, and a copy of the manufacturers certificate of warranty.

## **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:

- Recording of an OER-approved Declaration of Covenant and Restrictions (DCR) with the City Register or county clerk, as appropriate. The DCR will include a description of all ECs and ICs, will summarize the requirements of the Site Management Plan, and will note that the property owner and property owner's successors and assigns must comply with the DCR and the approved SMP. The recorded DCR will be submitted in the Remedial Action Report. The DCR will be recorded prior to OER issuance of the Notice of Completion;
- Submittal of a Site Management Plan in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, monitoring, inspection, reporting 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 at a frequency to be determined 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 use and will not be used for a higher level of use without prior approval by OER.

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

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

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

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

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

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

Investigations reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA). As part of the BCP 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**

SVOCs, pesticides and metals are present in the historic fill materials throughout the Site at levels above unrestricted SCO levels including:

SVOCs: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene

Pesticides: 4,4-DDT, Alpha Chlordane

Metals: Barium, Lead, Mercury, Silver, Zinc

The fill material is present from surface grade to a depth of 3 to 8 feet below the surface.

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

The fill material is present throughout the Site from surface grade to a depth of 3 to 8 feet below the surface. This material will be partially removed and managed under the proposed remediation and redevelopment of the site.

### **Potential Routes of Exposure**

Potential On-Site Exposures: An exposure route is the mechanism by which a receptor comes into contact with a chemical. 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, soil or building materials.

Potential On-Site Exposures: Construction workers engaged in excavation of soils at the site for the installation of basement level foundation of the new buildings may be exposed to historic fill containing metals, pesticides and SVOCs through ingestion and dermal contact.

Potential Off-Site Exposures: Off-site pedestrians and residents could be exposed to metals, pesticides and SVOCs in historic fill materials through dust generated during excavation or grading work at the Site.

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

Based upon this analysis, there are two future potential exposure pathways: 1) direct exposure to on-site soils and dust from on-site soils; and 2) exposure to soil vapors. Potential on-site receptors include adult and child visitors, construction workers, trespassers and commercial workers. The potential off-site receptors are adult and child pedestrians and residents. The primary route of exposure would be inhalation and dermal contact on-site and inhalation off site.

During remedial construction, on-site and off-site exposures to contaminated dust from historic fill will be addressed through dust controls, and through the implementation of the community air monitoring program and a construction health and safety plan.

After the remedial action is complete, there will be no remaining exposure pathways. The composite cover and long-term site management will interrupt any remaining exposure pathways. The vapor barrier will prevent migration of vapors into the new buildings. Continued protection after the remedial action will be achieved by the implementation of site management including periodic inspection and certification of the performance of remedial controls.

## **5.0 REMEDIAL ACTION MANAGEMENT**

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

Principal personnel who will oversee the remedial action include Kevin Brussee, Project Manager-EBC and Kevin Waters, Field Operations Officer-EBC. The PE and QEP for this project are Ariel Czmerinski P.E., AMC Engineering and Charles Sosik P.G. EBC.

### **5.2 SITE SECURITY**

Site access will be controlled by a chain link fence which surrounds the property.

### **5.3 WORK HOURS**

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

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

The Health and Safety Plan is included in **Attachment E**. The Site Safety Coordinator will be Kevin Waters - EBC. 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, if required, under 29 CFR 1910.120, including 24 and 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 including 24 and 40 hr HAZWOPER 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. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while sampling 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. Exceedences of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be reported to the OER Project Manager and included in the Daily Report.

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

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter

to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

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

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

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a

period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\text{mcg}/\text{m}^3$ ) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed  $150 \text{ mcg}/\text{m}^3$  above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than  $150 \text{ mcg}/\text{m}^3$  above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within  $150 \text{ mcg}/\text{m}^3$  of the upwind level and in preventing visible dust migration.

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

## 5.6 AGENCY APPROVALS

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

## 5.7 SITE PREPARATION

### Pre-Construction Meeting

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

## **Mobilization**

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

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

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the 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.

## **Equipment and Material Staging**

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

### **Stabilized Construction Entrance**

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

### **Truck Inspection Station**

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the NYC BCP 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.

## **5.8 TRAFFIC CONTROL**

Drivers of trucks leaving the NYC BCP 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 north on Myrtle Avenue to Park Avenue, east on Park Avenue to Kent Avenue, north on Kent Avenue to Williamsburg Street East. North on Williamsburg Street merging left onto the Brooklyn-Queens Expressway.

## **5.9 DEMOBILIZATION**

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination, and;
- General refuse disposal.

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

## 5.10 REPORTING AND RECORD KEEPING

### Daily Reports

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

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

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

### **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.

### **5.13 DATA USABILITY SUMMARY REPORT**

The primary objective of a Data Usability Summary Report (DUSR) is to determine whether or not data meets the site specific criteria for data quality and data use. The DUSR provides an evaluation of analytical data without third party data validation. The DUSR for post-remedial samples collected during implementation of this RAWP will be included in the Remedial Action Report (RAR).

## 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 and DUSR;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material.
- Account of the origin and required chemical quality testing for material imported onto the Site.
- Recorded Declaration of Covenants and Restrictions.
- Reports and supporting material will be submitted in digital form.

## Remedial Action Report Certification

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

I, \_\_\_\_\_, 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 **Site name** Site **Site number**.

I, \_\_\_\_\_, am a qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the **Site name** Site **Site number**.

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

## 7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a 12 month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	-
Mobilization	1	1
Remedial Excavation	2	8
Demobilization	10	1
Record Declaration of Covenants and Restrictions	28	2
Submit Remedial Action Report	32	2

# **TABLES**

**TABLE 1**

**TABLE 1 - Imported Backfill and Clean Soil Limits**

All values are listed in parts per million (ppm)

Contaminant	Unrestricted	Residential	Restricted - Residential	Restricted - Commercial or Industrial
<b>Metals</b>				
Arsenic	13	16	16	16
Barium	350	350	400	400
Beryllium	7.2	14	47	47
Cadmium	2.5	2.5	4.3	7.5
Chromium, Hexavalent	1	19	19	19
Chromium, Trivalent	30	36	180	1500
Copper	50	270	270	270
Cyanide	27	27	27	27
Lead	63	400	400	450
Manganese	1600	2000	2000	2000
Mercury (total)	0.18	0.73	0.73	0.73
Nickel	30	130	130	130
Selenium	3.9	4	4	4
Silver	2	8.3	8.3	8.3
Zinc	109	2200	2480	2480
<b>PCBs/Pesticides</b>				
2,4,5-TP Acid (Silvex)	3.8	3.8	3.8	3.8
4,4'-DDE	0.0033	1.8	8.9	17
4,4'-DDT	0.0033	1.7	7.9	47
4,4'-DDD	0.0033	2.6	13	14
Aldrin	0.005	0.019	0.097	0.19
Alpha-BHC	0.02	0.02	0.02	0.02
Beta-BHC	0.036	0.072	0.09	0.09
Chlordane (alpha)	0.094	0.91	2.9	2.9
Delta-BHC	0.04	0.25	0.25	0.25
Dibenzofuran	7	14	59	210
Dieldrin	0.005	0.039	0.1	0.1
Endosulfan I	2.4	4.8	24	102
Endosulfan II	2.4	4.8	24	102
Endosulfan sulfate	2.4	4.8	24	200
Endrin	0.014	0.06	0.06	0.06
Heptachlor	0.042	0.38	0.38	0.38
Lindane	0.1	0.1	0.1	0.1
Polychlorinated biphenyls	0.1	1	1	1

**TABLE 1 - Imported Backfill and Clean Soil Limits (cont')**

All values are listed in parts per million (ppm)

Contaminant	Unrestricted	Residential	Restricted - Residential	Restricted - Commercial or Industrial
<b>Semivolatile Organic Compounds</b>				
Acenaphthene	20	98	98	98
Acenaphthylene	100	100	100	107
Anthracene	100	100	100	500
Benzo(a)anthracene	1	1	1	1
Benzo(a)pyrene	1	1	1	1
Benzo(b)fluoranthene	1	1	1	1.7
Benzo(g,h,i)perylene	100	100	100	500
Benzo(k)fluoranthene	0.8	1	1.7	1.7
Chrysene	1	1	1	1
Dibenz(a,h)anthracene	0.33	0.33	0.33	0.56
Fluoranthene	100	100	100	500
Fluorene	30	100	100	386
Indeno(1,2,3-cd)pyrene	0.5	0.5	0.5	5.6
m-Cresol(s)	0.33	0.33	0.33	0.33
Naphthalene	12	12	12	12
o-Cresol(s)	0.33	0.33	0.33	0.33
p-Cresol(s)	0.33	0.33	0.33	0.33
Pentachlorophenol	0.8	0.8	0.8	0.8
Phenanthrene	100	100	100	500
Phenol	0.33	0.33	0.33	0.33
Pyrene	100	100	100	500
<b>Volatile Organic Compounds</b>				
1,1,1-Trichloroethane	0.68	0.68	0.68	0.68
1,1-Dichloroethane	0.27	0.27	0.27	0.27
1,1-Dichloroethene	0.33	0.33	0.33	0.33
1,2-Dichlorobenzene	1.1	1.1	1.1	1.1
1,2-Dichloroethane	0.02	0.02	0.02	0.02
1,2-Dichloroethene(cis)	0.25	0.25	0.25	0.25
1,2-Dichloroethene(trans)	0.19	0.19	0.19	0.19
1,3-Dichlorobenzene	2.4	2.4	2.4	2.4
1,4-Dichlorobenzene	1.8	1.8	1.8	1.8
1,4-Dioxane	0.1	0.1	0.1	0.1
Acetone	0.05	0.05	0.05	0.05
Benzene	0.06	0.06	0.06	0.06
Butylbenzene	12	12	12	12
Carbon tetrachloride	0.76	0.76	0.76	0.76
Chlorobenzene	1.1	1.1	1.1	1.1
Chloroform	0.37	0.37	0.37	0.37

**TABLE 1 - Imported Backfill and Clean Soil Limits (cont')**  
 All values are listed in parts per million (ppm)

Contaminant	Unrestricted	Residential	Restricted - Residential	Restricted - Commercial or Industrial
<b>Volatile Organic Compounds (cont')</b>				
Ethylbenzene	1	1	1	1
Hexachlorobenzene	0.33	0.33	1.2	3.2
Methyl ethyl ketone	0.12	0.12	0.12	0.12
Methyl tert-butyl ether	0.93	0.93	0.93	0.93
Methylene chloride	0.05	0.05	0.05	0.05
Propylbenzene-n	3.9	3.9	3.9	3.9
Sec-Butylbenzene	11	11	11	11
Tert-Butylbenzene	5.9	5.9	5.9	5.9
Tetrachloroethene	1.3	1.3	1.3	1.3
Toluene	0.7	0.7	0.7	0.7
Trichloroethene	0.47	0.47	0.47	0.47
Trimethylbenzene-1,2,4	3.6	3.6	3.6	3.6
Trimethylbenzene-1,3,5	8.4	8.4	8.4	8.4
Vinyl chloride	0.02	0.02	0.02	0.02
Xylene (mixed)	0.26	1.6	1.6	1.6

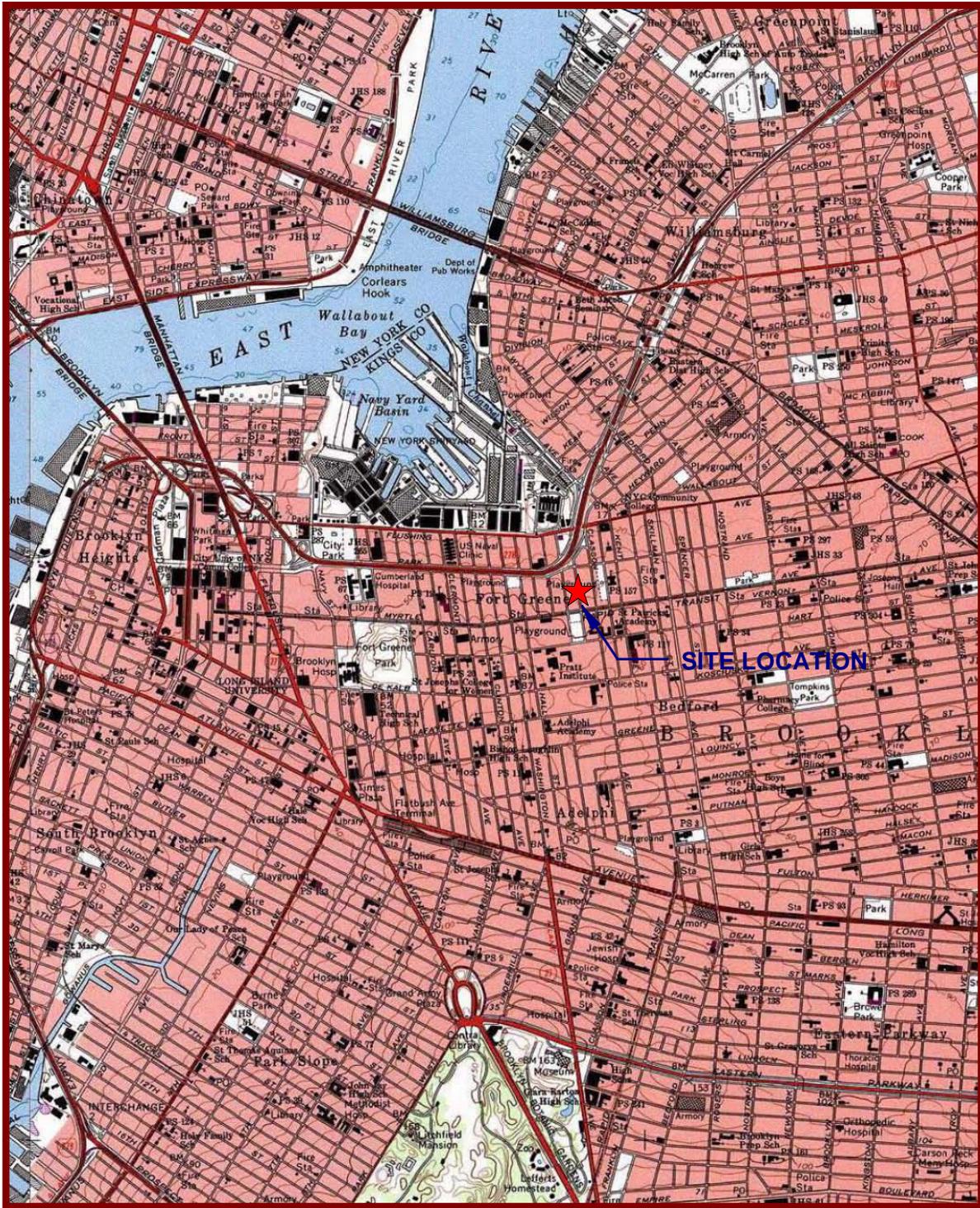
**NOTES:**

- 1) Allowable values for imported soils are derived from 6NYCRR Part 375 Table 6.8(b) Soil Cleanup Objectives and is determined by comparing the use-based Protection of Public Health value (based on the site's achieved cleanup track) with the Protection of Groundwater value and selecting the lower of the two (for sites with no ecological resources).
- 2) The SCO for Hexavalent or Trivalent Chromium is considered to be met if the analysis for the total species of this contaminant is below the specific SCO for Hexavalent Chromium.
- 3) The following material may be imported, without chemical testing, to be used as backfill beneath pavement or the final soil cover (i.e. the uppermost 1 or 2 feet, depending on the site's use restriction): a) - Rock or stone, consisting of virgin material from a permitted mine or quarry; b) - Recycled concrete, brick or asphalt from a NYSDEC-registered C&D processing facility which conforms to Section 304 of the New York State Department of Transportation Standard Specifications Construction and Materials Volume 1 (2002). This material must contain less than 10% (by weight) material which would pass through a size 200 sieve.

