

**211 MCGUINNESS BOULEVARD MIXED-USE  
DEVELOPMENT  
BROOKLYN, NEW YORK**

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**Remedial Action Work Plan**

**NYC VCP Number: 15CVCP100K  
NYCOER Project Number: 15RHAN236K**

**Prepared for:**

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**MARCH 2015**

# REMEDIAL ACTION WORK PLAN

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## LIST OF ACRONYMS

<b>Acronym</b>	<b>Definition</b>
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering and Institutional Controls
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
VCA	Voluntary Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC VCP	New York City Voluntary 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

# CERTIFICATION

I, Kevin Walsh, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 211 McGuinness Boulevard Mixed-Use Development site, Project No. 15RHAN236K and VCP number 15CVCP100K.

I, Stephen Kaplan am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the 211 McGuinness Boulevard Mixed-Use Development site, Project No. 15RHAN236K and VCP number 15CVCP100K.

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

\_\_\_\_\_  
Name

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

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



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

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

\_\_\_\_\_  
Date

## **EXECUTIVE SUMMARY**

Stellar Management has applied to enroll in the New York City Voluntary Brownfield Cleanup Program (NYC VCP) to investigate and remediate a 33,750-square foot site located at 209 through 235 McGuinness Boulevard 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 209 and 211-235 McGuinness Boulevard in the Greenpoint section in Brooklyn, New York and is identified as Block 2576 and Lot Nos. 20 and 23 on the New York City Tax Map. Figure 1 shows the Site location, with an aerial photograph included as Figure 2, with a property survey provided as Figure 4. The Site is 33,750-square feet and is bounded by a gasoline filling station to the north, a multi-unit residential apartment building with ground-floor retail to the south, McGuinness Boulevard to the east, and multi-family/multi-unit residential uses to the west along Eckford Street. A map of the site boundary is shown in Figure 2. Currently, Lot No. 23 is developed with three vacant connected, one-story commercial buildings that were formerly utilized as an auto part store and service garage, a billiards hall, an antiques retailer and a vacant commercial space with basement. Lot No. 20 is improved with a two-story, two-family residence with basement.

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

The applicant's proposed development consists of an approximately 213,000 gross square foot (gsf) mixed use building to be built on Block 2576, Lots 20 and 23. The building will contain 197 residential units, of which 40 will be affordable units pursuant to the Inclusionary Housing program, and 18,366 square feet of ground floor commercial space. Ground floor uses include a lobby, a lounge, and a library associated with the residential component of the building,

and local retail space. Additionally, the cellar level of the building will have an 18,450 square foot, attended parking garage with 110 parking spaces one floor below-grade. The cellar level will also include storage areas for building tenants as well as bicycle storage. The new building will be approximately 80 feet tall and have 8 above-grade floors. The existing buildings on the site will be demolished to make way for the new construction.

### **Summary of Environmental Findings**

1. Elevation of the property is approximately 17-feet above mean sea level.
2. Depth to groundwater is confirmed at approximately 12-to-14 feet below grade surface (bgs).
3. Groundwater presumably flows from southeast to northwest beneath the Site.
4. Bedrock was not encountered during the PVE Sheffler and VHB subsurface investigations.
5. The stratigraphy of the site, from the surface down, revealed the presence of fill (i.e., brick, asphalt, concrete, etc.) uniformly within the top three-feet, followed by a mixture of light and medium brown sand with traces of gravel within deeper areas. Some additional minor quantities of fill materials were encountered (approximately nine-feet bgs).
6. Soil/fill samples collected during 2014 Phase II and 2014 RI were compared to NYSDEC Unrestricted Use Soil Cleanup Objectives and Restricted Residential Use Soil Cleanup Objectives as presented in 6NYCRR Part 375-6.8 and CP51. No PCBs were detected above Unrestricted Use SCOs. One VOC, Isopropylbenzene (2,600 µg/kg) was found above Restricted Residential Use SCOs in one deep sample. Ten SVOCs, including benz(a)anthracene (maximum of 59,000 µg/kg), benzo(a)pyrene (maximum of 47,000 µg/kg), benzo(b)fluoranthene (maximum of 48,000 µg/kg), benzo(k)fluoranthene (maximum of 23,000 µg/kg) chrysene (maximum of 59,000 µg/kg), dibenz(a,h)anthracene (maximum of 13,000 µg/kg), indeno(1,2,3-cd)pyrene (maximum of 29,000 µg/kg), fluoranthene (maximum 150,000 µg/kg), phenanthrene (maximum 150,000 µg/kg), and pyrene (maximum 150,000 µg/kg) were detected above Restricted

Residential Use SCOs in three shallow and one deep soil samples. Naphthalene (maximum of 16,000 µg/kg) was also detected in one shallow soil sample at a concentration above Unrestricted Use SCOs. Most of elevated SVOCs were detected at sample location VHB SB-3 (0-2' and 14-16'), representing a hot spot. Metals including arsenic (maximum of 25 mg/kg), cadmium (maximum of 2.8 mg/kg), copper (maximum of 980 mg/kg), lead (maximum of 680 mg/kg), mercury (maximum of 1.9 mg/kg), and zinc (maximum of 1000 mg/kg) were detected above Unrestricted Use SCOs in the shallow soil samples. Of these metals, arsenic, lead, and mercury also exceeded Restricted Residential Use SCOs. One pesticide, 4,4-DDE (maximum of 13.8 µg/kg) was detected above Unrestricted Use SCOs in one shallow soil sample.