**TABLE 2**  
**Track 4 - Site Specific SCOs**

<b>Contaminant</b>	<b>Site Specific SCO (ppm)</b>
Barium	750
Lead	800
Mercury	2
Zinc	400
Total SVOCs	250

# **FIGURES**



40°43.000' N  
40°42.000' N  
40°41.000' N  
40°40.000' N

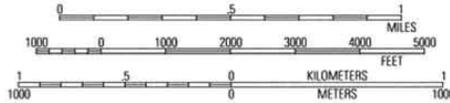
74°00.000' W

73°59.000' W

73°58.000' W

WGS84 73°57.000' W

USGS Brooklyn, NY Quadrangle 1994, Contour Interval = 10 feet



MNTN  
13°  
06/12/11



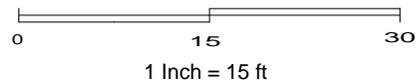
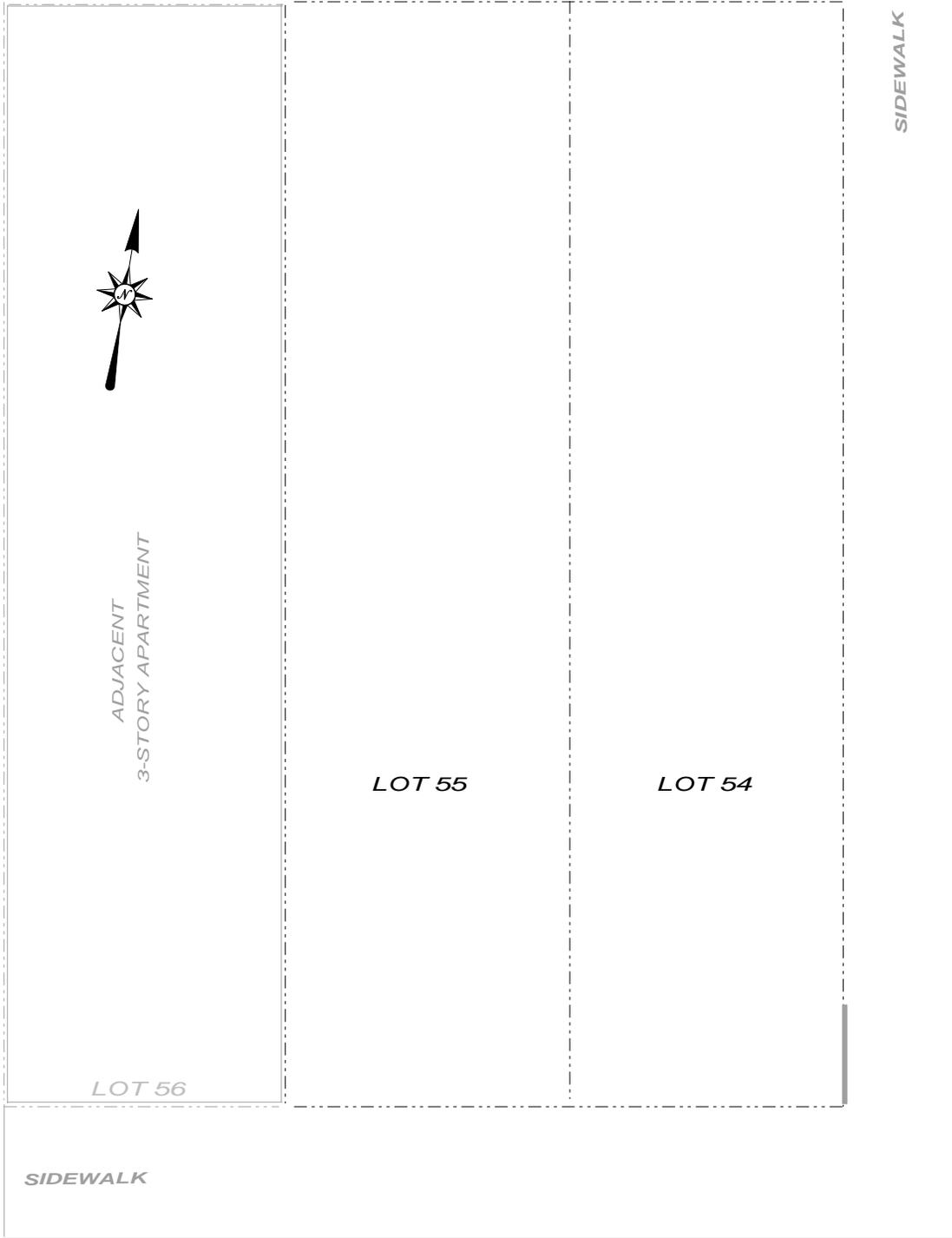
**ENVIRONMENTAL BUSINESS CONSULTANTS**

Phone 631.504.6000  
Fax 631.924.2870

**547 & 549 MYRTLE AVENUE  
BROOKLYN, NY**

**FIGURE 1**

**SITE LOCATION MAP**

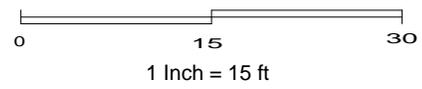
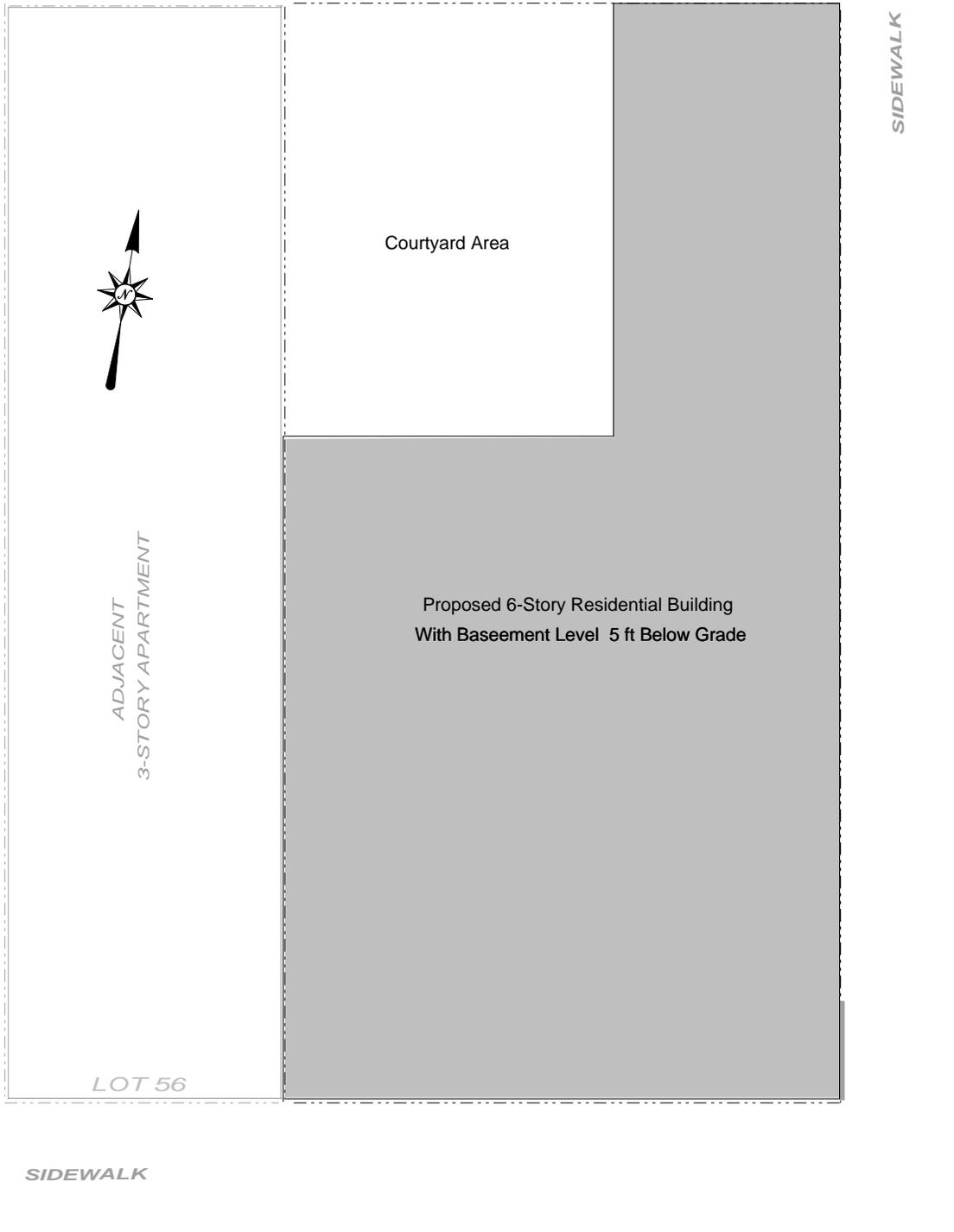


***ABC***  
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Phone 631.504.6000  
 Fax 631.924.2780

547 & 549 MYRTLE AVENUE  
 BROOKLYN, NY

**FIGURE 2 SITE PLAN**

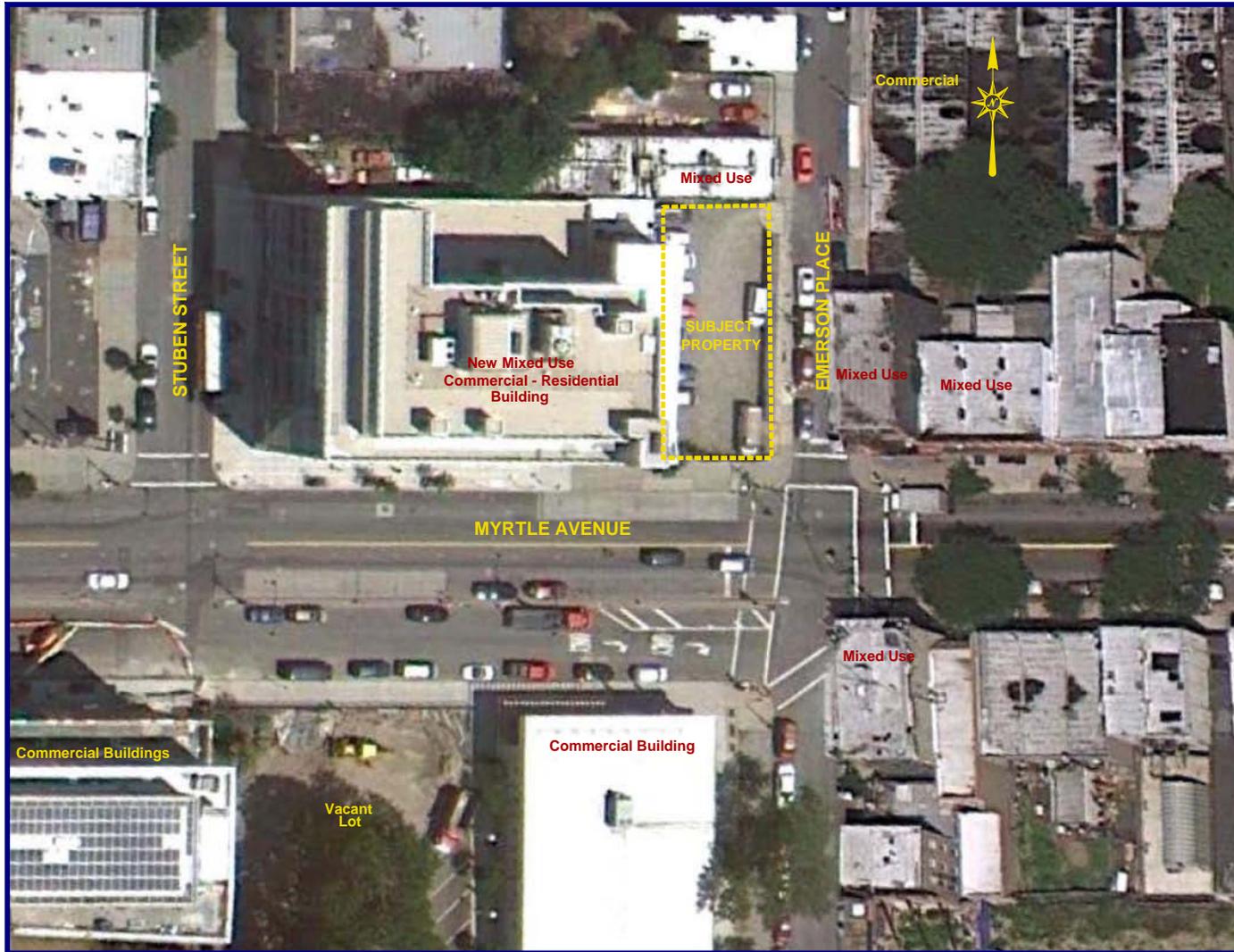


***EBC***  
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 1808 Middle Country Road, Ridge, NY 11961

Phone 631.504.6000  
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547 & 549 MYRTLE AVENUE  
 BROOKLYN, NY

**FIGURE 3** DEVELOPMENT PLAN



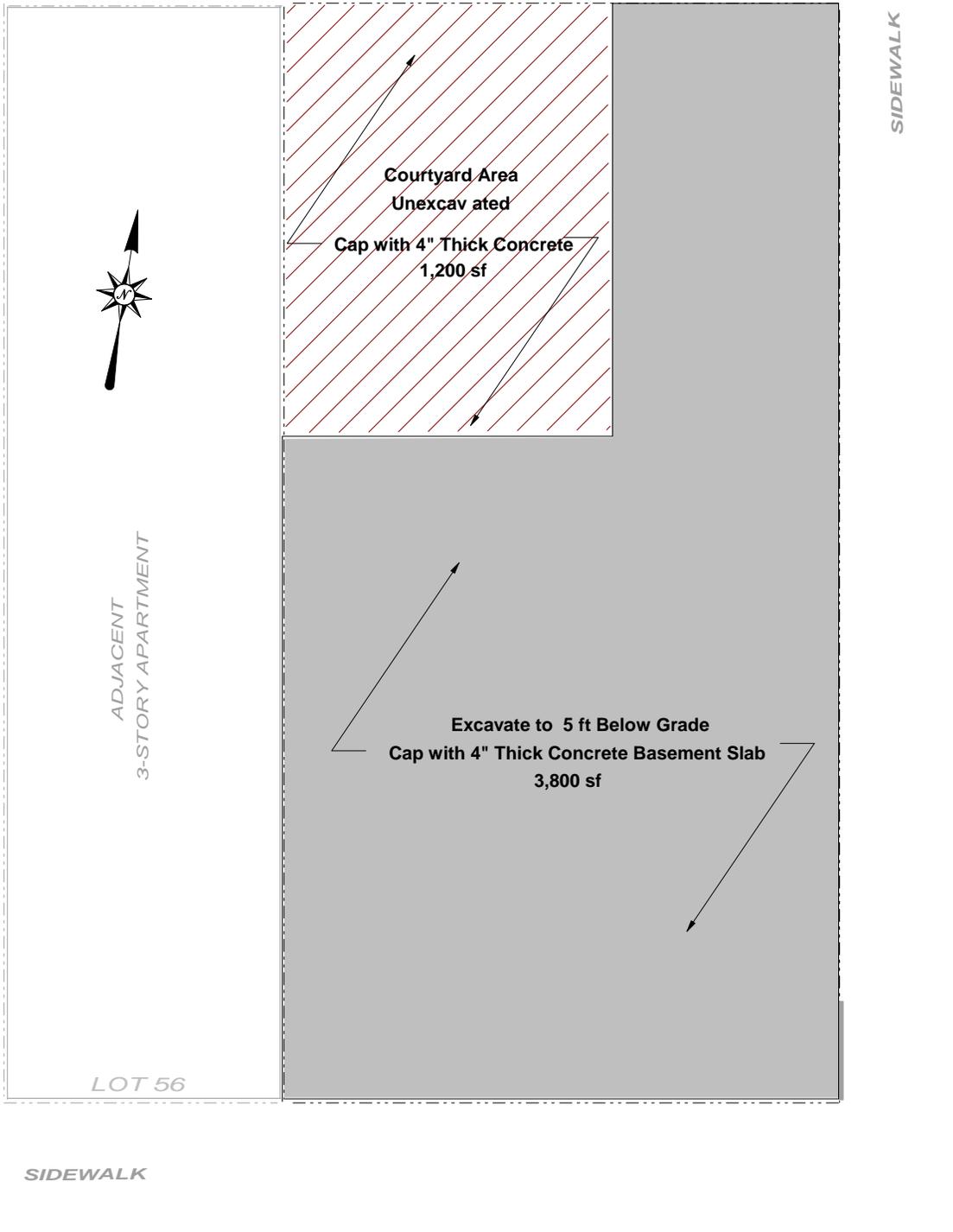
**EBC**

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 1808 MIDDLE COUNTRY ROAD, RIDGE, NY 11961

Phone 631.504.6000  
 Fax 631.924.2780

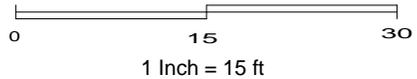
547-549 MYRTLE AVENUE, BROOKLYN, NY  
 SURROUNDING LAND USE

**FIGURE 4**



LOT 56

MYRTLE AVENUE

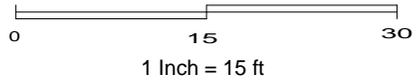
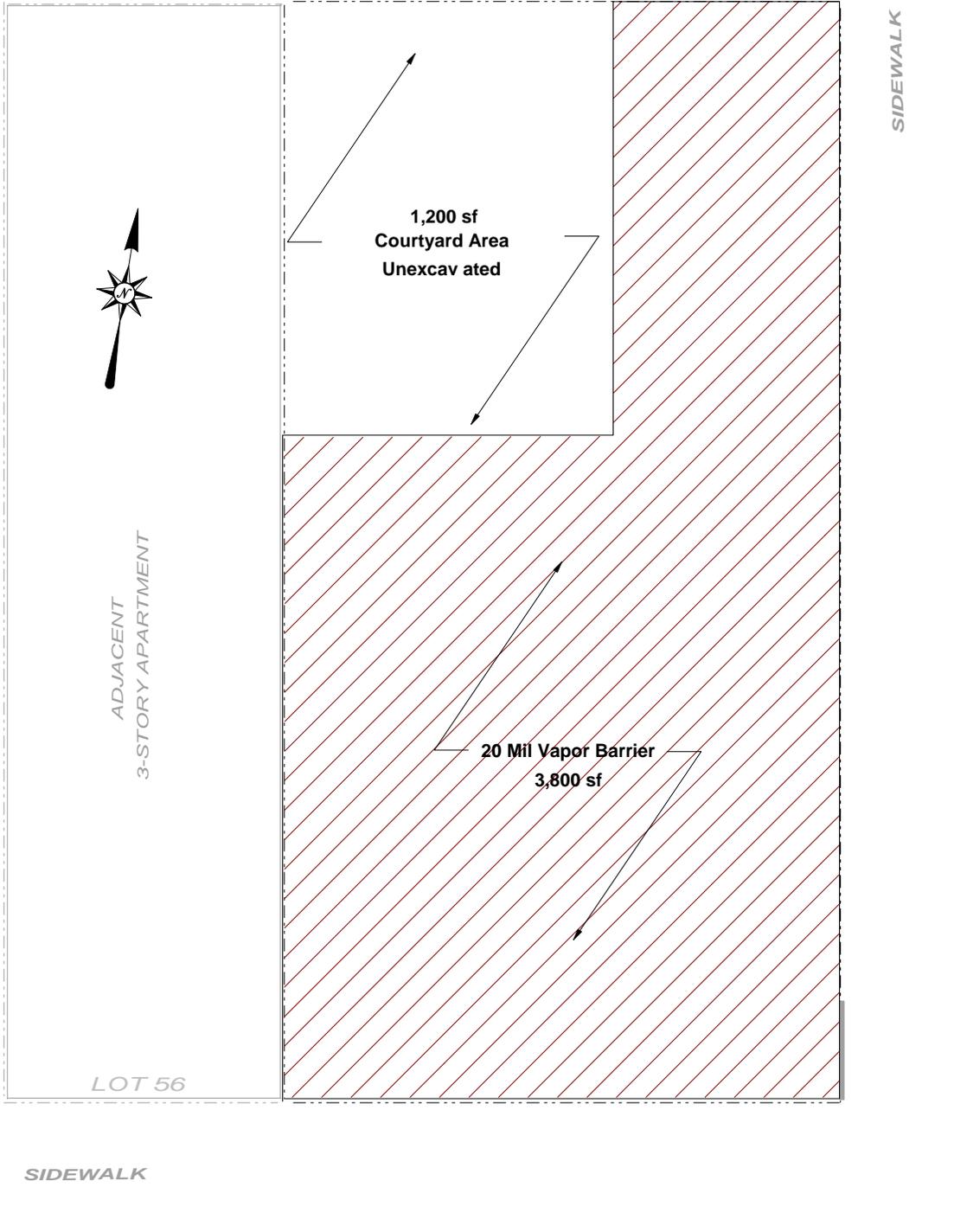


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547 & 549 MYRTLE AVENUE  
 BROOKLYN, NY

**FIGURE 5** EXCAVATION AND CAPPING PLAN

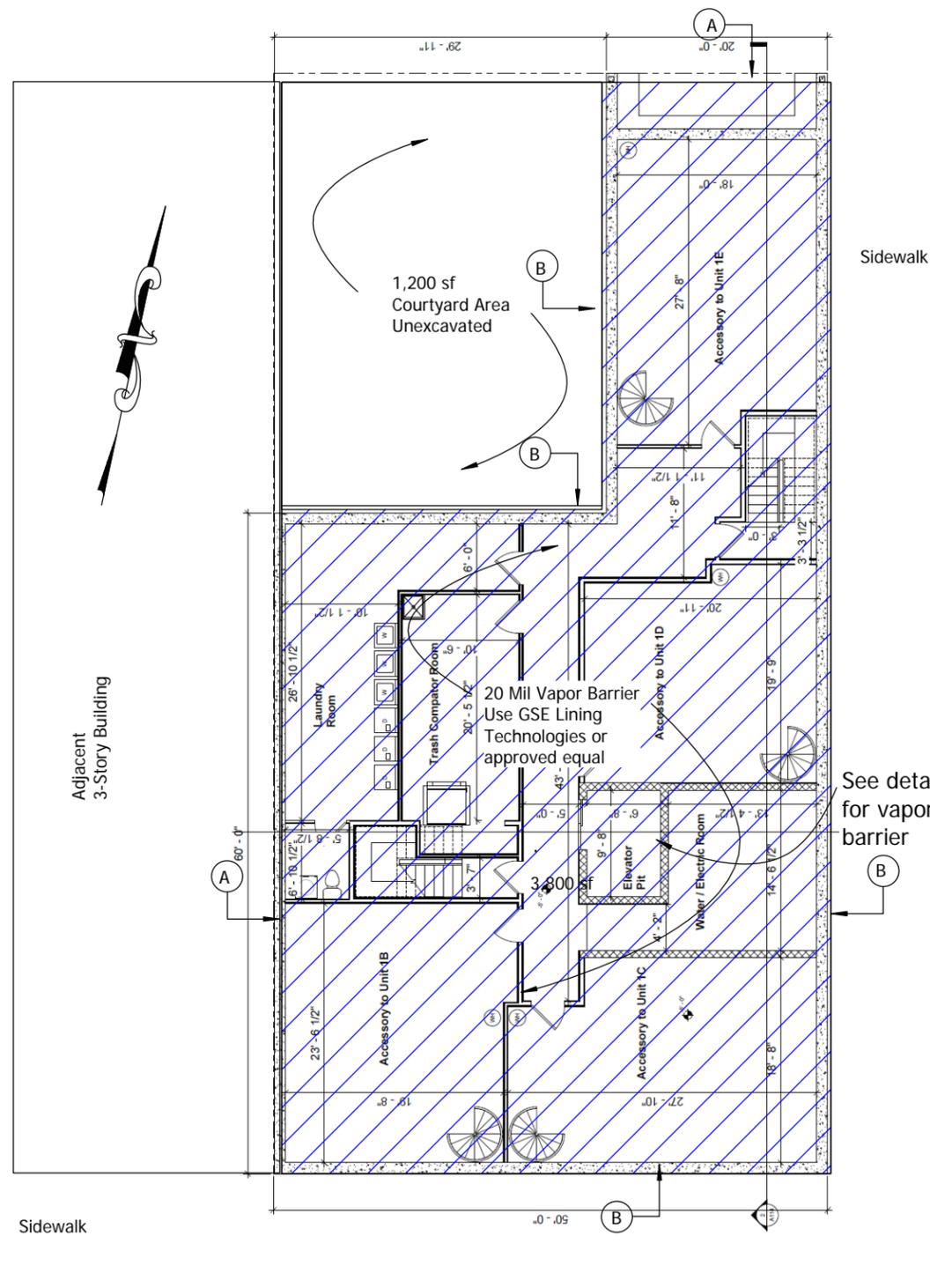


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Phone 631.504.6000  
 Fax 631.924.2780

547 & 549 MYRTLE AVENUE  
 BROOKLYN, NY

**FIGURE 6** VAPOR BARRIER PLAN

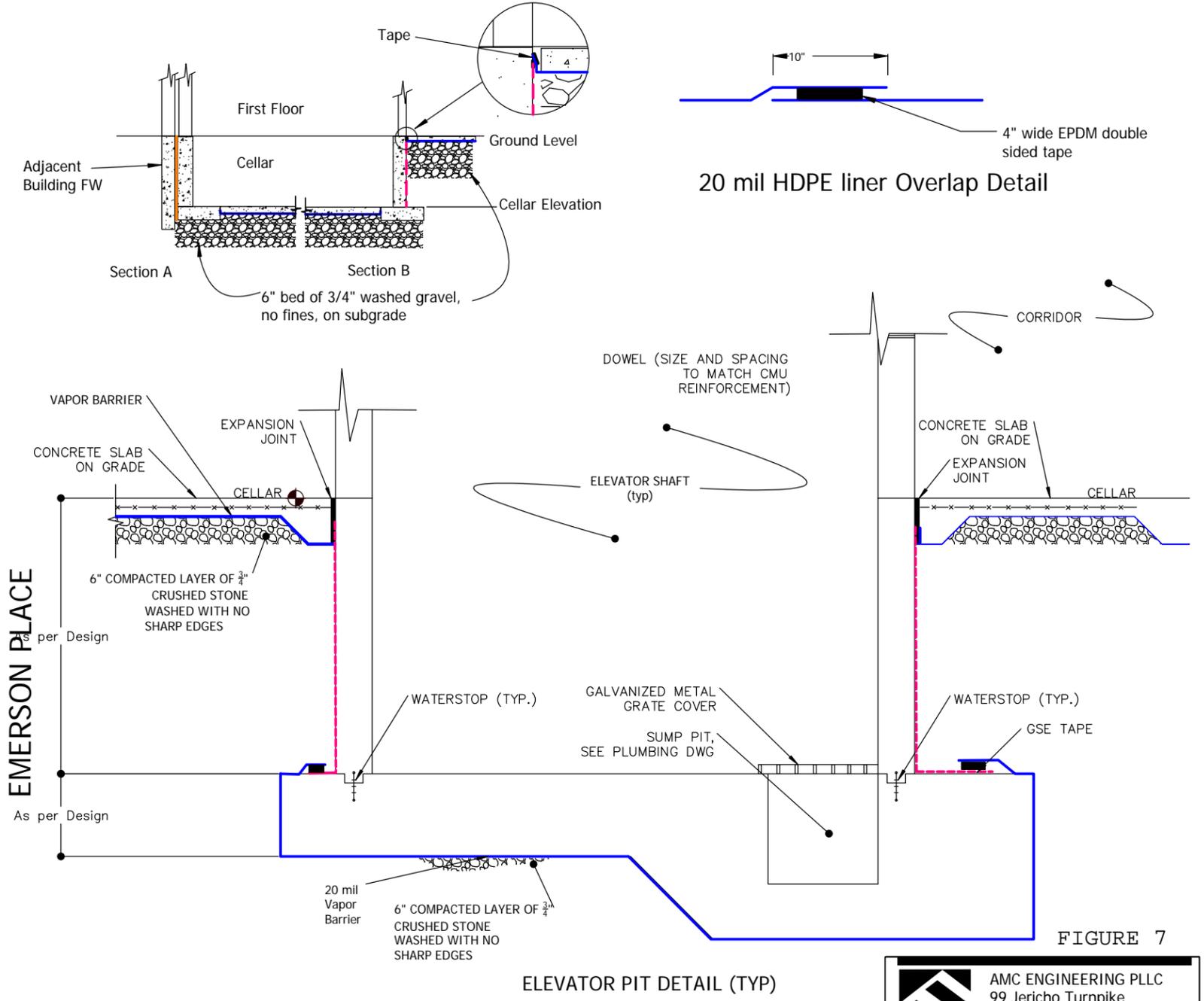


Foundation plan obtained Avishay I. Mazor, PE

**MYRTLE AVENUE**

0 15 30

- 20 MIL GSE HDPE VAPOR BARRIER OVERLAP 4" ON FOUNDATION
- WALL. SECURE WITH GSE TAPE.
- SPRAY ON/TROWEL 15 MIL MIN PROCOR 75 (GRACE) OR APPR'D EQUAL
- 15 GSE HDPE VAPOR BARRIER BLIND SIDE INSTALLATION



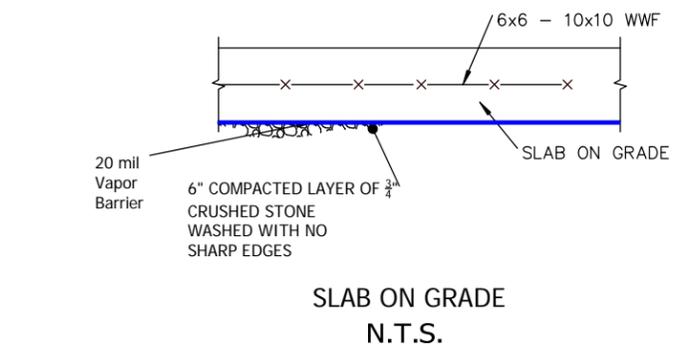
**EMERSON PLACE**

per Design

As per Design

**ELEVATOR PIT DETAIL (TYP)**

**FIGURE 7**



**AMC ENGINEERING PLLC**  
 99 Jericho Turnpike  
 Jericho, NY 11753  
 516 417-8588

PROJECT

**547-549 MYRTLE AVENUE**  
**BROOKLYN, NY**

TITLE:

**VAPOR BARRIER**

DATE: 12/21/11

PROJECT No:

DRAWING BY: AC

CHK BY:

DWG No:

**ENV-001-01**

CADO FILE No: 1 of 1

**ATTACHMENT A**  
**PROPOSED DEVELOPMENT PLANS**



































**ATTACHMENT B**  
**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.

This project intends to use recycled concrete aggregate wherever possible in grading and backfilling the site.

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.

The project will reduce the consumption of virgin materials by substituting recycled concrete aggregate for mined gravel and / or sand backfill whenever possible.

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.

Recycled concrete materials and other backfill materials will be locally sourced reducing the energy consumption associated with transporting these materials to the Site.

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.

**Paperless Brownfield Cleanup Program.** East Wing 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.** East Wing 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.

**ATTACHMENT C**  
**CITIZEN PARTICIPATION PLAN**

## CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and East Wing Construction have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Brownfield 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 BCP, East Wing 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, Brianna Gribble, who can be contacted about these issues or any other 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. East Wing will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Williamsburg Library  
240 Division Avenue  
Brooklyn, NY 11211  
718-302-3485

Sunday – Closed  
Monday – 10am – 6pm  
Tuesday – 1pm – 8pm  
Wednesday – 1pm – 6pm  
Thursday – 1pm – 6pm  
Friday – 10am – 6pm  
Saturday - Closed

**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.

The major issues of concern to the public will be potential impacts of nuisance odors and dust during the disturbance of historic fill soils at the Site. This work will be performed in accordance with procedures which will be specified under a detailed Remedial Program which considers and takes preventive measures for exposures to future residents of the property and those on adjacent properties during construction. Detailed plans to monitor the potential for exposure including a Construction Health and Safety Plan and a Community Air Monitoring Plan are required components of the remedial program. Implementation of these plans will be under the direct oversight of the New York City Department of Environmental Remediation (NYCOER).

These plans will specify the following worker and community health and safety activities during remedial activity at the Site:

- On-site air monitoring for worker protection,
- Perimeter air monitoring for community protection,

The Health and Safety Plan and the Community Air Monitoring Plan prepared as part of the Remedial Action Work Plan will be available for public review at the document repository..

**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 East Wing, reviewed and approved by OER prior to distribution and mailed by East Wing. Public comment is solicited in public notices for all work plans developed under the NYC Brownfield 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 BCP project. See flow chart on the following page, which identifies when during the NYC BCP 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.**

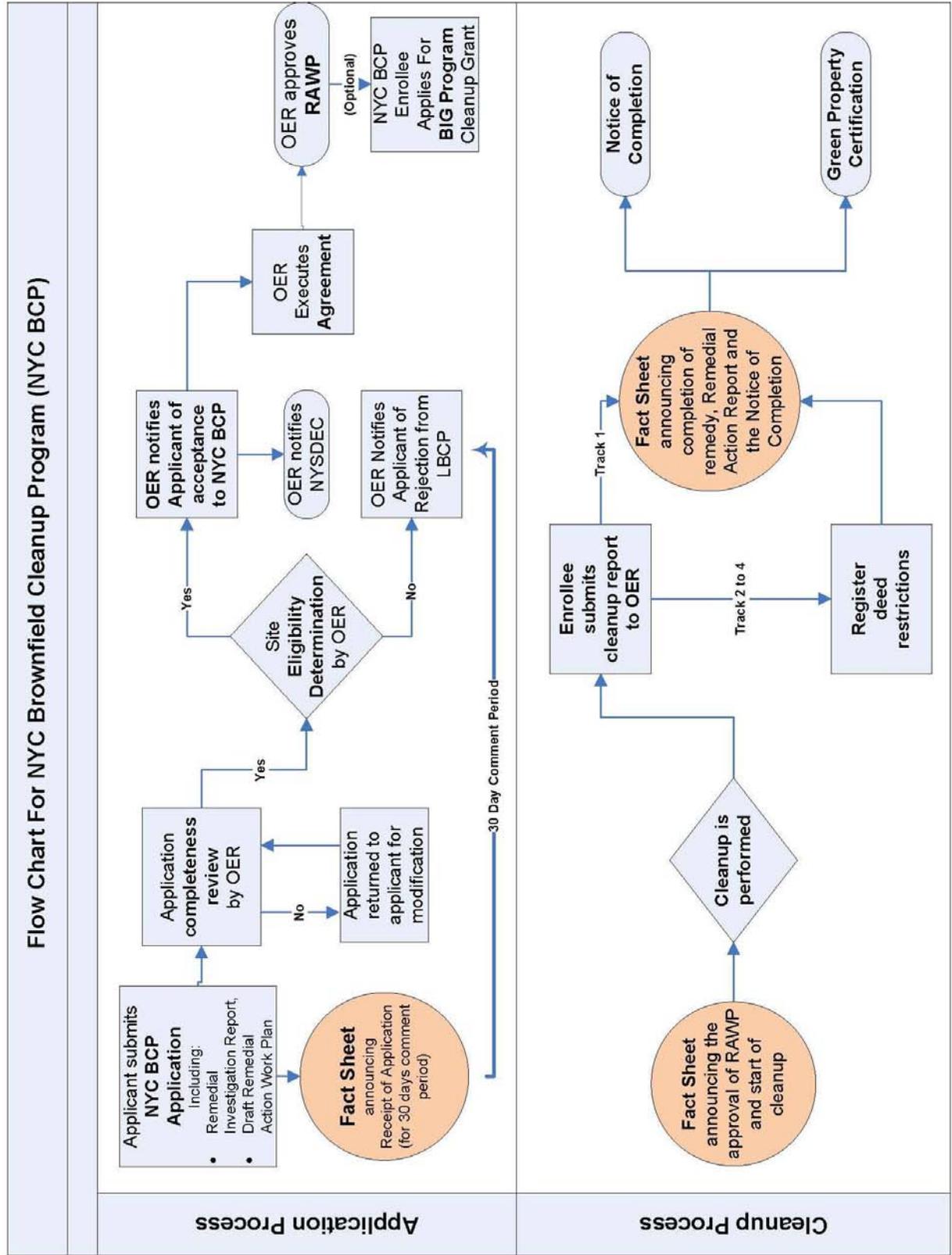
Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes 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**



**ATTACHMENT D**  
**SOIL/MATERIALS MANAGEMENT PLAN**

## **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 for trucks leaving the site is north on Myrtle Avenue to Park Avenue, east on Park Avenue to Kent Avenue, north on Kent Avenue to Williamsburg Street East. North on Williamsburg Street merging left onto the Brooklyn-Queens Expressway.

. 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.

If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), including transport to a Part 360-16 Registration Facility, a formal request will be made for approval by OER with an associated plan compliant with 6NYCRR Part 360-16. This request and plan will include the location, volume and a description of the material to be recycled, including verification that the material is not impacted by site uses and that the material complies with receipt requirements for recycling under 6NYCRR Part 360. This material will be appropriately handled on-Site to prevent mixing with impacted material.

## **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 Table 1. '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 BCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed. Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

## **1.8 DEMARCATION**

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

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

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

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. The backfill and cover soil quality objectives are listed in Table 1.

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

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

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;

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

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

#### SOURCE SCREENING AND TESTING

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

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

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

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

## **1.10 FLUIDS MANAGEMENT**

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

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

## **1.11 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.

**ATTACHMENT E**  
**CONSTRUCTION HEALTH AND SAFETY**  
**PLAN**

# RESIDENTIAL DEVELOPMENT PROJECT

547-549 MYRTLE AVENUE  
BROOKLYN, NEW YORK  
Block 1894, Lots 54 and 55

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## CONSTRUCTION HEALTH AND SAFETY PLAN

November 2011

*Prepared for:*

East Wing Construction  
316A Himrod Street  
Brooklyn, NY 11337

*Prepared By:*

**EBC**

**ENVIRONMENTAL BUSINESS CONSULTANTS**

1808 Middle Country Road  
Ridge, NY 11961

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## STATEMENT OF COMMITMENT

This Health and Safety Plan (HASP) has been prepared to ensure that workers are not exposed to risks from hazardous materials during the Remedial Activities planned for 547-549 Myrtle Avenue, Brooklyn, New York.

This HASP, which applies to persons present at the site actually or potentially exposed to hazardous materials, describes emergency response procedures for actual and potential chemical hazards. This HASP is also intended to inform and guide personnel entering the work area or exclusion zone. Persons are to acknowledge that they understand the potential hazards and the contents of this Health and Safety policy by signing off on receipt of their individual copy of the document. The General Contractor and their subcontractors and suppliers are retained as independent contractors and are responsible for ensuring the health and safety of their own employees. The General contractor has the option of adopting this HASP or providing its own for the planned scope of work under the Remedial Action Plan.