7. Groundwater samples collected during the 2014 Phase II and 2014 RI were compared to NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (GQS) for Class GA (drinking water). No VOCs, SVOCs, pesticides, or PCBs were detected above the GQS. The dissolved metals antimony (maximum 50.73 µg/L), manganese (maximum 1,078 µg/L), and sodium (maximum 25,600 µg/L) were detected above their respective GQS.
8. Soil vapor samples collected during the 2014 Phase II and 2014 RI were compared to the compounds in Table 3.1 Air Guidance Valued derived by the New York State of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion (October 2006). Soil vapor results detected trace to high levels of petroleum related compounds including BTEX (maximum of 3,290 ug/m<sup>3</sup>), hexane (maximum of 3,900 ug/m<sup>3</sup>), cyclohexane (maximum of 9,100 ug/m<sup>3</sup>), and benzene (maximum of 3,200 ug/m<sup>3</sup>). 1,1,1-Trichloroethane and carbon tetrachloride were not detected in any of the soil vapor samples. The chlorinated solvents tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected in one sample but at concentrations below the monitoring level ranges established within the NYSDOH Final Guidance on Soil Vapor Intrusion.

## 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 required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan;
2. Perform a Community Air Monitoring Program for particulates and volatile organic carbon compounds;
3. Selection of NYSDEC 6NYCRR Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs);
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas;
5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency specified by disposal facility. A Waste Characterization Report documenting sample procedures, location, analytical results and disposal facility(s) approval letters will be submitted to NYCOER prior to the start of the remedial action;
6. Excavation and removal of soil/fill exceeding Unrestricted Use (Track 1) SCOs. For development purposes, the entire property will be excavated to a depth of 11 feet below grade for construction of the new cellar level parking garage and storage areas. A small area will be excavated to depths of 16 feet below grade. Additionally, metals and SVOCs hotspot area near boring SB-3 will be excavated to depths of 16 feet to achieve

Unrestricted Use SCOs. Approximately 20,414 tons of soil will be excavated and removed from this Site;

7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-Site;
8. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials;
9. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations;
10. 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;
11. Collection and analysis of eight end-point samples to determine the performance of the remedy with respect to attainment of SCOs;
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations;
13. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations;
14. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations;
15. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP;

If Track 1 Unrestricted Use SCOs are not achieved, the following construction elements implemented as part of new development will constitute Engineering Controls:

16. As part of new development, construction and maintenance of an engineered composite cover consisting of a 12-inch thick concrete slab building foundation to prevent human exposure to any potential residual soil/fill remaining under the Site;
17. As part of new development, installation of a vapor barrier beneath the building slab and outside foundation sidewalls to street grade. The soil vapor barrier will be installed within the occupiable locations of the building where the subgrade parking garage is not located;
18. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
19. If Track 1 SCOs are not achieved, 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/or Institutional Controls and reporting at a specified frequency; and
20. If Track 1 SCOs are not achieved, Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and Institutional Controls and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

## **Community Protection Statement**

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

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

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

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

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

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

**Site Safety Coordinator.** This project has a designated Site safety coordinator to implement the Health and Safety Plan. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is Stephen Kaplan and can be reached at (631) 787-3400.

**Worker Training.** Workers participating in cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. This pertains to workers performing specific tasks including removing contaminated material and installing cleanup systems in contaminated areas.

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

**Odor, Dust and Noise Control.** This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager Bryan Murty at (631) 787-3400 or NYC Office of Environmental Remediation Project Manager, Alysha Alfieri at (212) 788-8841.

**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 Monday through Friday, 7:00 AM through 5:00 PM.

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

**Complaint Management.** The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager Lyle Kamesaki at (212) 843-3566, the NYC Office of Environmental Remediation Project Manager Alysha Alfieri at (212) 788-8841, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

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

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

**Soil Chemical Testing and Screening.** All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held

instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

**Stockpile Management.** Soil stockpiles, if warranted and allowed, 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 Brooklyn Public Library, Greenpoint Branch, 107 Norman Avenue, Brooklyn, New York.