## 1.0 INTRODUCTION

This document describes the health and safety guidelines developed by Environmental Business Consultants (EBC) for implementation of a Remedial Action Plan at a residential development project located at 547-549 Myrtle Avenue in Brooklyn, NY, to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes during the excavation of historic fill materials at the site. In accordance with the Occupational Safety and Health Administration (OSHA) 29 CFR Part 1910.120 Hazardous Waste Operations and Emergency Response Final rule, this HASP, including the attachments, addresses safety and health hazards related to subsurface sample collection activities and is based on the best information available. The HASP may be revised by EBC at the request of East Wing Construction, (“the owner”) and/or the New York State Department of Environmental Conservation (NYSDEC) or New York City Office of Environmental Remediation (NYCOER) upon receipt of new information regarding site conditions. Changes will be documented by written amendments signed by EBC’s Project Manager, site safety officer and/or the EBC Health and Safety Consultant.

### 1.1 Scope

This HASP addresses the potential hazards related to the site Remedial Action Plan (RAP). The RAP activities are as described below:

- 1) Site mobilization of General Contractor (GC) and Subcontractors to install the building foundation.
  - a) Excavate top six feet of soil (historic fill across site)
  - b) Install building foundation.
  - c) Cap courtyard area with 4 inches of concrete

### 1.2 Application

The HASP applies to all personnel involved in the above tasks who wish to gain access to active work areas, including but not limited to:

- General Contractor
- EBC employees and subcontractors;
- Client representatives; and
- Federal, state or local representatives.

### 1.3 Site Safety Plan Acceptance, Acknowledgment and Amendments

The project superintendent and the site safety officer are responsible for informing personnel (EBC employees and/or owner or owners representatives) entering the work area of the contents of this plan and ensuring that each person signs the safety plan acknowledging the on-site hazards and procedures required to minimize exposure to adverse effects of these hazards. A copy of the Acknowledgement Form is included in **Appendix A**.

Site conditions may warrant an amendment to the HASP. Amendments to the HASP are acknowledged by completing forms included in **Appendix B**.

### 1.4 Key Personnel - Roles and Responsibilities

Personnel responsible for implementing this Construction Health and Safety Plan are:

Name	Title	Address	Contact Numbers
Mr. Kevin Brussee	EBC Project Manager	1808 Middle Country Road Ridge, NY 11961	(631) 504-6000 Cell (631) 338-1749
Mr. Kevin Waters	EBC Site Safety Officer	1808 Middle Country Road Ridge, NY 11961	(631) 504-6000

The project manager is responsible for overall project administration and, with guidance from the site safety officer, for supervising the implementation of this HASP. The site safety officer will conduct daily (tail gate or tool box) safety meetings at the project site and oversee daily safety issues. Each subcontractor and supplier (defined as an OSHA employer) is also responsible for the health and safety of its employees. If there is any dispute about health and safety or project activities, on-site personnel will attempt to resolve the issue. If the issue cannot be resolved at the site, then the project manager will be consulted.

The site safety officer is also responsible for coordinating health and safety activities related to hazardous material exposure on-site. The site safety officer is responsible for the following:

1. Educating personnel about information in this HASP and other safety requirements to be observed during site operations, including, but not limited to, decontamination procedures, designation of work zones and levels of protection, air monitoring, fit testing, and emergency procedures dealing with fire and first aid.
2. Coordinating site safety decisions with the project manager.
3. Designating exclusion, decontamination and support zones on a daily basis.
4. Monitoring the condition and status of known on-site hazards and maintaining and implementing the air quality monitoring program specified in this HASP.
5. Maintaining the work zone entry/exit log and site entry/exit log.
6. Maintaining records of safety problems, corrective measures and documentation of chemical exposures or physical injuries (the site safety officer will document these conditions in a bound notebook and maintain a copy of the notebook on-site).

The person who observes safety concerns and potential hazards that have not been addressed in the daily safety meetings should immediately report their observations/concerns to the site safety officer or appropriate key personnel.

## 2.0 SITE BACKGROUND AND SCOPE OF WORK

The Site is located at 547 & 549 Myrtle Avenue in the Clinton Hill section of Brooklyn, New York and is identified as Block 1894 and Lots 54 and 55 on the New York City Tax Map. **Figure 1** shows the Site location.. Each lot has 25 feet of frontage on Myrtle Avenue and is 100 feet deep for a total combined lot area of 5,000 square feet. Lot 54 is a corner lot and includes 100 feet of frontage on Emerson Avenue (**Figure 2**). Both lots are currently vacant and are utilized as parking for commercial vans for a building materials facility located across Emerson Street. The area surrounding the subject site consists of a mix of residential and commercial properties.

The elevation of the property ranges from approximately 39 to 43 feet above the National Geodetic Vertical Datum (NGVD) feet. The topography of the property approximates street level for the first 65 feet and then rises steeply (4 ft increase in elevation) toward the rear of the lot.

The depth to groundwater beneath the site, as determined from field measurements, is approximately 38-40 feet below grade. Based on regional groundwater contour maps, groundwater flow is expected to be northwest toward Navy Basin.

Historical information (DOB records, Sanborn Maps and City Directory listings) reviewed for the subject site identified the subject lots as being developed prior to 1887 with a three story residential building with first floor stores. Historic use of the first floor stores included laundry supplies, groceries/provisions, a trucking company out of a portion of the Lot 54 property on Emerson Place, a club and a church. The three story building located on Lot 54 was demolished in 2007 and the three story building located on Lot 55 has been vacant since approximately 1965.

### 2.1 Redevelopment Plans

The proposed project consists of the construction of a new 6-story residential building. The project will include a five foot deep first floor/cellar level which will extend to the property boundaries. The cellar level will be used for utility rooms, laundry room, storage, and auxiliary space to 4 apartments on the first floor. Floors 1-6 will be residential apartments. The footprint of the proposed building covers 3,800 sf of the 5,000 sf total lot leaving a 1,200 sf courtyard in the northwest corner of the property. The courtyard will be paved with no landscaping or green areas. Approximately 844 cubic yards (1,250 tons) of soil will be excavated for the basement level.

### 2.2 Description of Remedial Action Plan

Site activities included within the Remedial Action Plan that are included within the scope of this HASP include the following:

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and implementation of a Citizen Participation Plan.
2. Perform a Community Air Monitoring Program for particulates and volatile organic carbon compounds.

3. Establish Track 1 Soil Cleanup Objectives (SCOs). Excavation and removal of soil/fill exceeding SCOs.
4. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
5. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
6. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media onsite.
7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
8. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
9. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
10. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
11. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP.
12. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency (unless Track 1 is achieved).
13. Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including prohibition of the following: (1) use of groundwater without treatment rendering it safe for the intended use; (2) disturbance of residual contaminated material (if Track 1 is not achieved) unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval (unless Track 1 is achieved).

### **3.0 HAZARD ASSESSMENT**

This section identifies the hazards associated with the proposed scope of work, general physical hazards that can be expected at most sites; and presents a summary of documented or potential chemical hazards at the site. Every effort must be made to reduce or eliminate these hazards. Those that cannot be eliminated must be guarded against using engineering controls and/or personal protective equipment.

#### **3.1 Physical Hazards**

##### *3.1.1 Tripping Hazards*

An area of risk associated with on-site activities are presented by uneven ground, concrete, curbstones or equipment which may be present at the site thereby creating a potential tripping hazard. During intrusive work, care should be taken to mark or remove any obstacles within the exclusion zone.

##### *3.1.2 Climbing Hazards*

During site activities, workers may have to work on excavating equipment by climbing. The excavating contractor will conform with any applicable NIOSH and OSHA requirements or climbing activities.

##### *3.1.3 Cuts and Lacerations*

Field activities that involve excavating activities usually involve contact with various types of machinery. A first aid kit approved by the American Red Cross will be available during all intrusive activities.

##### *3.1.4 Lifting Hazards*

Improper lifting by workers is one of the leading causes of industrial injuries. Field workers in the excavation program may be required to lift heavy objects. Therefore, all members of the field crew should be trained in the proper methods of lifting heavy objects. All workers should be cautioned against lifting objects too heavy for one person.

##### *3.1.5 Utility Hazards*

Before conducting any excavation, the excavation contractor will be responsible for locating and verifying all existing utilities at each excavation.

##### *3.1.6 Traffic Hazards*

All traffic, vehicular and pedestrian, shall be maintained and protected at all times consistent with local, state and federal agency regulations regarding such traffic and in accordance with NYCDOT guidelines. The excavation contractor shall carry on his operations without undue interference or delays to traffic. The excavation contractor shall furnish all labor, materials, guards, barricades, signs, lights, and anything else necessary to maintain traffic and to protect his work and the public, during operations.

#### **3.2 Work in Extreme Temperatures**

Work under extremely hot or cold weather conditions requires special protocols to minimize the chance that employees will be affected by heat or cold stress.

### 3.2.1 Heat Stress

The combination of high ambient temperature, high humidity, physical exertion, and personal protective apparel, which limits the dissipation of body heat and moisture, can cause heat stress.

The following prevention, recognition and treatment strategies will be implemented to protect personnel from heat stress. Personnel will be trained to recognize the symptoms of heat stress and to apply the appropriate treatment.

#### 1. Prevention

- a. Provide plenty of fluids. Available in the support zone will be a 50% solution of fruit punch and water or plain water.
- b. Work in Pairs. Individuals should avoid undertaking any activity alone.
- c. Provide cooling devices. A spray hose and a source of water will be provided to reduce body temperature, cool protective clothing and/or act as a quick-drench shower in case of an exposure incident.
- d. Adjustment of the work schedule. As is practical, the most labor-intensive tasks should be carried out during the coolest part of the day.

#### 2. Recognition and Treatment

##### a. Heat Rash (or prickly heat):

Cause: Continuous exposure to hot and humid air, aggravated by chafing clothing.

Symptoms: Eruption of red pimples around sweat ducts accompanied by intense itching and tingling.

Treatment: Remove source or irritation and cool skin with water or wet cloths.

##### b. Heat Cramps (or heat prostration)

Cause: Profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.

Symptoms: Muscular weakness, staggering gait, nausea, dizziness, shallow breathing, pale and clammy skin, approximately normal body temperature.

Treatment: Perform the following while making arrangement for transport to a medical facility. Remove the worker to a contamination reduction zone. Remove protective clothing. Lie worker down on back in a cool place and raise feet 6 to 12 inches. Keep warm, but loosen all clothing. If conscious, provide sips of salt-water solution, using one teaspoon of salt in 12 ounces of water. Transport to a medical facility.

##### c. Heat Stroke

Cause: Same as heat exhaustion. This is also an extremely serious condition.

Symptoms: Dry hot skin, dry mouth, dizziness, nausea, headache, rapid pulse.

Treatment: Cool worker immediately by immersing or spraying with cool water or sponge bare skin after removing protective clothing. Transport to hospital.

### 3.2.2 Cold Exposure

Exposure to cold weather, wet conditions and extreme wind-chill factors may result in excessive loss of body heat (hypothermia) and /or frostbite. To guard against cold exposure and to prevent cold injuries, appropriate warm clothing should be worn, warm shelter must be readily available, rest periods should be adjusted as needed, and the physical conditions of on-site field personnel should be closely monitored. Personnel and supervisors working on-site will be made aware of the signs and symptoms of frost bite and hypothermia such as shivering, reduced blood pressure, reduced coordination, drowsiness, impaired judgment, fatigue, pupils dilated but reactive to light and numbing of the toes and fingers.

### 3.3 Chemical Hazards

Soil collected from the site as part of several subsurface investigations performed at the site have revealed significant concentrations of volatile organic compounds associated with gasoline. Volatile organic compounds related to gasoline may be encountered in soil during or following the removal of the USTs. Elevated levels of metals may be present in historic fill at the site.

Semi-Volatile organic compounds reported to be present at elevated concentrations in historic fill materials at the Site include the following:

Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(a)pyrene	Phenanthrene
Benzo(k)fluoranthene	Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Chrysene

Metals reported to be present at elevated concentrations in historic fill materials at the Site include the following:

Barium	Lead	Silver	Mercury	Zinc
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Pesticides reported to be present at elevated concentrations in historic fill materials at the Site include the following:

4,4-DDT	Alpha Chlordane
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Metals, pesticides and SVOCs are present in the historic fill materials at the site which extend from surface to approximately 3 to 8 feet below surface grade depending on location at the site.

The primary routes of exposure to identified contaminants in soil to on-site construction workers are through inhalation, ingestion and absorption.

**Appendix C** includes information sheets for all detected chemicals that may be encountered at the site.

#### 3.3.1 Respirable Dust

Dust may be generated from vehicular traffic and/or excavation activities. If visible observation detects elevated levels of dust, a program of wetting will be employed by the site safety officer. If elevated dust levels persist, the site safety office will employ dust monitoring using a particulate monitor (Miniram or equivalent). If monitoring detects concentrations greater than 150 µg/m<sup>3</sup> over daily background, the site safety officer will take corrective actions as defined herein, including the use of water for dust suppression and if this is not effective, requiring workers to wear APRs with efficiency particulate air (HEPA) cartridges.

Absorption pathways for dust and direct contact with soils or groundwater will be mitigated with the implementation of latex gloves, hand washing and decontamination exercises when necessary.

### 3.3.2 *Dust Control and Monitoring During Earthwork*

Dust generated during excavation activities or other earthwork may contain contaminants identified in soils at the site. Dust will be controlled by wetting the working surface with water. Calcium chloride may be used if the problem cannot be controlled with water. Air monitoring and dust control techniques are specified in a site specific Dust Control Plan (if applicable). Site workers will not be required to wear APR's unless dust concentrations are consistently over 150 µg/m<sup>3</sup> over site-specific background in the breathing zone as measured by a dust monitor unless the site safety officer directs workers to wear APRs. The site safety officer will use visible dust as an indicator to implement the dust control plan.

### 3.3.3 *Organic Vapors*

Elevated levels of VOCs were not reported in soil, groundwater or soil gas samples collected during previous investigations at the site. However, it is possible that organic vapors will be encountered during excavation activities. The site safety officer will periodically monitor organic vapors with a Photoionization Detector (PID) during excavation activities to determine whether organic vapor concentrations exceed action levels shown in Section 5 and/or the Community Air Monitoring Plan.

## 4.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) shall be selected in accordance with the site air monitoring program, OSHA 29 CFR 1910.120(c), (g), and 1910.132. Protective equipment shall be NIOSH approved and respiratory protection shall conform to OSHA 29 CFR Part 1910.133 and 1910.134 specifications; head protection shall conform to 1910.135; eye and face protection shall conform to 1910.133; and foot protection shall conform to 1910.136. The only true difference among the levels of protection from D thru B is the addition of the type of respiratory protection. **It is anticipated that work will be performed in Level D PPE.**

### 4.1 Level D

Level D PPE shall be donned when the atmosphere contains no known hazards and work functions preclude splashes, immersion, or the potential for inhalation of, or contact with, hazardous concentrations of harmful chemicals. Level D PPE consists of:

- standard work clothes, coveralls, or tyvek, as needed;
- steel toe and steel shank work boots;
- hard hat;
- gloves, as needed;
- safety glasses;
- hearing protection;
- equipment replacements are available as needed.

### 4.2 Level C

Level C PPE shall be donned when sustained concentrations of measured total organic vapors in the breathing zone exceed background concentrations (using a portable OVA, or equivalent), by more than 5 ppm. The specifications on the APR filters used must be appropriate for contaminants identified or expected to be encountered. Level C PPE shall be donned when the identified contaminants have adequate warning properties and criteria for using APR have been met. Level C PPE consists of:

- chemical resistant or coated tyvek coveralls;
- steel-toe and steel-shank workboots;
- chemical resistant overboots or disposable boot covers;
- disposable inner gloves (surgical gloves);
- disposable outer gloves;
- full face APR fitted with organic vapor/dust and mist filters or filters appropriate for the identified or expected contaminants;
- hard hat;
- splash shield, as needed; and,
- ankles/wrists taped with duct tape.

The site safety officer will verify if Level C is appropriate by checking organic vapor concentrations using compound and/or class-specific detector tubes.

The exact PPE ensemble is decided on a site-by-site basis by the Site Safety Officer with the intent to provide the most protective and efficient worker PPE.

### 4.3 Activity-Specific Levels of Personal Protection

The required level of PPE is activity-specific and is based on air monitoring results (Section 4.0) and properties of identified or expected contaminants. **It is expected that site work will be performed in Level D.** If air monitoring results indicate the necessity to upgrade the level of protection, engineering controls (i.e. Facing equipment away from the wind and placing site personnel upwind of excavations, active venting, etc.) will be implemented before requiring the use of respiratory protection.

## 5.0 AIR MONITORING AND ACTION LEVELS

29 CFR 1910.120(h) specifies that monitoring shall be performed where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed permissible exposure limits, or published exposure levels if there are no permissible exposure limits, for hazardous substances.

### 5.1 Air Monitoring Requirements

If excavation work is performed, air will be monitored for VOCs with a portable ION Science 3000EX photoionization detector, or the equivalent. If necessary, Lower Explosive Limit (LEL) and oxygen will be monitored with a Combustible Gas Indicator (CGI). If appropriate, fugitive dust will be monitored using a MiniRam Model PDM-3 aerosol monitor. Air will be monitored when any of the following conditions apply:

- initial site entry;
- during any work where a potential IDLH condition or flammable atmosphere could develop;
- excavation work begins on another portion of the site;
- contaminants, other than those previously identified, have been discovered;
- each time a different task or activity is initiated;
- during trenching and/or excavation work.

The designated site safety officer will record air monitoring data and ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. Instruments will be zeroed daily and checked for accuracy. Monitoring results will be recorded in a field notebook and will be transferred to instrument reading logs.

### 5.2 Work Stoppage Responses

The following responses will be initiated whenever one or more of the action levels necessitating a work stoppage are exceeded:

- 1 The SSO will be consulted immediately
- 2 All personnel (except as necessary for continued monitoring and contaminant migration, if applicable) will be cleared from the work area (eg from the exclusion zone).
- 3 Monitoring will be continued until intrusive work resumes.

### 5.3 Action Levels During Excavation Activities

Instrument readings will be taken in the breathing zone above the excavation pit unless otherwise noted. Each action level is independent of all other action levels in determining responses.

Organic Vapors (PID)	LEL %	Responses
0-1 ppm above background	0%	<ul style="list-style-type: none"> <li>• Continue excavating</li> <li>• Level D protection</li> <li>• Continue monitoring every 10 minutes</li> </ul>
1-5 ppm Above Background, Sustained Reading	1-10%	<ul style="list-style-type: none"> <li>• Continue excavating</li> <li>• Go to Level C protection or employ</li> </ul>

		<p>engineering controls</p> <ul style="list-style-type: none"> <li>• Continue monitoring every 10 minutes</li> </ul>
5-25 ppm Above Background, Sustained Reading	10-20%	<ul style="list-style-type: none"> <li>• Discontinue excavating, unless PID is only action level exceeded.</li> <li>• Level C protection or employ engineering controls</li> <li>• Continue monitoring for organic vapors 200 ft downwind</li> <li>• Continuous monitoring for LEL at excavation pit</li> </ul>
>25 ppm Above Background, Sustained Reading	>20%	<ul style="list-style-type: none"> <li>• Discontinue excavating</li> <li>• Withdraw from area, shut off all engine ignition sources.</li> <li>• Allow pit to vent</li> <li>• Continuous monitoring for organic vapors 200 ft downwind.</li> </ul>

Notes: Air monitoring will occur in the breathing zone 30 inches above the excavation pit. Readings may also be taken in the excavation pit but will not be used for action levels.

If action levels for any one of the monitoring parameters are exceeded, the appropriate responses listed in the right hand column should be taken. If instrument readings do not return to acceptable levels after the excavation pit has been vented for a period of greater than one-half hour, a decision will then be made whether or not to seal the pit with suppressant foam.

If, during excavation activities, downwind monitoring PID readings are greater than 5 ppm above background for more than one-half hour, excavation will stop until sustained levels are less than 5 ppm (see Community Air Monitoring Plan).

## 6.0 SITE CONTROL

### 6.1 Work Zones

The primary purpose of site controls is to establish the perimeter of a hazardous area, to reduce the migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by unauthorized persons. When operations are to take place involving hazardous materials, the site safety officer will establish an exclusion zone, a decontamination zone, and a support zone. These zones "float" (move around the site) depending on the tasks being performed on any given day. The site safety officer will outline these locations before work begins and when zones change. The site safety officer records this information in the site log book.

**Due to the dimensions of the Site and the work area, it is expected that an exclusion zone will include the entire fenced area with the exception of the construction entrance area, which will serve as the decontamination zone. A support zone if needed will be located outside of the fenced area.** All onsite workers during excavation of historic fill materials must provide evidence of OSHA 24 or 40-hour Hazardous Waste Operations and Emergency Response Operations training to conduct work within the exclusion zone established by the site safety officer. The exclusion zone is defined by the site safety officer but will typically be a 50-foot area around work activities. Gross decontamination (as determined by the site Health and Safety Officer) is conducted in the exclusion zone; all other decontamination is performed in the decontamination zone or trailer, if provided.

Protective equipment is removed in the decontamination zone. Disposable protective equipment is stored in receptacles staged in the decontamination zone, and non-disposable equipment is decontaminated. All personnel and equipment exit the exclusion zone through the decontamination zone. If a decontamination trailer is provided the first aid equipment, an eye wash unit, and drinking water are kept in the decontamination trailer.

The support zone is used for vehicle parking, daily safety meetings, and supply storage. Eating, drinking, and smoking are permitted only in the support zone. When a decontamination trailer is not provided, the eye wash unit, first aid equipment, and drinking water are kept at a central location designated by the site safety officer.

## 7.0 CONTINGENCY PLAN/EMERGENCY RESPONSE PLAN

Site personnel must be prepared in the event of an emergency. Emergencies can take many forms: illnesses, injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather.

Emergency telephone numbers and a map to the hospital will be posted in the command post. Site personnel should be familiar with the emergency procedures, and the locations of site safety, first aid, and communication equipment.

### 7.1 Emergency Equipment On-site

Private telephones:	Site personnel.
Two-way radios:	Site personnel where necessary.
Emergency Alarms:	On-site vehicle horns*.
First aid kits:	On-site, in vehicles or office.
Fire extinguisher:	On-site, in office or on equipment.

\* Horns: Air horns will be supplied to personnel at the discretion of the project superintendent or site safety officer.

### 7.2 Emergency Telephone Numbers

General Emergencies	911
Suffolk County Police	911
NYC Fire Department	911
Jamaica Hospital Medical Center	(718) 206-6000
NYSDEC Spills Hotline	1-800-457-7362
NYSDEC Project Manager	(718) 482-4010
NYC Department of Health	(212) 676-2400
National Response Center	1-800-424-8802
Poison Control	1-800-222-1222
Project Manager	1-631-504-6000
Site Safety Officer	1-631-504-6000

### 7.3 Personnel Responsibilities During an Emergency

The project manager is primarily responsible for responding to and correcting any emergency situations. However, in the absence of the project manager, the site safety officer shall act as the project manager's on-site designee and perform the following tasks:

- Take appropriate measures to protect personnel including: withdrawal from the exclusion zone, evacuate and secure the site, or upgrade/downgrade the level of protective clothing and respiratory protection;
- Ensure that appropriate federal, state, and local agencies are informed and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. If toxic materials are released to the air, the local authorities should be informed in order to assess the need for evacuation;
- Ensure appropriate decontamination, treatment, or testing for exposed or injured



evacuated safely. The head count will be correlated to the site and/or exclusion zone entry/exit log.

- If emergency site evacuation is necessary, all personnel are to escape the emergency situation and decontaminate to the maximum extent practical.

### **7.7 Spill Control Procedures**

Spills associated with site activities may be attributed to project equipment and include gasoline, diesel and hydraulic oil. In the event of a leak or a release, site personnel will inform their supervisor immediately, locate the source of spillage and stop the flow if it can be done safely. A spill containment kit including absorbent pads, booms and/or granulated speedy dry absorbent material will be available to site personnel to facilitate the immediate recovery of the spilled material. Daily inspections of site equipment components including hydraulic lines, fuel tanks, etc. will be performed by their respective operators as a preventative measure for equipment leaks and to ensure equipment soundness. In the event of a spill, site personnel will immediately notify the NYSDEC (1-800-457-7362), and a spill number will be generated.

### **7.8 Vapor Release Plan**

If work zone organic vapor (excluding methane) exceeds 5 ppm, then a downwind reading will be made either 200 feet from the work zone or at the property line, whichever is closer. If readings at this location exceed 5 ppm over background, the work will be stopped.

If 5 ppm of VOCs are recorded over background on a PID at the property line, then an off-site reading will be taken within 20 feet of the nearest residential or commercial property, whichever is closer. If efforts to mitigate the emission source are unsuccessful for 30 minutes, then the designated site safety officer will:

- contact the local police;
- continue to monitor air every 30 minutes, 20 feet from the closest off-site property. If two successive readings are below 5 ppm (non-methane), off-site air monitoring will be halted.
- All property line and off site air monitoring locations and results associated with vapor releases will be recorded in the site safety log book.

***APPENDIX A***  
***SITE SAFETY ACKNOWLEDGEMENT FORM***

## DAILY BREIFING SIGN-IN SHEET

Date: \_\_\_\_\_ Person Conducting Briefing: \_\_\_\_\_

Project Name and Location: \_\_\_\_\_

1. AWARENESS (topics discussed, special safety concerns, recent incidents, etc...):

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2. OTHER ISSUES (HASP changes, attendee comments, etc...):

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3. ATTENDEES (Print Name):

1.	11.
2.	12.
3.	13.
4.	14.
5.	15.
6.	16.
7.	17.
8.	18.
9.	19.
10.	20.

***APPENDIX B***  
***SITE SAFETY PLAN AMENDMENTS***

**SITE SAFETY PLAN AMENDMENT FORM**

**Site Safety Plan Amendment #:** \_\_\_\_\_

**Site Name:** \_\_\_\_\_

**Reason for Amendment:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Alternative Procedures:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Required Changes in PPE:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
**Project Superintendent (signature)**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Health and Safety Consultant (signature)**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Site Safety Officer (signature)**

\_\_\_\_\_  
**Date**

***APPENDIX C***  
***CHEMICAL HAZARDS***

**CHEMICAL HAZARDS**

The attached International Chemical Safety Cards are provided for contaminants of concern that have been identified in soils and/or groundwater at the site.

# International Chemical Safety Cards

**BENZO(b)FLUORANTHENE**

ICSC: 0720



Benz(e)acephenanthrylene  
 2,3-Benzofluoranthene  
 Benzo(e)fluoranthene  
 3,4-Benzofluoranthene  
 $C_{20}H_{12}$   
 Molecular mass: 252.3

ICSC # 0720  
 CAS # 205-99-2  
 RTECS # [CU1400000](#)  
 EC # 601-034-00-4  
 March 25, 1999 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>			In case of fire in the surroundings: use appropriate extinguishing media.
<b>EXPLOSION</b>			
<b>EXPOSURE</b>		AVOID ALL CONTACT!	
• <b>INHALATION</b>		Local exhaust or breathing protection.	Fresh air, rest.
• <b>SKIN</b>		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• <b>EYES</b>		Safety spectacles 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.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0720**

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

**BENZO(b)FLUORANTHENE**

ICSC: 0720

<b>I</b>	<b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS CRYSTALS	<b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation
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M  
P  
O  
R  
T  
A  
N  
T  
D  
A  
T  
A

**PHYSICAL DANGERS:**

**CHEMICAL DANGERS:**

Upon heating, toxic fumes are formed.

**OCCUPATIONAL EXPOSURE LIMITS:**

TLV: A2 (suspected human carcinogen); (ACGIH 2004).

MAK:

Carcinogen category: 2;

(DFG 2004).

of its aerosol and through the skin.

**INHALATION RISK:**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

**EFFECTS OF SHORT-TERM EXPOSURE:**

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**

This substance is possibly carcinogenic to humans. May cause genetic damage in humans.

**PHYSICAL PROPERTIES**

Boiling point: 481°C  
Melting point: 168°C  
Solubility in water:  
none

Octanol/water partition coefficient as log Pow: 6.12

**ENVIRONMENTAL DATA**

This substance may be hazardous to the environment; special attention should be given to air quality and water quality.



**NOTES**

Benzo(b)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. ACGIH recommends environment containing benzo(b)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m<sup>3</sup>. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

**ADDITIONAL INFORMATION**

**ICSC: 0720**

**BENZO(b)FLUORANTHENE**

(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.

# International Chemical Safety Cards

**BENZO(a)PYRENE**

ICSC: 0104



Benz(a)pyrene  
3,4-Benzopyrene  
Benzo(d,e,f)chrysene  
 $C_{20}H_{12}$   
Molecular mass: 252.3

ICSC # 0104  
CAS # 50-32-8  
RTECS # [DJ3675000](#)  
EC # 601-032-00-3  
October 17, 2005 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Combustible.	NO open flames.	Water spray, foam, powder, carbon dioxide.
<b>EXPLOSION</b>			
<b>EXPOSURE</b>	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
• <b>INHALATION</b>		Local exhaust or breathing protection.	Fresh air, rest.
• <b>SKIN</b>	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• <b>EYES</b>		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.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants.	T symbol N symbol R: 45-46-60-61-43-50/53 S: 53-45-60-61

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0104**

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

# BENZO(a)PYRENE

ICSC: 0104

<b>I M P O R T A N T A D V I S I O N</b>	<p><b>PHYSICAL STATE; APPEARANCE:</b> PALE-YELLOW CRYSTALS</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: Exposure by all routes should be carefully controlled to levels as low as possible A2 (suspected human carcinogen); (ACGIH 2005). MAK: Carcinogen category: 2; Germ cell mutagen group: 2; (DFG 2005).</p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.</p> <p><b>INHALATION RISK:</b> Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b></p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. Animal tests show that this substance possibly causes toxicity to human reproduction or development.</p>
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<b>PHYSICAL PROPERTIES</b>	Boiling point: 496°C Melting point: 178.1°C Density: 1.4 g/cm <sup>3</sup>	Solubility in water: none (<0.1 g/100 ml) Vapour pressure : negligible Octanol/water partition coefficient as log Pow: 6.04
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<b>ENVIRONMENTAL DATA</b>	The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish, in plants and in molluscs. The substance may cause long-term effects in the aquatic environment.	
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## NOTES

Do NOT take working clothes home. Benzo(a)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAHs) in the environment, usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

## ADDITIONAL INFORMATION

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ICSC: 0104

BENZO(a)PYRENE

(C) IPCS, CEC, 1994

<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.
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# International Chemical Safety Cards

## BENZ(a)ANTHRACENE

ICSC: 0385



1,2-Benzoanthracene  
Benzo(a)anthracene  
2,3-Benzphenanthrene  
Naphthanthracene  
 $C_{18}H_{12}$   
Molecular mass: 228.3

ICSC # 0385  
CAS # 56-55-3  
RTECS # [CV9275000](#)  
EC # 601-033-00-9  
October 23, 1995 Validated



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Combustible.		Water spray, powder. 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>		<b>AVOID ALL CONTACT!</b>	
• <b>INHALATION</b>		Local exhaust or breathing protection.	Fresh air, rest.
• <b>SKIN</b>		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• <b>EYES</b>		Safety goggles 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.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: complete protective clothing including self-contained breathing apparatus.	Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

**SEE IMPORTANT INFORMATION ON BACK**

ICSC: 0385

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

ICSC: 0385

# BENZ(a)ANTHRACENE

<p>I M P O R T A N T D A T A</p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS TO YELLOW BROWN FLUORESCENT FLAKES OR POWDER.</p> <p><b>PHYSICAL DANGERS:</b> Dust explosion possible if in powder or granular form, mixed with air.</p> <p><b>CHEMICAL DANGERS:</b></p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: A2 (suspected human carcinogen); (ACGIH 2004). MAK: Carcinogen category: 2 (as pyrolysis product of organic materials) (DFG 2005).</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> 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></p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> This substance is probably carcinogenic to humans.</p>
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<p><b>PHYSICAL PROPERTIES</b></p>	<p>Sublimation point: 435°C Melting point: 162°C Relative density (water = 1): 1.274 Solubility in water: none</p>	<p>Vapour pressure, Pa at 20°C: 292 Octanol/water partition coefficient as log Pow: 5.61</p>
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<p><b>ENVIRONMENTAL DATA</b></p>	<p>Bioaccumulation of this chemical may occur in seafood.</p>	
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## NOTES

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. Tetraphene is a common name. Card has been partly updated in October 2005 and August 2006: see sections Occupational Exposure Limits, EU classification.

## ADDITIONAL INFORMATION

**ICSC: 0385**

**BENZ(a)ANTHRACENE**

(C) IPCS, CEC, 1994

### IMPORTANT LEGAL NOTICE:

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# International Chemical Safety Cards

## COAL-TAR PITCH

ICSC: 1415



Pitch

ICSC # 1415  
 CAS # 65996-93-2  
 RTECS # [GF8655000](#)  
 EC # 648-055-00-5  
 March 07, 2002 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Combustible.	NO open flames.	Foam, dry powder, carbon dioxide.
<b>EXPLOSION</b>			
<b>EXPOSURE</b>		AVOID ALL CONTACT! PREVENT DISPERSION OF DUST!	
<b>•INHALATION</b>	Sneezing. Cough. See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	Closed system and ventilation.	Fresh air, rest.
<b>•SKIN</b>	MAY BE ABSORBED! Redness. Burning sensation.	Protective gloves. Protective clothing.	Rinse and then wash skin with water and soap.
<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>	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: A/P2 filter respirator for organic vapour and harmful dust.)	Separated from strong oxidants. Separated from food and feedstuffs	Do not transport with food and feedstuffs. Note: H T symbol R: 45 S: 53-45

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1415

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

## COAL-TAR PITCH

ICSC: 1415

<p>I</p> <p>M</p> <p>P</p>	<p><b>PHYSICAL STATE; APPEARANCE:</b>                      BLACK TO BROWN PASTE</p> <p><b>PHYSICAL DANGERS:</b></p>	<p><b>ROUTES OF EXPOSURE:</b>                      The substance can be absorbed into the body by inhalation and through the skin and by ingestion.</p> <p><b>INHALATION RISK:</b>                      Evaporation at 20°C is negligible; a harmful concentration</p>
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**CHEMICAL DANGERS:**

The substance decomposes on heating above 400°C producing toxic fumes Reacts with strong oxidants

of airborne particles can, however, be reached quickly when dispersed and when heated.

**OCCUPATIONAL EXPOSURE LIMITS:**

TLV: (as benzene soluble aerosol for coal tar pitch volatiles) 0.2 mg/m<sup>3</sup> as TWA A1 (ACGIH 2001).  
OSHA PEL: TWA 0.2 mg/m<sup>3</sup> (benzene-soluble fraction) 1910.1002 [See Appendix C](#)  
NIOSH REL: Ca TWA 0.1 mg/m<sup>3</sup> (cyclohexane-extractable fraction) [See Appendix A](#) [See Appendix C](#)  
NIOSH IDLH: Ca 80 mg/m<sup>3</sup> See: [65996932](#)

**EFFECTS OF SHORT-TERM EXPOSURE:**

The substance is irritating to the eyes the skin and the respiratory tract

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**

Repeated or prolonged contact with skin may cause dermatitis and hyperpigmentation of skin. This substance is carcinogenic to humans.

**PHYSICAL PROPERTIES**

Boiling point: >250°C  
Melting point: 30-180°C  
Density: >1 g/cm<sup>3</sup>  
Solubility in water: at 20°C none

Vapour pressure, kPa at 20°C: <0.01  
Flash point: >200°C o.c.  
Auto-ignition temperature: >500°C  
Octanol/water partition coefficient as log Pow: 6.04

**ENVIRONMENTAL DATA**

This substance may be hazardous to the environment; special attention should be given to soil contamination and aquatic organisms. The substance may cause long-term effects in the aquatic environment.



**NOTES**

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

NFPA Code: H0; F1; R0;

**ADDITIONAL INFORMATION**

**ICSC: 1415**

**COAL-TAR PITCH**

(C) IPCS, CEC, 1994

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# International Chemical Safety Cards

**INDENO(1,2,3-cd)PYRENE**

ICSC: 0730



o-Phenylenepyrene  
2,3-Phenylenepyrene  
C<sub>22</sub>H<sub>12</sub>  
Molecular mass: 276.3

ICSC # 0730  
CAS # 193-39-5  
RTECS # [NK9300000](#)  
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>			In case of fire in the surroundings: use appropriate extinguishing media.
<b>EXPLOSION</b>			
<b>EXPOSURE</b>		AVOID ALL CONTACT!	
• <b>INHALATION</b>		Local exhaust or breathing protection.	Fresh air, rest.
• <b>SKIN</b>		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• <b>EYES</b>		Safety spectacles 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.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0730

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

**INDENO(1,2,3-cd)PYRENE**

ICSC: 0730

<b>I</b>	<b>PHYSICAL STATE; APPEARANCE:</b> YELLOW CRYSTALS	<b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation of its aerosol and through the skin.
<b>M</b>	<b>PHYSICAL DANGERS:</b>	<b>INHALATION RISK:</b>
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**CHEMICAL DANGERS:**  
Upon heating, toxic fumes are formed.