**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 through a city environmental designation. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

# **REMEDIAL ACTION WORK PLAN**

## **1.0 SITE BACKGROUND**

Stellar Management has applied to enroll in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a property located at 209 and 211-235 McGuinness Boulevard in the Greenpoint 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 209 and 211-235 McGuinness Boulevard in the Greenpoint section in Brooklyn, New York and is identified as Block 2576 and Lot Nos. 20 and 23 on the New York City Tax Map. Figure 1 shows the Site location, with an aerial photograph included as Figure 2, with a property survey provided as Figure 4. The Site is 33,750-square feet and is bounded by a gasoline filling station to the north, a multi-unit residential apartment building with ground-floor retail to the south, McGuinness Boulevard to the east, and multi-family/multi-unit residential uses to the west along Eckford Street. A map of the site boundary is shown in Figure 2. Currently, Lot No. 23 is developed with three vacant connected, one-story commercial buildings that were formerly utilized as an auto part store and service garage, a billiards hall, an antiques retailer and a vacant commercial space with basement. Lot No. 20 is improved with a two-story, two-family residence with basement.

## **1.2 PROPOSED REDEVELOPMENT PLAN**

The applicant's proposed development consists of an approximately 213,000 gsf mixed use building to be built on Block 2576, Lots 20 and 23. The building will contain 197 residential units, of which 40 will be affordable units pursuant to the Inclusionary Housing program, and 18,366 square feet of ground floor commercial space. Ground floor uses include a lobby, a lounge, and a library associated with the residential component of the building, and local retail space. Additionally, the cellar level of the building will have an 18,450 square foot, attended parking garage with 110 parking spaces one floor below-grade. The cellar level will also include storage areas for building tenants as well as bicycle storage. The new building will be approximately 80 feet tall and have 8 above-grade floors. The existing buildings on the site will be demolished to make way for the new construction. Proposed redevelopment plans are included as Figures 3A through 3E.

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

## **1.3 DESCRIPTION OF SURROUNDING PROPERTY**

The site was rezoned from a M1-1 zoning district to R7A, with a C2-4 commercial overlay in 2012. The affected area is in the Greenpoint section of Brooklyn Community District 1. The area surrounding the affected area is mixed use in character, containing residential buildings to the north, south, and west, and industrial/manufacturing, retail commercial uses, as well as parking and transportation uses to the east. North, south, and west of the affected area are row houses and mid-rise apartment buildings. A supermarket with surface parking lot is located directly across McGuinness Boulevard, to the east of the affected area. Other commercial and light industrial uses are located further east.

An M1-1 district covers a large area east of the project site. M1-1 is a light industrial district that permits most commercial uses, manufacturing uses that are fully enclosed and meet high performance standards, and community facilities without sleeping accommodations. Residential development is not permitted. Commercial and manufacturing development is permitted at a floor area ratio (FAR) of 1.0, and community facility development is permitted at an FAR of 2.4. The area along McGuinness Boulevard north of the affected area is zoned R6A. R6A permits

residential and community facility development at 3.0 FAR and typically results in mid-rise apartment building development of six or seven stories, occupying a high percentage of their building lot, and set on or near the street line. The Quality Housing bulk provisions are mandatory in R6A. The area on McGuinness Boulevard south of the affected area is zoned R7A, a medium-density quality housing district. R7A permits residential or community facility development and typically results in high lot coverage, seven or eight-story apartment building.

The blocks west of the affected area are zoned R6B, a quality housing district permitting 2.0 FAR of residential or commercial development. R6B typically produces four- to five-story row houses or apartment buildings.

The aerial photograph on Figure 2 depicts 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, 211 McGuinness Boulevard Mixed-Use Development*” (RIR).

Based upon previous Phase I Environmental Site Assessments (ESAs) completed for the subject property, a portion of Lot 20 was historically developed as a porcelain manufacturing facility dating from 1887 at least 1916. Activities on-site included a machine shop, mixing and molding, porcelain painting, coal storage, and operation of numerous kilns. During the porcelain manufacturing process, various metals may have been used in the glazing processes. Subsequent to initial redevelopment of Lot 20, the northern portion of the parcel was developed as an automobile service facility, which has been operating on the parcel under different ownership since at least 1942.

A history of Lot No. 23 was established dating back to 1887, when the parcel was vacant. By 1905, the parcel was improved with the existing two-story two-family residence with two small accessory structures (likely sheds). Between 1916 and 1942, the accessory sheds were presumably removed and replaced with a one-story detached garage located on the western portions of the subject property. The detached garage is no longer present, but was likely demolished between 2007 and present.

The Areas of Concern identified in the Phase I ESAs produced for the respective parcels include portions of the site where underground storage tanks (USTs) were previously located, along with areas along the northern portions of the subject property proximate to the adjacent gasoline filling station. Furthermore, given the historically industrial nature of the subject and surrounding properties, a potential for soil, groundwater and soil vapor impacts at the subject property was identified.