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

**OCCUPATIONAL EXPOSURE LIMITS:**  
TLV not established.  
MAK:  
Carcinogen category: 2;  
(DFG 2004).

**EFFECTS OF SHORT-TERM EXPOSURE:**

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**  
This substance is possibly carcinogenic to humans.

**PHYSICAL PROPERTIES**

Boiling point: 536°C  
Melting point: 164°C  
Solubility in water:  
none

Octanol/water partition coefficient as log Pow: 6.58

**ENVIRONMENTAL DATA**

This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in fish.



**NOTES**

Indeno(1,2,3-cd)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. ACGIH recommends environment containing Indeno(1,2,3-c,d)pyrene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m<sup>3</sup>. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

**ADDITIONAL INFORMATION**

**ICSC: 0730**

**INDENO(1,2,3-cd)PYRENE**

(C) IPCS, CEC, 1994

**IMPORTANT LEGAL NOTICE:**

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# International Chemical Safety Cards

**DIBENZO(a,h)ANTHRACENE**

ICSC: 0431



1,25,6-Dibenzanthracene  
 $C_{22}H_{14}$   
 Molecular mass: 278.4

ICSC # 0431  
 CAS # 53-70-3  
 RTECS # [HN2625000](#)  
 EC # 601-041-00-2  
 October 23, 1995 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Combustible.	NO open flames.	Water spray, powder.
<b>EXPLOSION</b>			
<b>EXPOSURE</b>		AVOID ALL CONTACT!	
• <b>INHALATION</b>		Local exhaust or breathing protection.	Fresh air, rest.
• <b>SKIN</b>	Redness. Swelling. Itching.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• <b>EYES</b>	Redness.	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.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: P3 filter respirator for toxic particles.	Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0431**

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

**DIBENZO(a,h)ANTHRACENE**

ICSC: 0431

<b>I</b>	<b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS CRYSTALLINE POWDER.	<b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation, through the skin and by ingestion.
<b>M</b>	<b>PHYSICAL DANGERS:</b>	<b>INHALATION RISK:</b> Evaporation at 20°C is negligible; a harmful concentration
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**CHEMICAL DANGERS:**

of airborne particles can, however, be reached quickly.

**OCCUPATIONAL EXPOSURE LIMITS:**  
TLV not established.

**EFFECTS OF SHORT-TERM EXPOSURE:**

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**

The substance may have effects on the skin, resulting in photosensitization. This substance is probably carcinogenic to humans.

**PHYSICAL PROPERTIES**

Boiling point: 524°C  
Melting point: 267°C  
Relative density (water = 1): 1.28

Solubility in water:  
none  
Octanol/water partition coefficient as log Pow: 6.5

**ENVIRONMENTAL DATA**

Bioaccumulation of this chemical may occur in seafood.



**NOTES**

This is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. DBA is a commonly used name. This substance is one of many polycyclic aromatic hydrocarbons (PAH).

**ADDITIONAL INFORMATION**

**ICSC: 0431**

**DIBENZO(a,h)ANTHRACENE**

(C) IPCS, CEC, 1994

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# International Chemical Safety Cards

**CHRYSENE**

ICSC: 1672



Benzoaphenanthrene  
1,2-Benzophenanthrene  
1,2,5,6-Dibenzonaphthalene  
 $C_{18}H_{12}$   
Molecular mass: 228.3

ICSC # 1672  
CAS # 218-01-9  
RTECS # [GC0700000](#)  
UN # 3077  
EC # 601-048-00-0  
October 12, 2006 Validated



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Combustible.	NO open flames.	Water spray. Dry powder. 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.	
<b>EXPOSURE</b>	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	AVOID ALL CONTACT!	
• <b>INHALATION</b>		Local exhaust or breathing protection.	Fresh air, rest.
• <b>SKIN</b>		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• <b>EYES</b>		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>		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: P3 filter respirator for toxic particles. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants, Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	T symbol N symbol R: 45-68-50/53 S: 53-45-60-61 UN Hazard Class: 9 UN Packing Group: III Signal: Warning Aqua-Cancer Suspected of causing cancer Very toxic to aquatic life with long lasting effects Very toxic to aquatic life

**SEE IMPORTANT INFORMATION ON BACK**

# International Chemical Safety Cards

## CHRYSENE

ICSC: 1672

<p><b>I M P O R T A N T  D A T A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS TO BEIGE CRYSTALS OR POWDER</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 burning producing toxic fumes Reacts violently with strong oxidants</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: A3 (confirmed animal carcinogen with unknown relevance to humans); (ACGIH 2006). MAK not established.</p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.</p> <p><b>INHALATION RISK:</b> A harmful concentration of airborne particles can be reached quickly when dispersed</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b></p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> This substance is possibly carcinogenic to humans.</p>
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<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point: 448°C Melting point: 254 - 256°C Density: 1.3 g/cm<sup>3</sup></p>	<p>Solubility in water: very poor Octanol/water partition coefficient as log Pow: 5.9</p>
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<p><b>ENVIRONMENTAL DATA</b></p>	<p>The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in seafood. It is strongly advised that this substance does not enter the environment.</p>	
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**NOTES**

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. This substance does not usually occur as a pure substance but as a component of polyaromatic hydrocarbon (PAH) mixtures. Human population studies have associated PAH's exposure with cancer and cardiovascular diseases.

Transport Emergency Card: TEC (R)-90GM7-III

**ADDITIONAL INFORMATION**

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ICSC: 1672

CHRYSENE

(C) IPCS, CEC, 1994

<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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# International Chemical Safety Cards

**BENZO(k)FLUORANTHENE**

ICSC: 0721



Dibenzo(b,jk)fluorene  
8,9-Benzofluoranthene  
11,12-Benzofluoranthene  
 $C_{20}H_{12}$   
Molecular mass: 252.3

ICSC # 0721  
CAS # 207-08-9  
RTECS # [DF6350000](#)  
EC # 601-036-00-5  
March 25, 1999 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>			In case of fire in the surroundings: use appropriate extinguishing media.
<b>EXPLOSION</b>			
<b>EXPOSURE</b>		AVOID ALL CONTACT!	
• <b>INHALATION</b>		Local exhaust or breathing protection.	Fresh air, rest.
• <b>SKIN</b>		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• <b>EYES</b>		Safety spectacles 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>		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0721**

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

**BENZO(k)FLUORANTHENE**

ICSC: 0721

I  M	<b>PHYSICAL STATE; APPEARANCE:</b> YELLOW CRYSTALS	<b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation of its aerosol and through the skin.
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**PHYSICAL DANGERS:**

**CHEMICAL DANGERS:**

Upon heating, toxic fumes are formed.

**OCCUPATIONAL EXPOSURE LIMITS:**

TLV not established.

MAK:

Carcinogen category: 2;  
(DFG 2004).

**INHALATION RISK:**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

**EFFECTS OF SHORT-TERM EXPOSURE:**

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**

This substance is possibly carcinogenic to humans.

**PHYSICAL PROPERTIES**

Boiling point: 480°C  
Melting point: 217°C  
Solubility in water:  
none

Octanol/water partition coefficient as log Pow: 6.84

**ENVIRONMENTAL DATA**

This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and in fish.



**NOTES**

Benzo(k)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. ACGIH recommends environment containing benzo(k)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m<sup>3</sup>. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

**ADDITIONAL INFORMATION**

**ICSC: 0721**

**BENZO(k)FLUORANTHENE**

(C) IPCS, CEC, 1994

**IMPORTANT LEGAL NOTICE:**

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# International Chemical Safety Cards

SILVER

ICSC: 0810



Argentum  
C.I. 77820  
Ag

ICSC # 0810  
CAS # 7440-22-4  
RTECS # [VW3500000](#)  
September 10, 1997 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Not combustible, except as powder.		
<b>EXPLOSION</b>			
<b>EXPOSURE</b>		PREVENT DISPERSION OF DUST!	
• <b>INHALATION</b>		Local exhaust or breathing protection.	Fresh air, rest.
• <b>SKIN</b>		Protective gloves.	Rinse skin with plenty of water or shower.
• <b>EYES</b>		Safety spectacles, 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>		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Separated from ammonia, strong hydrogen peroxide solutions, strong acids.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0810

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

SILVER

ICSC: 0810

<b>I</b>	<b>PHYSICAL STATE; APPEARANCE:</b> WHITE METAL, TURNS DARK ON EXPOSURE TO OZONE, HYDROGEN SULFIDE OR SULFUR.	<b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation and by ingestion.
<b>M</b>		
<b>P</b>	<b>PHYSICAL DANGERS:</b>	<b>INHALATION RISK:</b> Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.
<b>O</b>	<b>CHEMICAL DANGERS:</b>	
<b>R</b>	Shock-sensitive compounds are formed with acetylene.	

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A

Reacts with acids causing fire hazard. Contact with strong hydrogen peroxide solution will cause violent decomposition to oxygen gas. Contact with ammonia may cause formation of compounds that are explosive when dry.

**EFFECTS OF SHORT-TERM EXPOSURE:**  
Inhalation of high amounts of metallic silver vapours may cause lung damage with pulmonary oedema.

**OCCUPATIONAL EXPOSURE LIMITS:**

TLV (metal): 0.1 mg/m<sup>3</sup> (ACGIH 1997).  
EU OEL: 0.1 mg/m<sup>3</sup> as TWA (EU 2000).  
OSHA PEL: TWA 0.01 mg/m<sup>3</sup>  
NIOSH REL: TWA 0.01 mg/m<sup>3</sup>  
NIOSH IDLH: 10 mg/m<sup>3</sup> (as Ag) See: [IDLH INDEX](#)

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**  
The substance may cause a grey-blue discoloration of the eyes, nose, throat and skin (argyria/argyrosis).

**PHYSICAL PROPERTIES**

Boiling point: 2212°C  
Melting point: 962°C  
Relative density (water = 1): 10.5  
Solubility in water: none

**ENVIRONMENTAL DATA**

This substance may be hazardous to the environment; special attention should be given to aquatic organisms.



**NOTES**

Card has been partially updated in March 2008: see Occupational Exposure Limits.

**ADDITIONAL INFORMATION**

**ICSC: 0810**

**SILVER**

(C) IPCS, CEC, 1994

**IMPORTANT LEGAL NOTICE:**

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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 reviewed



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.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area in case of a large 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.	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs Well closed.	Special material. Do not transport with 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

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0056**

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

## MERCURY

ICSC: 0056

<p><b>I</b> <b>M</b> <b>P</b> <b>O</b> <b>R</b> <b>T</b> <b>A</b> <b>N</b> <b>T</b> <b>D</b> <b>A</b> <b>T</b> <b>A</b></p>	<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<sub>f</sub>: 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 kidneys, resulting in irritability, emotional instability, tremor, mental and memory disturbances, speech disorders. Danger of cumulative effects. Animal tests show that this substance possibly causes toxic effects upon human reproduction.</p>
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<p><b>PHYSICAL PROPERTIES</b></p>	<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>
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<p><b>ENVIRONMENTAL DATA</b></p>	<p>The substance is very toxic to aquatic organisms. In the food chain important to humans, bioaccumulation takes place, specifically in fish.</p>	
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### NOTES

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

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<b>ICSC: 0056</b>	(C) IPCS, CEC, 1994	<b>MERCURY</b>
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<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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# International Chemical Safety Cards

**LEAD**

ICSC: 0052



Lead metal  
Plumbum  
Pb  
Atomic mass: 207.2  
(powder)

ICSC # 0052  
CAS # 7439-92-1  
RTECS # [OF7525000](#)  
October 08, 2002 Peer reviewed

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.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment. Personal protection: P3 filter respirator for toxic particles.	Separated from food and feedstuffs incompatible materials See Chemical Dangers.	R: S:

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0052**

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

<p><b>I M P O R T A N T T A D A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> BLUISH-WHITE OR SILVERY-GREY SOLID IN VARIOUS FORMS. TURNS TARNISHED ON EXPOSURE TO AIR.</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 heating, toxic fumes are formed. Reacts with oxidants. Reacts with hot concentrated nitric acid, boiling concentrated hydrochloric acid and sulfuric acid. Attacked by pure water and by weak organic acids in the presence of oxygen.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 0.05 mg/m<sup>3</sup> A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued (ACGIH 2004). MAK: Carcinogen category: 3B; Germ cell mutagen group: 3A; (DFG 2004). EU OEL: as TWA 0.15 mg/m<sup>3</sup> (EU 2002). 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>. 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>. NIOSH IDLH: 100 mg/m<sup>3</sup> (as Pb) See: <a href="#">7439921</a></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 concentration of airborne particles can be reached quickly when dispersed, especially if powdered.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b></p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> The substance may have effects on the blood bone marrow central nervous system peripheral nervous system kidneys , resulting in anaemia, encephalopathy (e.g., convulsions), peripheral nerve disease, abdominal cramps and kidney impairment. Causes toxicity to human reproduction or development.</p>
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<b>PHYSICAL PROPERTIES</b>	Boiling point: 1740°C Melting point: 327.5°C	Density: 11.34 g/cm <sup>3</sup> Solubility in water: none
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<b>ENVIRONMENTAL DATA</b>	Bioaccumulation of this chemical may occur in plants and in mammals. It is strongly advised that this substance does not enter the environment.	
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**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**

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<b>ICSC: 0052</b>	<b>LEAD</b>
(C) IPCS, CEC, 1994	

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# International Chemical Safety Cards

**BARIUM SULFATE**

ICSC: 0827



Barium sulphate  
Blanc fixe  
Artificial barite  
BaSO<sub>4</sub>  
Molecular mass: 233.43

ICSC # 0827

CAS # 7727-43-7

RTECS # [CR0600000](#)

October 20, 1999 Peer reviewed

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>			
<b>EXPOSURE</b>		PREVENT DISPERSION OF DUST!	
• <b>INHALATION</b>		Local exhaust or breathing protection.	Fresh air, rest.
• <b>SKIN</b>		Protective gloves.	Remove contaminated clothes. 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>		Do not eat, drink, or smoke during work.	Rinse mouth.
<b>SPILLAGE DISPOSAL</b>	<b>STORAGE</b>	<b>PACKAGING &amp; LABELLING</b>	
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Personal protection: P1 filter respirator for inert particles.		R: S:	
<b>SEE IMPORTANT INFORMATION ON BACK</b>			
<b>ICSC: 0827</b>	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

## BARIUM SULFATE

ICSC: 0827

<p><b>I M P O R T A N T D A T A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> ODOURLESS TASTELESS, WHITE OR YELLOWISH CRYSTALS OR POWDER.</p> <p><b>PHYSICAL DANGERS:</b></p> <p><b>CHEMICAL DANGERS:</b> Reacts violently with aluminium powder.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 10 mg/m<sup>3</sup> as TWA; (ACGIH 2004). MAK: (Inhalable fraction) 4 mg/m<sup>3</sup>; (Respirable fraction) 1.5 mg/m<sup>3</sup>; (DFG 2004). OSHA PEL<sup>†</sup>: TWA 15 mg/m<sup>3</sup> (total) TWA 5 mg/m<sup>3</sup> (resp) NIOSH REL: TWA 10 mg/m<sup>3</sup> (total) TWA 5 mg/m<sup>3</sup> (resp) NIOSH IDLH: N.D. See: <a href="#">IDLH INDEX</a></p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation of its aerosol.</p> <p><b>INHALATION RISK:</b> Evaporation at 20°C is negligible; a nuisance-causing concentration of airborne particles can, however, be reached quickly.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b></p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> Lungs may be affected by repeated or prolonged exposure to dust particles, resulting in baritosis (a form of benign pneumoconiosis).</p>
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<b>PHYSICAL PROPERTIES</b>	<p>Melting point (decomposes): 1600°C Density: 4.5 g/cm<sup>3</sup></p>	Solubility in water: none
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<b>ENVIRONMENTAL DATA</b>	
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### NOTES

Occurs in nature as the mineral barite; also as barytes, heavy spar. Card has been partly updated in October 2005. See section Occupational Exposure Limits.

### ADDITIONAL INFORMATION

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<b>ICSC: 0827</b>	<b>BARIUM SULFATE</b>
(C) IPCS, CEC, 1994	

<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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# International Chemical Safety Cards

**ZINC POWDER**

ICSC: 1205



Blue powder  
Merrillite  
Zn  
Atomic mass: 65.4  
(powder)

ICSC # 1205  
CAS # 7440-66-6  
RTECS # [ZG8600000](#)  
UN # 1436 (zinc powder or dust)  
EC # 030-001-00-1  
October 24, 1994 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking. NO contact with acid(s), base (s) and incompatible substances (see Chemical Dangers).	Special powder, dry sand, NO other agents. NO water.
<b>EXPLOSION</b>	Risk of fire and explosion on contact with acid(s), base(s), water and incompatible substances.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Prevent deposition of dust.	In case of fire: cool drums, etc., by spraying with water but avoid contact of the substance with water.
<b>EXPOSURE</b>		<b>PREVENT DISPERSION OF DUST! STRICT HYGIENE!</b>	
• <b>INHALATION</b>	Metallic taste and metal fume fever. Symptoms may be delayed (see Notes).	Local exhaust.	Fresh air, rest. Refer for medical attention.
• <b>SKIN</b>	Dry skin.	Protective gloves.	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. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Extinguish or remove all ignition sources. Do NOT wash away into sewer. Sweep spilled substance into containers. then remove to safe place. Personal protection: self-contained breathing apparatus.	Fireproof. Separated from acids, bases oxidants Dry.	Airtight. F symbol N symbol R: 15-17-50/53 S: 2-7/8-43-46-60-61 UN Hazard Class: 4.3 UN Subsidiary Risks: 4.2

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 1205**

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# International Chemical Safety Cards

## ZINC POWDER

ICSC: 1205

<p><b>I</b> <b>M</b> <b>P</b> <b>O</b> <b>R</b> <b>T</b> <b>A</b> <b>N</b> <b>T</b> <b>D</b> <b>A</b> <b>T</b> <b>A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> ODOURLESS GREY TO BLUE POWDER.</p> <p><b>PHYSICAL DANGERS:</b> Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.</p> <p><b>CHEMICAL DANGERS:</b> Upon heating, toxic fumes are formed. The substance is a strong reducing agent and reacts violently with oxidants. Reacts with water and reacts violently with acids and bases forming flammable/explosive gas (hydrogen - see ICSC0001) Reacts violently with sulfur, halogenated hydrocarbons and many other substances 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 and by ingestion.</p> <p><b>INHALATION RISK:</b> Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> Inhalation of fumes may cause metal fume fever. The effects may be delayed.</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> Repeated or prolonged contact with skin may cause dermatitis.</p>
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<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point: 907°C Melting point: 419°C Relative density (water = 1): 7.14</p>	<p>Solubility in water: reaction Vapour pressure, kPa at 487°C: 0.1 Auto-ignition temperature: 460°C</p>
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<p><b>ENVIRONMENTAL DATA</b></p>	
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### NOTES

Zinc may contain trace amounts of arsenic, when forming hydrogen, may also form toxic gas arsine (see ICSC 0001 and ICSC 0222). Reacts violently with fire extinguishing agents such as water, halons, foam and carbon dioxide. The symptoms of metal fume fever do not become manifest until several hours later. Rinse contaminated clothes (fire hazard) with plenty of water.