Given the potential for subsurface impacts, the following subsurface investigations were performed by PVE Sheffler, LLC (PVE Sheffler) on Lot No. 20:

- Installation of five soil borings in areas where potential subsurface impacts could be identified.
- Installation of three temporary groundwater monitoring wells for collection and analysis of groundwater samples.
- Collection of three (3) sub-slab soil vapor samples for analysis for vapor intrusion.

### **Summary of Environmental Findings**

Based upon the results of the PVE Sheffler subsurface investigation, along with consultation with the New York City Office of Environmental Remediation (NYCOER), VHB conducted a supplemental subsurface investigation on Lot No. 20, along with additional subsurface investigations on Lot No. 23 to satisfy the E-Designation requirements for HazMat. An NYCOER-approved short form Work Plan outlined the following supplemental and additional subsurface investigations:

1. Installation of five (5) soil borings installed at the site at approved locations to supplement PVE Sheffler's initial sample data, with two multi-depth soil samples collected from each soil boring location.
2. Collection of one groundwater sample from a centralized soil boring location.
3. One sub-slab soil vapor sample collected within a centralized location on Lot No. 20.
4. Elevation of the property is approximately 17-feet above mean sea level.

5. Depth to groundwater is confirmed at approximately 12-to-14 feet below grade surface (bgs).
6. Groundwater presumably flows from southeast to northwest beneath the Site.
7. Bedrock was not encountered during the PVE Sheffler and VHB subsurface investigations.
8. The stratigraphy of the site, from the surface down, revealed the presence of fill (i.e., brick, asphalt, concrete, etc.) uniformly within the top three-feet, followed by a mixture of light and medium brown sand with traces of gravel within deeper areas. Some additional minor quantities of fill materials were encountered (approximately nine-feet bgs).
9. Soil/fill samples collected during 2014 Phase II and 2014 RI were compared to NYSDEC Unrestricted Use Soil Cleanup Objectives and Restricted Residential Use Soil Cleanup Objectives as presented in 6NYCRR Part 375-6.8 and CP51. No PCBs were detected above Unrestricted Use SCOs. One VOC, Isopropylbenzene (2,600 µg/kg) was found above Restricted Residential Use SCOs in one deep sample. Ten SVOCs, including benz(a)anthracene (maximum of 59,000 µg/kg), benzo(a)pyrene (maximum of 47,000 µg/kg), benzo(b)fluoranthene (maximum of 48,000 µg/kg), benzo(k)fluoranthene (maximum of 23,000 µg/kg) chrysene (maximum of 59,000 µg/kg), dibenz(a,h)anthracene (maximum of 13,000 µg/kg), indeno(1,2,3-cd)pyrene (maximum of 29,000 µg/kg), fluoranthene (maximum 150,000 µg/kg), phenanthrene (maximum 150,000 µg/kg), and pyrene (maximum 150,000 µg/kg) were detected above Restricted Residential Use SCOs in three shallow and one deep soil samples. Naphthalene (maximum of 16,000 µg/kg) was also detected in one shallow soil sample at a concentration above Unrestricted Use SCOs. Most of elevated SVOCs were detected at sample location VHB SB-3 (0-2' and 14-16'), representing a hot spot. Metals including arsenic (maximum of 25 mg/kg), cadmium (maximum of 2.8 mg/kg), copper (maximum of 980 mg/kg), lead (maximum of 680 mg/kg), mercury (maximum of 1.9 mg/kg), and zinc (maximum of 1000 mg/kg) were detected above Unrestricted Use SCOs in the shallow soil samples. Of these metals, arsenic, lead, and mercury also exceeded Restricted Residential Use SCOs. One pesticide, 4,4-

DDE (maximum of 13.8 µg/kg) was detected above Unrestricted Use SCOs in one shallow soil sample.

10. Groundwater samples collected during the 2014 Phase II and 2014 RI were compared to NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (GQS) for Class GA (drinking water). No VOCs, SVOCs, pesticides, or PCBs were detected above the GQS. The dissolved metals antimony (maximum 50.73 µg/L), manganese (maximum 1,078 µg/L), and sodium (maximum 25,600 µg/L) were detected above their respective GQS.
11. Soil vapor samples collected during the 2014 Phase II and 2014 RI were compared to the compounds in Table 3.1 Air Guidance Valued derived by the New York State of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion (October 2006). Soil vapor results detected trace to high levels of petroleum related compounds including BTEX (maximum of 3,290 ug/m<sup>3</sup>), hexane (maximum of 3,900 ug/m<sup>3</sup>), cyclohexane (maximum of 9,100 ug/m<sup>3</sup>), and benzene (maximum of 3,200 ug/m<sup>3</sup>). 1,1,1-Trichloroethane and carbon tetrachloride were not detected in any of the soil vapor samples. The chlorinated solvents tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected in one sample but at concentrations below the monitoring level ranges established within the NYSDOH Final Guidance on Soil Vapor Intrusion.