Transport Emergency Card: TEC (R)-43GWS-II+III  
NFPA Code: H0; F1; R1;

### ADDITIONAL INFORMATION

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<b>ICSC: 1205</b>	(C) IPCS, CEC, 1994	<b>ZINC POWDER</b>
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<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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# International Chemical Safety Cards

DDT

ICSC: 0034



Dichlorodiphenyltrichloroethane  
 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane  
 2,2-bis(p-Chlorophenyl)-1,1,1-trichloroethane  
 1,1'-(2,2,2-Trichloroethylidene)bis(4-chlorobenzene)  
 p,p'-DDT  
 $C_{14}H_9Cl_5$   
 Molecular mass: 354.5



ICSC # 0034  
 CAS # 50-29-3  
 RTECS # [KJ3325000](#)  
 UN # 2761  
 EC # 602-045-00-7  
 April 20, 2004 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Powder, water spray, foam, carbon dioxide.
<b>EXPLOSION</b>			
<b>EXPOSURE</b>		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
<b>•INHALATION</b>	Cough.	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>	Redness.	Safety goggles, 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>	Tremors. Diarrhoea. Dizziness. Headache. Vomiting. Numbness. Paresthesias. Hyperexcitability. Convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Do NOT let this chemical enter the environment. Sweep spilled substance into sealable non-metallic containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: P3 filter respirator for toxic particles.	Provision to contain effluent from fire extinguishing. Separated from iron, aluminum and its salts, food and feedstuffs See Chemical Dangers.	Do not transport with food and feedstuffs. Severe marine pollutant. T symbol N symbol R: 25-40-48/25-50/53 S: 1/2-22-36/37-45-60-61 UN Hazard Class: 6.1 UN Packing Group: III

**SEE IMPORTANT INFORMATION ON BACK**

ICSC: 0034

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

ICSC: 0034

DDT

<p><b>I</b> <b>M</b> <b>P</b> <b>O</b> <b>R</b> <b>T</b> <b>A</b> <b>N</b> <b>T</b> <b>D</b> <b>A</b> <b>T</b> <b>A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> COLOURLESS CRYSTALS WHITE POWDER. TECHNICAL PRODUCT IS WAXY SOLID.</p> <p><b>PHYSICAL DANGERS:</b></p> <p><b>CHEMICAL DANGERS:</b> On combustion, forms toxic and corrosive fumes including hydrogen chloride. Reacts with aluminium and iron.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 1 mg/m<sup>3</sup> as TWA A3 (ACGIH 2004). MAK: 1 mg/m<sup>3</sup> H Peak limitation category: II(8) (DFG 2003). OSHA PEL: TWA 1 mg/m<sup>3</sup> skin NIOSH REL: Ca TWA 0.5 mg/m<sup>3</sup> <a href="#">See Appendix A</a> NIOSH IDLH: Ca 500 mg/m<sup>3</sup> See: <a href="#">50293</a></p>	<p><b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by ingestion.</p> <p><b>INHALATION RISK:</b> Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly especially if powdered.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> May cause mechanical irritation. The substance may cause effects on the central nervous system, resulting in convulsions and respiratory depression. Exposure at high levels 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 central nervous system and liver. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.</p>
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<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point: 260°C Melting point: 109°C Density: 1.6 g/cm<sup>3</sup></p>	<p>Solubility in water: poor Octanol/water partition coefficient as log Pow: 6.36</p>
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<p><b>ENVIRONMENTAL DATA</b></p>	<p>The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to birds. Bioaccumulation of this chemical may occur along the food chain, for example in milk and aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be given to avoid any additional release, e.g. through inappropriate disposal.</p>	
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## NOTES

Depending on the degree of exposure, periodic medical examination is indicated. Carrier solvents used in commercial formulations may change physical and toxicological properties. Do NOT take working clothes home. Consult national legislation. Agritan, Azotox, Anofex, Ixodex, Gesapon, Gesarex, Gesarol, Guesapon, Clofenotane, Zeidane, Dicophane, Neocid are trade names.

Transport Emergency Card: TEC (R)-61GT7-III

## ADDITIONAL INFORMATION

<p><b>ICSC: 0034</b></p>	<p><b>DDT</b></p>
<p>(C) IPCS, CEC, 1994</p>	

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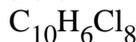
# International Chemical Safety Cards

## CHLORDANE (TECHNICAL PRODUCT)

ICSC: 0740



1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene  
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene



Molecular mass: 409.8

ICSC # 0740

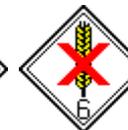
CAS # 57-74-9

RTECS #

UN # 2996

EC # 602-047-00-8

March 26, 1998 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
<b>FIRE</b>	Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Alcohol-resistant foam, powder, carbon dioxide.
<b>EXPLOSION</b>			
<b>EXPOSURE</b>		PREVENT GENERATION OF MISTS! STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
<b>•INHALATION</b>	(See Ingestion).	Breathing protection.	Fresh air, rest. Refer for medical attention.
<b>•SKIN</b>	MAY BE ABSORBED!	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 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>	Confusion. Convulsions. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
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: chemical protection suit including self-contained breathing apparatus.	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs bases and incompatible materials See Chemical Dangers. Well closed. Keep in a well-ventilated room.	Do not transport with food and feedstuffs. Severe marine pollutant. Xn symbol N symbol R: 21/22-40-50/53 S: 2-36/37-60-61 UN Hazard Class: 6.1 UN Packing Group: III

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0740**

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

## CHLORDANE (TECHNICAL PRODUCT)

ICSC: 0740

<p><b>I M P O R T A N T D A T A</b></p>	<p><b>PHYSICAL STATE; APPEARANCE:</b> TECHNICAL: LIGHT YELLOW TO AMBER VISCOUS LIQUID</p> <p><b>PHYSICAL DANGERS:</b></p> <p><b>CHEMICAL DANGERS:</b> The substance decomposes on burning, on contact with bases producing toxic fumes including phosgene hydrogen chloride Attacks iron, zinc, plastic, rubber and coatings.</p> <p><b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV: 0.5 mg/m<sup>3</sup> as TWA (skin) A3 (confirmed animal carcinogen with unknown relevance to humans); (ACGIH 2004). MAK: (Inhalable fraction) 0.5 mg/m<sup>3</sup> Peak limitation category: II(8); skin absorption (H); Carcinogen category: 3B; (DFG 2004). OSHA PEL: TWA 0.5 mg/m<sup>3</sup> skin NIOSH REL: Ca TWA 0.5 mg/m<sup>3</sup> skin <a href="#">See Appendix A</a> NIOSH IDLH: Ca 100 mg/m<sup>3</sup> See: <a href="#">57749</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> Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.</p> <p><b>EFFECTS OF SHORT-TERM EXPOSURE:</b> Exposure at high levels may result in disorientation, tremors, convulsions, respiratory failure and death. Medical observation is indicated.</p> <p><b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> The substance may have effects on the liver immune system, resulting in tissue lesions and liver impairment. This substance is possibly carcinogenic to humans.</p>
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<p><b>PHYSICAL PROPERTIES</b></p>	<p>Boiling point at 0.27kPa: 175°C Relative density (water = 1): 1.59-1.63 Solubility in water: none</p>	<p>Vapour pressure, Pa at 25°C: 0.0013 Octanol/water partition coefficient as log Pow: 2.78</p>
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<p><b>ENVIRONMENTAL DATA</b></p>	<p>The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to soil organisms, honey bees. It is strongly advised that this substance does not enter the environment. The substance may cause long-term effects in the aquatic environment.</p>	
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### NOTES

If the substance is formulated with solvents also consult the ICSCs of these materials. Carrier solvents used in commercial formulations may change physical and toxicological properties. Belt, Chlor Kil, Chlortox, Corodan, Gold Crest, Intox, Kypchlor, Niran, Octachlor, Sydane, Synklor, Termi-Ded, Topiclör, and Toxichlor are trade names. Also consult ICSC 0743 Heptachlor.

Transport Emergency Card: TEC (R)-61GT6-III

### ADDITIONAL INFORMATION

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ICSC: 0740

CHLORDANE (TECHNICAL PRODUCT)

(C) IPCS, CEC, 1994

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***APPENDIX D***  
***HOSPITAL INFORMATION AND MAP***  
***FIELD ACCIDENT REPORT***

FIELD ACCIDENT REPORT

This report is to be filled out by the designated Site Safety Officer after EVERY accident.

PROJECT NAME \_\_\_\_\_ PROJECT. NO. \_\_\_\_\_

Date of Accident \_\_\_\_\_ Time \_\_\_\_\_ Report By \_\_\_\_\_

Type of Accident (Check One):

Vehicular             Personal             Property

Name of Injured \_\_\_\_\_ DOB or Age \_\_\_\_\_

How Long Employed \_\_\_\_\_

Names of Witnesses \_\_\_\_\_  
\_\_\_\_\_

Description of Accident \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Action Taken \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Did the Injured Lose Any Time? \_\_\_\_\_ How Much (Days/Hrs.)? \_\_\_\_\_

Was Safety Equipment in Use at the Time of the Accident (Hard Hat, Safety Glasses, Gloves, Safety Shoes, etc.)? \_\_\_\_\_  
\_\_\_\_\_

(If not, it is the EMPLOYEE'S sole responsibility to process his/her claim through his/her Health and Welfare Fund.)

INDICATE STREET NAMES, DESCRIPTION OF VEHICLES, AND NORTH ARROW

## HOSPITAL INFORMATION AND MAP

The hospital nearest the site is:

### The Brooklyn Hospital Center

121 Dekalb Avenue, Brooklyn, NY 11201-5493  
(718) 250-8000

1.1 Miles – About 3 Minutes

**A** 549 Myrtle Ave, Brooklyn, NY 11205

1. Head **west** on **Myrtle Ave** toward **Steuben St**  
About 1 min

go 0.4 mi  
total 0.4 mi

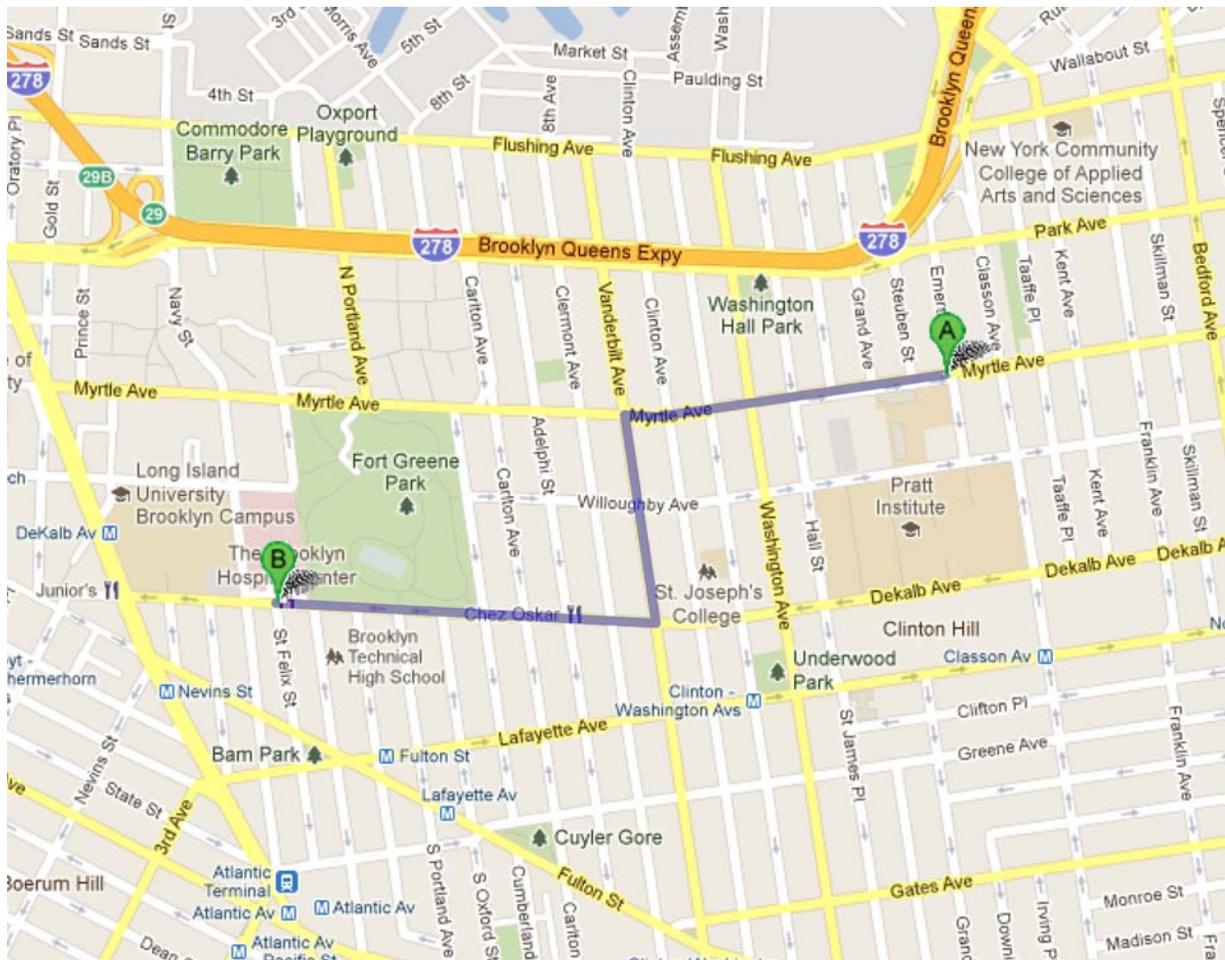
**2.** Turn left onto **Vanderbilt Ave**  
About 1 min

go 0.3 mi  
total 0.7 mi

**3.** Turn right at the 2nd cross street onto **Dekalb Ave**  
Destination will be on the right  
About 1 min

go 0.5 mi  
total 1.1 mi

**B** 121 Dekalb Ave, Brooklyn, NY 11217



**ATTACHMENT F**  
**VAPOR BARRIER SPECIFICATIONS**

### *Vapor Barrier Design and Installation*

A vapor barrier is being recommended for this project as a preventative measure. This section includes the specifications and guidelines for installing a below concrete slab sheet vapor barrier. The vapor barrier will extend throughout the area to be occupied by the new multi-use building to be constructed on the site. Vapor barrier seams, penetrations, and repairs will be sealed either by the tape method or weld method, according to the manufacturer's recommendations and instructions.

A vapor retarder or barrier, by definition, is a material or assembly of materials that resists vapor diffusion through it. For this project the sheet material will consist of a black high-density polyethylene (HDPE) film, 20 mil thick.

ASTM references for vapor barriers include the following:

1. ASTM E 1745-97 "Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs."
2. ASTM E 1643-98 "Standard Practice for Vapor Barriers."

### *Materials*

The minimum values for the HDPE film will meet the following:

Property	Test Method	Minimum Values
Thickness, mil (mm)	ASTM D 5199	20
Density, g/cm <sup>3</sup>	ASTM D 1505	0.94
Carbon Black Content, %	ASTM D 1603, mod.	2.0
Tensile Properties (each direction)	ASTM D 6693	
Strength at Yield, lb/in. (kN/m)		22
Strength at Break, lb/in. (kN/m)		44
Elongation at Yield, %	(1.3" gauge length)	10
Elongation at Break, %	(2.0" gauge length)	500
Tear Resistance, lb (N)	ASTM D 1004	5
Puncture Resistance, lb (N)	ASTM D 4833	26
Notched Constant Tensile Load, hours	ASTM D 5397, app.	400
Oxidative Induction Time, min.	ASTM D 3895	100

The manufacturer of the specified liner is: GSE LINING TECHNOLOGY, INC.

1. All joints in the HDPE sheeting will be sealed with either a tape seal or a weld seal. The tape seal consists of a butyl mastic self-adhering tape, 2 inch (50 mm) wide, compatible with the sheet material.
2. The weld seal consists of an extrudate rod or bead, compatible with sheet material.

Preparation for the installation of the vapor barrier membrane is as follows:

3. Do not install vapor retarder/barrier until items penetrating it are in place.
4. Rake, trim, and tamp surfaces over which membrane is to be installed.
5. Substrates must be regular and smooth with no gaps or voids greater than 0.5 inches (12 mm).
6. The substrate must be free of loose aggregate and sharp protrusions.
7. The substrate does not need to be dry, but standing water must be removed.

#### *Membrane Installation*

Place the membrane HDPE film side to the substrate with printed coating side up facing towards the concrete pour. Lay membrane with seams perpendicular to and lapped in direction of concrete pour.

End laps should be staggered to avoid a build-up of layers. Accurately position succeeding sheets to overlap the previous sheet 3 inches (75 mm). Ensure that the underside of the succeeding sheet is clean, dry, and free from contamination before attempting to overlap.

If manufacturer recommends sealing overlaps with tape, proceed with the following steps:

8. Secure overlaps to the bottom sheet with tape.
9. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. During cold or damp conditions, the tape adhesive can be gently warmed using a hot air gun or similar to remove moisture or condensation and improve initial adhesion.
10. If manufacturer recommends sealing overlaps by welding, weld overlap seams according to manufacturer's instructions.
11. Penetrations through the membrane such as utility conduits, can be sealed either using the tape and liquid membrane method or the extrusion weld method.