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

## **2.0 REMEDIAL ACTION OBJECTIVES**

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

### **Groundwater**

- Prevent direct exposure to groundwater impacted with heavy metals.

### **Soil**

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

### **Soil Vapor**

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

### 3.0 REMEDIAL ALTERNATIVES ANALYSIS

The goal of the remedy selection process is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing Remedial Action Objectives (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 ten criteria:

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

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

Alternative 1 involves:

- Selection of NYSDEC 6NYCRR Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
- Removal of all soil/fill exceeding Unrestricted Use SCOs throughout the Site and confirmation that Unrestricted Use SCOs have been achieved with post-excavation endpoint sampling. If soil/fill-containing analytes at concentrations above Unrestricted Use SCOs is still present at the base of the excavation after removal of all soil required for construction of the new parking garage is complete, additional excavation will be

performed to ensure complete removal of soil that does not meet Track 1 Unrestricted Use SCOs.

- No Engineering or Institutional Controls are required for a Track 1 cleanup but a vapor barrier would be installed beneath the slab of the ventilated garage to prevent any potential future exposures from off-Site soil vapor.
- As part of development, placement of a final cover over the entire Site.

Alternative 2 involves:

- Establishment of Site-Specific (Track 4) SCOs
- Removal of all soil/fill exceeding Track 4 Site-Specific SCOs and confirmation that Track 4 has been achieved with post-excavation endpoint sampling. Excavation for the new development would take place to a depth of 10-feet 9.5-inches below ground surface, with an additional 5-feet eight-inches for two elevator shafts. However, if soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation after removal of all soil required for construction of the new parking garage is complete, additional excavation will be performed to meet Track 4 Site-Specific SCOs.
- Placement of a final cover over the entire Site to prevent exposure to remaining soil/fill.
- Installation of a soil vapor barrier beneath the parking garage to prevent any potential future exposures from off-Site soil vapor.
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site; prohibitions of sensitive Site uses, such as farming or vegetable gardening, to prevent future exposure pathways; and prohibition of a higher level of land use without OER approval.
- Establishment of an approved Site Management Plan (SMP) to ensure long-term management of these Engineering and Institutional Controls including the performance of periodic inspections and certification that the controls are performing as they were intended. The SMP will note that the property owner and the property owner's successors and assigns must comply with the approved SMP.

### **3.1 THRESHOLD CRITERIA**

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

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

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

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

For both Alternatives, potential exposure to the contaminated soils or groundwater during construction would be minimized by implementing a Construction Health and Safety Plan (CHASP), an approved Soil/Materials Management Plan, and Community Air Monitoring Plan (CAMP). Potential use of groundwater for potable supply would be prevented as its use is prohibited by city laws and regulations and groundwater is present, at a minimum 12 to 14 feet below grade and probably, will not be encountered during development. Potential future migration of off-Site soil vapors would be prevented by installing a vapor barrier below the new ventilated parking garage located throughout Site. The subgrade parking garage will be built and ventilated per requirements of NYC Building Department codes.

## **3.2. BALANCING CRITERIA**

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

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

Alternative 1 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to achieve Track 1 Unrestricted Use SCOs and Groundwater Protection Standards. Compliance with SCGs for soil vapor would also be achieved by installing a vapor barrier beneath the new building foundation at below-grade portions other than the proposed parking garage by operation of the new ventilated parking area per requirements of the NYC Building Department's codes. As part of development, a 12-inch thick bottom concrete slab will prevent human exposure to residual soil/fill remaining under the Site.

Alternative 2 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to meet Track 4 Site-Specific SCOs. Compliance with SCGs for soil vapor would also be achieved by installing a vapor barrier beneath the new building foundation at below-grade portions other than the proposed parking garage and by construction and operation of the new ventilated parking area per requirements of the NYC Building Department's codes. A Site Management Plan would ensure that these controls remained protective for the long term.

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

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

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on public health and the environment during

implementation of the remedial action, including protection of the community, environmental impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

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

An additional short-term adverse impact and risks to the community associated with both remedial alternatives is increased truck traffic. Approximately 800, 25-ton capacity truck trips would be necessary to transport fill and soil excavated during Site development. Truck traffic will be routed on the most direct course using major thoroughfares where possible and flaggers will be used to protect pedestrians at Site entrances and exits.

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

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

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

Alternative 1 would achieve long-term effectiveness and permanence related to on-Site contamination by permanently removing all impacted soil/fill above Track 1 Unrestricted Use SCOs. As such, no long term impacts are expected, and no on-site controls would be required. Additionally, the proposed development plan includes the installation of a cover system and vapor barrier which would prevent potential future migration of soil vapors into the garage.

Alternative 2 would provide long-term effectiveness by removing most on-Site contamination and attaining Track 4 Site-Specific SCOs, by establishing Engineering Controls including a composite cover system across the Site; placing a vapor barrier and a composite cover system across the Site, establishing use restrictions, establishing an SMP to ensure long-term management Institutional Controls (ICs) Engineering Controls (ECs), and implementing a deed restriction to memorialize these controls for the long term. Implementation of a Site Management Plan (SMP) will effectively manage long-term Institutional Controls by requiring periodic inspections to ensure the long-term success of the remedy. The SMP would ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as they were intended, assuring that protections designed into the remedy will provide continued high level of protection in perpetuity.

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

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

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

With regard to Alternative One, all contaminated soils would be removed in order to achieve the most conservative NYSDEC Part 375 Track One Unrestricted Use SCOs. As such, all elements of toxicity and point-source contaminants would be eliminated at the Site.

Implementation of Alternatives Two would result in a reduction of toxicity, mobility and volume of contaminated media to the maximum extent practicable to concentrations within the respective SCOs, thereby minimizing or effectively eliminating exposure to future site occupants.

## **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 proposed remedial action described herein under Alternatives One, and Two (i.e., excavation and off-site removal of impacted media) have been proven effective as the best and most feasible means to reduce or eliminate impacted soils to the maximum extent practicable. The techniques, materials and equipment to implement both alternatives are readily available, feasible, implementable, and have been proven effective in remediating the contaminants associated with the Site. They use standard materials and services and well-established

technology. The reliability of each remedy is high. There are no special difficulties associated with any of the activities proposed.

### **Cost effectiveness**

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

Since historic fill at the Site was found during the RI to extend to a depth of 3 feet and the new development calls for the excavation and removal of soil to the depth of more than 11 feet below grade within the proposed parking garage footprint, the costs associated with both Alternative 1 and Alternative 2 will likely be comparable. If additional soil/fill with analytes above Track 1 Unrestricted Use SCOs but below Track 4 Site-Specific SCOs remains after excavation for the new garage, long-term costs for Alternative 2 would likely be higher than Alternative 1 based on implementation of a Site Management Plan as part of Alternative 2.

### **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.

As a condition of the NYC VCP and E-Designation program, a public review of this RAP is required. As such, any public or community input that would facilitate additional community acceptance without compromising the goals of the proposed Site redevelopment will be considered. Based on the overall goals of the remedial program and initial permitting associated with the proposed site development, no adverse community opinion is anticipated for either alternative. This RAWP will be subject to a public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternative and the selected remedy. This public comment will be considered by OER prior to approval of this plan. The Citizen Participation Plan for the project is provided in Appendix 1.

## **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 Site was rezoned for residential uses by the New York City Planning Commission in November 2012 and the associated Environmental Analysis with respect to Land Use and Zoning was evaluated at that time. Based upon rezoning, the subject property was listed as an E-Designated site. In order to comply with the Site's E-Designation, site investigations with respect to hazardous materials are being conducted in accordance with the E-Designation program. The remedial action alternatives provided herein would eliminate (Alternative One) or greatly reduce (Alternatives Two) public exposure to impacted media at the Site. Both alternatives for remedial action at the Site are comparable with respect to the proposed use and to land uses in the vicinity of the Site. Improvements in the current environmental condition of the property achieved by the alternatives are also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse.

## **Sustainability of the Remedial Action**

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

and promotion of the use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

In addition to remediation at the site, there are also sustainability benefits from each of the three proposed alternatives. As part of each alternative, where feasible, all soils which are determined to be “non-impacted” or “minimally impacted” within Track One or Track four SCOs will be eligible for soil banking as part of the NYC VCP. Under the soil banking program, soils would be re-used, if feasible, on alternate sites deemed appropriate by NYCOER, thereby reducing landfill disposal capacity along with reduced truck travel. Implementation of Alternatives Two and Three would also efficiently reduce energy consumption by reducing the volume of material generated from the Site.