Procedures for sealing penetrations using the tape and seal method include the following:

12. Scribe membrane tight to the penetration.
13. If the membrane is not within 0.5 inches (12 mm) of the penetration, apply tape to cover the gap.
14. Wrap the penetration with tape by positioning the tape 0.5 inches (12 mm) above the membrane.
15. Mix and apply Liquid Membrane around the penetrations using a fillet to provide a watertight seal between the membrane and tape.

Procedures for sealing penetrations using the extrusion weld method include the following:

Scribe membrane tight to the penetration.

16. Perform extrusion weld techniques according to manufacturer's instructions.

#### *Protection*

Protect membrane from damage until permanent covering is in place.

#### *Membrane Repair*

The membrane can be repaired using either the tape method or the weld method.

The procedure to repair the membrane using the tape method is as follows:

- Repair punctures and tears in membrane using patches of the material and overlapping the puncture or tear a minimum of 12 inches.
- Seal with tape.

The procedure to repair the membrane using the weld method is as follows:

- Repair punctures and tears in membrane using patches of the material and overlapping the puncture or tear a minimum of 6 inches. Seal with extrusion weld.

#### *Inspection*

Upon completion of the installation of the membrane, the Contractor shall coordinate an inspection with the Engineer or its designated representative. The membrane shall not be covered until the Contractor receives written approval from the Engineer.

#### *Pouring of Concrete*

It is recommended that concrete be poured within 56 days of application of the membrane. Concrete must be placed and compacted carefully to avoid damage to the membrane. Never use a sharp object to consolidate the concrete.



### Permeability For GSE Geomembranes

Due to its chemical structure, polyethylene is an (essentially) impermeable substance. The material is made up of very long molecules. There does exist, however, molecular voids (sometimes referred to as "free space") among the individual polyethylene chains. The existence of these spaces is recognized when we say polyethylene is essentially impermeable. Permeation may exist when, for instance, the pressure behind the permeant is very high or the permeant's molecular size is very small. However, the degree of permeation exhibited is difficult to determine using currently available test procedures. As a result, test results frequently reflect the inaccuracy of the procedure rather than the permeation of the material. Testing of GSE HDPE performed by an independent laboratory produced the following results.

A sometimes overlooked factor when reviewing permeation data is that most permeameters apply pressure to encourage permeation. In geotechnical and environmental applications, geomembranes are not subjected to the high pressures of potential permeants as they are in a permeation laboratory test. The lack of a driving force greatly diminishes actual permeation since the gaseous molecules find an easier path to follow than through the polyethylene liner. Also, because of the high pressures required to force permeants through polyethylene, failure of the permeameter is common. This is commonly in the form of a test apparatus leak. Such leaks can result in erroneous results.

Test	ASTM Method	Results
Methane Permeability	D 1434	2.0 x 10 <sup>-6</sup> mL/cm <sup>2</sup> ·s
Water Vapor Permeability	E 96	1.7 x 10 <sup>-9</sup> mL/cm <sup>2</sup> ·s

It must be emphasized that different chemicals will permeate at different rates due to differences in molecular shape, polarity and phase (gas or liquid). For example, the relatively small water molecule (atomic weight 18) will more easily permeate the polyethylene matrix as compared to a large molecule such as cyclohexanol (atomic weight 94).

The molecules' polarity must also be considered (recall the adage "like dissolves like"). Polyethylene is a non-polar molecule, therefore other non-polar molecules will permeate the matrix better. Examples of these molecules are hydrocarbons - especially those such as octane, pentane and hexene. The permeation of these are therefore greater than for polar molecules such as water.

TN006 PermeabilityGeomem R03/17/06

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<b>South America</b>	GSE Lining Technology Chile S.A.	Santiago, Chile		56 2 595 4200	Fax: 56 2 595 4290
<b>Asia Pacific</b>	GSE Lining Technology Company Limited	Bangkok, Thailand		66 2 937 0091	Fax: 66 2 937 0097
<b>Europe &amp; Africa</b>	GSE Lining Technology GmbH	Hamburg, Germany		49 40 767420	Fax: 49 40 7674234
<b>Middle East</b>	GSE Lining Technology-Egypt	The 6th of October City, Egypt		202 2 828 8888	Fax: 202 2 828 8889



## Chemical Resistance For GSE Geomembranes

GSE geomembranes are made of high quality, virgin polyethylene which demonstrates excellent chemical resistance. GSE polyethylene geomembranes are resistant to a great number and combinations of chemicals. It is this property of (HDPE) high density polyethylene geomembranes that makes it the lining material of choice.

In order to gauge the durability of a material in contact with a chemical mixture, testing is required in which the material is exposed to the chemical environment in question. Chemical resistance testing is a very large and complex topic because of two factors. First, the number of specific media is virtually endless and second, there are many criteria such as tensile strength, hardness, etc. that may be used to assess a material's resistance to degradation.

The chemical resistance of polyethylene has been investigated by many people over the past few decades. We are able to draw from that work when making statements about the chemical resistance of today's polyethylene geomembranes. In addition to that, many tests have been performed that specifically use geomembranes and certain chemical mixtures. Naturally, however, every mixture of chemicals cannot be tested for. As a result of these factors, GSE published a chemical resistance chart, demonstrating general guidelines.

Polyethylene is, for practical purposes, considered impermeable. Be aware, however, that all materials are permeable to some extent. Permeability varies with concentration, temperature, pressure and type of permeant. The rates of permeation are usually so low, however, that they are insignificant. As a point of reference, polyethylene is commonly used for packaging of several types of materials. These include gasoline, motor oil, household cleaners (i.e. bleach), muratic acid, pesticides, insecticides, fungi-

cides, and other highly concentrated chemicals. Also, you should be aware that there are some chemicals which may be absorbed by the material but only when present at very high concentrations. These include halogenated and/or aromatic hydrocarbons at greater than 50%; their absorption results in swelling and slight changes in physical properties such as increased tensile elongations. This includes many types of fuels and oils. Recognize that this action, however, does not affect the liner's ability to act as a barrier for the material it is containing.

Since polyethylene is a petroleum product, it can absorb other petroleum products. Like a sponge, the material becomes slightly thicker and more flexible but does not produce a hole or void. However, unlike a sponge, this absorption is not immediate. It takes a much longer time for a polyethylene liner to swell than it does for a sponge. The exact time it takes for swelling to occur depends on the particular constituents and concentrations of the contained media. However, a hole would not be produced. Also, this absorption is reversible and the material will essentially return to it's original state when the chemical is no longer in contact with the liner.

With regard to typical municipal landfills in the United States, legally allowable levels of chemicals have been demonstrated to have no adverse affect on polyethylene geomembrane performance. The very low levels of salts, metals and organic compounds do not damage polyethylene. A double-lined containment with a leachate (leak detection) removal system effectively prevents any significant, continuous exposure of the secondary membrane to these materials and for practical purposes makes the total liner system even more impermeable.

TN005 ChemicalResistance R03/17/06

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## Chemical Resistance Chart

GSE is the world's leading supplier of high quality, polyethylene geomembranes. GSE polyethylene geomembranes are resistant to a great number and combinations of chemicals. Note that the effect of chemicals on any material is influenced by a number of variable factors such as temperature, concentration, exposed area and duration. Many tests have been performed that use geomembranes and certain specific chemical mixtures. Naturally, however, every mixture of chemicals cannot be tested for, and various criteria may be used to judge performance. Reported performance ratings may not apply to all applications of a given material in the same chemical. Therefore, these ratings are offered as a guide only. This information is provided for reference purposes only and is not intended as a warranty or guarantee. GSE assumes no liability in connection with the use of this information.

Medium	Concentration	Resistance at:	
		20 °C (68 °F)	60 °C (140 °F)
<b>A</b>			
Acetic acid	100%	S	L
Acetic acid	10%	S	S
Acetic acid anhydride	100%	S	L
Acetone	100%	L	L
Adipic acid	sat. sol.	S	S
Allyl alcohol	96%	S	S
Aluminum chloride	sat. sol.	S	S
Aluminum fluoride	sat. sol.	S	S
Aluminum sulfate	sat. sol.	S	S
Alum	sol.	S	S
Ammonia, aqueous	dil. sol.	S	S
Ammonia, gaseous dry	100%	S	S
Ammonia, liquid	100%	S	S
Ammonium chloride	sat. sol.	S	S
Ammonium fluoride	sol.	S	S
Ammonium nitrate	sat. sol.	S	S
Ammonium sulfate	sat. sol.	S	S
Ammonium sulfide	sol.	S	S
Amyl acetate	100%	S	L
Amyl alcohol	100%	S	L
Aniline	100%	S	L
Antimony trichloride	90%	S	S
Arsenic acid	sat. sol.	S	S
Aqua regia	HCl-HNO <sub>3</sub>	U	U
<b>B</b>			
Barium carbonate	sat. sol.	S	S
Barium chloride	sat. sol.	S	S
Barium hydroxide	sat. sol.	S	S
Barium sulfate	sat. sol.	S	S
Barium sulfide	sol.	S	S
Benzaldehyde	100%	S	L
Benzene	—	L	L
Benzoic acid	sat. sol.	S	S
Beer	—	S	S
Borax (sodium tetraborate)	sat. sol.	S	S
Boric acid	sat. sol.	S	S
Bromine, gaseous dry	100%	U	U
Bromine, liquid	100%	U	U
Butane, gaseous	100%	S	S
1-Butanol	100%	S	S
Butyric acid	100%	S	L
<b>C</b>			
Calcium carbonate	sat. sol.	S	S
Calcium chlorate	sat. sol.	S	S
Calcium chloride	sat. sol.	S	S
Calcium nitrate	sat. sol.	S	S
Calcium sulfate	sat. sol.	S	S
Calcium sulfide	dil. sol.	L	L
Carbon dioxide, gaseous dry	100%	S	S
Carbon disulfide	100%	L	U
Carbon monoxide	100%	S	S
Chloroacetic acid	sol.	S	S
Carbon tetrachloride	100%	L	U
Chlorine, aqueous solution	sat. sol.	L	U
Chlorine, gaseous dry	100%	L	U
Chloroform	100%	U	U
Chromic acid	20%	S	L
Chromic acid	50%	S	L
Citric acid	sat. sol.	S	S

Medium	Concentration	Resistance at:	
		20 °C (68 °F)	60 °C (140 °F)
<b>C</b>			
Copper chloride	sat. sol.	S	S
Copper nitrate	sat. sol.	S	S
Copper sulfate	sat. sol.	S	S
Cresylic acid	sat. sol.	L	—
Cyclohexanol	100%	S	S
Cyclohexanone	100%	S	L
<b>D</b>			
Decahydronaphthalene	100%	S	L
Dextrine	sol.	S	S
Diethyl ether	100%	L	—
Diethylphthalate	100%	S	L
Dioxane	100%	S	S
<b>E</b>			
Ethandiol	100%	S	S
Ethanol	40%	S	L
Ethyl acetate	100%	S	U
Ethylene trichloride	100%	U	U
<b>F</b>			
Ferric chloride	sat. sol.	S	S
Ferric nitrate	sol.	S	S
Ferric sulfate	sat. sol.	S	S
Ferrous chloride	sat. sol.	S	S
Ferrous sulfate	sat. sol.	S	S
Fluorine, gaseous	100%	U	U
Fluorosilicic acid	40%	S	S
Formaldehyde	40%	S	S
Formic acid	50%	S	S
Formic acid	98-100%	S	S
Furfuryl alcohol	100%	S	L
<b>G</b>			
Gasoline	—	S	L
Glacial acetic acid	96%	S	L
Glucose	sat. sol.	S	S
Glycerine	100%	S	S
Glycol	sol.	S	S
<b>H</b>			
Heptane	100%	S	U
Hydrobromic acid	50%	S	S
Hydrobromic acid	100%	S	S
Hydrochloric acid	10%	S	S
Hydrochloric acid	35%	S	S
Hydrocyanic acid	10%	S	S
Hydrofluoric acid	4%	S	S
Hydrofluoric acid	60%	S	L
Hydrogen	100%	S	S
Hydrogen peroxide	30%	S	L
Hydrogen peroxide	90%	S	U
Hydrogen sulfide, gaseous	100%	S	S
<b>L</b>			
Lactic acid	100%	S	S
Lead acetate	sat. sol.	S	—
<b>M</b>			
Magnesium carbonate	sat. sol.	S	S
Magnesium chloride	sat. sol.	S	S
Magnesium hydroxide	sat. sol.	S	S
Magnesium nitrate	sat. sol.	S	S
Maleic acid	sat. sol.	S	S
Mercuric chloride	sat. sol.	S	S

Medium	Concentration	Resistance at:	
		20 °C (68 °F)	60 °C (140 °F)
Mercuric cyanide	sat. sol.	S	S
Mercuric nitrate	sol.	S	S
Mercury	100%	S	S
Methanol	100%	S	S
Methylene chloride	100%	L	—
Milk	—	S	S
Molasses	—	S	S
<b>N</b>			
Nickel chloride	sat. sol.	S	S
Nickel nitrate	sat. sol.	S	S
Nickel sulfate	sat. sol.	S	S
Nicotinic acid	dil. sol.	S	—
Nitric acid	25%	S	S
Nitric acid	50%	S	U
Nitric acid	75%	U	U
Nitric acid	100%	U	U
<b>O</b>			
Oils and Grease	—	S	L
Oleic acid	100%	S	L
Orthophosphoric acid	50%	S	S
Orthophosphoric acid	95%	S	L
Oxalic acid	sat. sol.	S	S
Oxygen	100%	S	L
Ozone	100%	L	U
<b>P</b>			
Petroleum (kerosene)	—	S	L
Phenol	sol.	S	S
Phosphorus trichloride	100%	S	L
Photographic developer	cust. conc.	S	S
Picric acid	sat. sol.	S	—
Potassium bicarbonate	sat. sol.	S	S
Potassium bisulfide	sol.	S	S
Potassium bromate	sat. sol.	S	S
Potassium bromide	sat. sol.	S	S
Potassium carbonate	sat. sol.	S	S
Potassium chlorate	sat. sol.	S	S
Potassium chloride	sat. sol.	S	S
Potassium chromate	sat. sol.	S	S
Potassium cyanide	sol.	S	S
Potassium dichromate	sat. sol.	S	S
Potassium ferricyanide	sat. sol.	S	S
Potassium ferrocyanide	sat. sol.	S	S
Potassium fluoride	sat. sol.	S	S
Potassium hydroxide	10%	S	S
Potassium hydroxide	sol.	S	S
Potassium hypochlorite	sol.	S	L
Potassium nitrate	sat. sol.	S	S
Potassium orthophosphate	sat. sol.	S	S
Potassium perchlorate	sat. sol.	S	S
Potassium permanganate	20%	S	S
Potassium persulfate	sat. sol.	S	S
Potassium sulfate	sat. sol.	S	S
Potassium sulfite	sol.	S	S
Propionic acid	50%	S	S
Propionic acid	100%	S	L
Pyridine	100%	S	L
<b>Q</b>			
Quinol (Hydroquinone)	sat. sol.	S	S
<b>S</b>			
Salicylic acid	sat. sol.	S	S

Medium	Concentration	Resistance at:	
		20 °C (68 °F)	60 °C (140 °F)
Silver acetate	sat. sol.	S	S
Silver cyanide	sat. sol.	S	S
Silver nitrate	sat. sol.	S	S
Sodium benzoate	sat. sol.	S	S
Sodium bicarbonate	sat. sol.	S	S
Sodium biphosphate	sat. sol.	S	S
Sodium bisulfite	sol.	S	S
Sodium bromide	sat. sol.	S	S
Sodium carbonate	sat. sol.	S	S
Sodium chlorate	sat. sol.	S	S
Sodium chloride	sat. sol.	S	S
Sodium cyanide	sat. sol.	S	S
Sodium ferricyanide	sat. sol.	S	S
Sodium ferrocyanide	sat. sol.	S	S
Sodium fluoride	sat. sol.	S	S
Sodium hydroxide	40%	S	S
Sodium hydroxide	sat. sol.	S	S
Sodium hypochlorite	15% active chlorine	S	S
Sodium nitrate	sat. sol.	S	S
Sodium nitrite	sat. sol.	S	S
Sodium orthophosphate	sat. sol.	S	S
Sodium sulfate	sat. sol.	S	S
Sodium sulfide	sat. sol.	S	S
Sulfur dioxide, dry	100%	S	S
Sulfur trioxide	100%	U	U
Sulfuric acid	10%	S	S
Sulfuric acid	50%	S	S
Sulfuric acid	98%	S	U
Sulfuric acid	fuming	U	U
Sulfurous acid	30%	S	S
<b>T</b>			
Tannic acid	sol.	S	S
Tartaric acid	sol.	S	S
Thionyl chloride	100%	L	U
Toluene	100%	L	U
Triethylamine	sol.	S	L
<b>U</b>			
Urea	sol.	S	S
Urine	—	S	S
<b>W</b>			
Water	—	S	S
Wine vinegar	—	S	S
Wines and liquors	—	S	S
<b>X</b>			
Xylenes	100%	L	U
<b>Y</b>			
Yeast	sol.	S	S
<b>Z</b>			
Zinc carbonate	sat. sol.	S	S
Zinc chloride	sat. sol.	S	S
Zinc (II) chloride	sat. sol.	S	S
Zinc (IV) chloride	sat. sol.	S	S
Zinc oxide	sat. sol.	S	S
Zinc sulfate	sat. sol.	S	S

Specific immersion testing should be undertaken to ascertain the suitability of chemicals not listed above with reference to special requirements.

**NOTES:**

(S) **Satisfactory:** Liner material is resistant to the given reagent at the given concentration and temperature. No mechanical or chemical degradation is observed.

(L) **Limited Application Possible:** Liner material may reflect some attack. Factors such as concentration, pressure and temperature directly affect liner performance against the given media. Application, however, is possible under less severe conditions, e.g. lower concentration, secondary containment, additional liner protections, etc.

(U) **Unsatisfactory:** Liner material is not resistant to the given reagent at the given concentration and temperature. Mechanical and/or chemical degradation is observed.

(-) **Not tested**

sat. sol. = Saturated aqueous solution, prepared at 20°C (68°F)

sol. = aqueous solution with concentration above 10% but below saturation level

dil. sol. = diluted aqueous solution with concentration below 10%

cust. conc. = customary service concentration

TN032 ResistChart R03/17/06

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