## **4.0 REMEDIAL ACTION**

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

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

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and implementation of required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan;
2. Perform a Community Air Monitoring Program for particulates and volatile organic carbon compounds;
3. Selection of NYSDEC 6NYCRR Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs);
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas;
5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency specified by disposal facility. A Waste Characterization Report documenting sample procedures, location, analytical results and disposal facility(s) approval letters will be submitted to NYCOER prior to the start of the remedial action;
6. Excavation and removal of soil/fill exceeding Unrestricted Use (Track 1) SCOs. For development purposes, the entire property will be excavated to a depth of 11 feet below grade for construction of the new cellar level parking garage and storage areas. A small

area will be excavated to depths of 16 feet below grade. Additionally, metals and SVOCs hotspot area near boring SB-3 will be excavated to depths of 16 feet to achieve Unrestricted Use SCOs. Approximately 20,414 tons of soil will be excavated and removed from this Site;

7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-Site;
8. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials;
9. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations;
10. 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;
11. Collection and analysis of six end-point samples to determine the performance of the remedy with respect to attainment of SCOs;
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations;
13. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations;
14. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations;

15. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP;

If Track 1 Unrestricted Use SCOs are not achieved, the following construction elements implemented as part of new development will constitute Engineering Controls:

16. As part of new development, construction and maintenance of an engineered composite cover consisting of a 12-inch thick concrete slab building foundation to prevent human exposure to any potential residual soil/fill remaining under the Site;
17. As part of new development, installation of a vapor barrier beneath the building slab and outside foundation sidewalls to street grade. The soil vapor barrier will be installed within the occupiable locations of the building where the subgrade parking garage is not located;
18. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
19. If Track 1 SCOs are not achieved, 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/or Institutional Controls and reporting at a specified frequency; and
20. If Track 1 SCOs are not achieved, Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and Institutional Controls and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

## 4.2 SOIL CLEANUP OBJECTIVES AND SOIL/FILL MANAGEMENT

Track One Unrestricted Use Soil Cleanup Objectives (SCOs) are proposed for this project. Track One and Track Two SCOs for this Site are listed on Table 1 . If Track 1 Unrestricted Use SCOs are not achieved, the 6NYCRR Part 375, Table 6.8(b) Track 2 Restricted Residential SCOs will be used as amended by the following Site-Specific (Track 4) SCOs:

<b>Total SVOCs:</b>	500 parts per million (ppm)
<b>Arsenic:</b>	23 ppm
<b>Lead:</b>	1,000 ppm
<b>Mercury:</b>	2 ppm

Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix 3. Planned excavation areas and depths will be contingent on waste characterization samples that will be provided to NYCOER upon completion.

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.

Based upon the sample results conveyed in the RIR, one “hot spot” was identified within AOC 3 (within the location of sample VHB SB-3). As described in the RIR, this area was identified where former tanks were located associated with the previous retail and auto repair tenants. A site map depicting Areas of Concern is provided as Figure 5 of this RAWP.

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

The total quantity of soil/fill expected to be excavated and disposed off-Site is approximately 20,414 tons. However, this estimate is subject to revision based upon site conditions.

At the issuance of this RAP, waste characterization sampling at the site was pending. As such, appropriate disposal facilities have not yet been determined. Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.

## **End-Point Sampling**

Removal actions for development purposes under this plan will be performed in conjunction with confirmation soil sampling. As required by NYCOER, six (6) confirmation samples will be collected from the base of the excavation at locations to be determined by NYCOER and the applicant. For comparison to Track 1 SCOs, analytes will include VOCs, SVOC, pesticides, PCBs and metals according to analytical methods described below. For comparison to Track Two SCOs and Track 4 SSCOs, as determined by NYCOER, only SVOCs and metals are required to be tested.

Hot-spot removal actions, whether established under this RAWP or identified during the remedial program, will be performed in conjunction with post remedial end-point samples to ensure that hot-spots are fully removed. Analytes for end-point sampling will be those parameters that are driving the hot-spot removal action and will be approved by OER. For the Site, one “hot spot” was identified within the location of sample VHB SB-3 (or Area of Concern 3). Based upon the laboratory results summarized in the RIR, one (1) additional endpoint sample will be collected within the area of VHB SB-3 will be analyzed SVOCs and metals. Frequency for hot-spot end-point sample collection is as follows:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.
2. For excavations 20 to 300 feet in perimeter:
  - For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
  - For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
3. For sampling of volatile organics, bottom samples should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches.

4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

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

New York State ELAP certified labs will be used for all confirmation and end-point sample analyses. Labs performing confirmation and end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all confirmation and end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. End-point samples will be Confirmation samples will be analyzed for compounds and elements as described above utilizing the following methodology:

Soil analytical methods will include:

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

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

Figure 6 depicts proposed endpoint sample locations. However, endpoint sample locations are subject to change based upon waste characterization samples and depth of hot spot excavation.

## **Quality Assurance/Quality Control**

Industry standards will be employed when collecting and transporting endpoint samples for laboratory analysis for quality assurance and quality control measures. Endpoint samples will consist of hand/grab samples utilizing with appropriate hand protection, or using a stainless steel hand auger, shovel and/or trowel that will be decontaminated between each use. Sampling equipment will be decontaminated between uses with a detergent solution (Alconox and potable water) and potable water rinse. Endpoint samples will be collected and field screened with a PID for the presence of VOCs. Endpoint samples will be further characterized and placed directly into laboratory-supplied glassware. Upon collection, the samples will be placed into a cooler packed with ice and stored at a temperature of 4° Celsius pending transport for laboratory analysis. Soil samples will be transported to the respective laboratory under appropriate chain-of-custody protocols via overnight carrier or laboratory courier.

As an added QA/QC measure, one blind duplicate sample will be collected, if needed to assess laboratory artifacts. Should trip blanks be recommended, same will be utilized during collection of VOC endpoint 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 Appendix 3. Given the redevelopment plans involve a proposed sub-grade parking structure and additional basement areas, there are currently no plans to import soils at the Site. However, should the need to import soils at the site be required, the estimated tonnage of soils proposed for import and/or re-use will be provided to NYCOER.

## **4.3 ENGINEERING CONTROLS**

The excavation required for the proposed Site development will achieve Track 1 Unrestricted Use SCOs. Track 1 remedial actions do not require Engineering Controls for soils. However, the following elements below will be incorporated into the foundation design as part of the development: s:

- composite cover system consisting of a 12” concrete pressure slab;

- soil vapor barrier; and
- A ventilated garage.

### **Composite Cover System**

Exposure to residual soil/fill will be prevented by an engineered, 12” concrete building slab.

Exposure to residual soil/fill will be prevented by an engineered, composite cover system to be built on the Site. This composite cover system is comprised of a minimum 12” thick concrete slab.

Figure 3E depicts the proposed building foundation and footings within the lower level (basement/cellar).

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**

Migration of soil vapor will be mitigated with a combination of building slab and vapor barrier. Based upon consultation and as required by NYCOER, a minimum 20-mm. waterproofing/vapor barrier will be installed beneath the occupiable portions of the building basement slab and along the sidewalls of the building basement in accordance with manufacturer specifications in order to mitigate a potential vapor encroachment condition in the new building at the Site. Design specifications of the vapor barrier system will be provided to NYCOER prior to the start of remedial action.

It should be noted that based upon discussions with NYCOER, a vapor barrier will not be required within the locations of the proposed sub-grade parking garage areas due to sub-grade parking garage ventilation requirements. Furthermore, as groundwater will likely be

encountered during excavation activities, in accordance with consultation with NYCOER, no sub-slab depressurization system (SSDS) will be required for the Site.

It should be noted that the design and specifications of the vapor barrier to be installed have not yet been determined. Furthermore, the vapor barrier must be designed in support of a moisture barrier for portions of the building cellar. Supporting documentation regarding the design and specifications of the vapor barrier will be provided to NYCOER for approval prior to commencement of remedial action.

The project's Professional Engineer licensed by the State of New York will have primary direct responsibility for overseeing the implementation of the vapor barrier. The extent of the proposed vapor barrier membrane is provided in Figure 3A. Design specifications are included in Appendix 5.

The Remedial Action Report will include photographs (maximum of two photos per page) of the installation process, PE/RA certified letter (on company letterhead) from primary contractor responsible for installation oversight and field inspections, and a copy of the manufacturer's certificate of warranty.

### **Ventilated Garage**

The proposed development includes a sub grade ventilated garage which will be operated per requirements of the New York City Department of Buildings codes and regulations.

## **4.4 INSTITUTIONAL CONTROLS**

Currently, the goal of this RAP is to achieve NYSDEC Part 375 Track One UUSCOs. Track One remedial actions do not require Engineering Controls with the exception of the required soil vapor barrier to be installed beneath the building foundation. However, should Track One UUSCOs not be achieved or deemed feasible due to field conditions, Institutional Controls (IC) will be utilized 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 implemented under a site-specific Site Management Plan (SMP) that will be included in the RAR.

Institutional Controls for this remedial action are:

- The property will continue to be registered with an E-Designation by the NYC Buildings Department. This RAWP includes a description of all ECs and ICs and summarizes the requirements of the Site Management Plan which will note that the property owner and property owner's successors and assigns must comply with the approved SMP;
- Submittal of a Site Management Plan in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, 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 by OER in the SMP and will comply with RCNY §43-1407(1)(3).
- Vegetable gardens and farming on the Site are prohibited in contact with residual soil materials;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use;
- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP;
- The Site will not be used for a higher level of use without prior approval by OER.

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

Site Management is the last phase of remediation and begins with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial

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

Site Management is not required for Track 1 remedial actions. However, if Track 1 SCOs are not achieved, Site Management will be the last phase of remediation and begins with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial Action. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by this RAWP. The Site Management Plan is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the Site Management Plan are implemented.

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

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

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

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the

COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur.

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

### **Known and Potential Sources**

Based upon the results of the subsurface investigations performed at the Site, and as summarized in the RIR, soil and soil vapor impacts were identified at the site. Elevated concentrations of metals were also identified in groundwater samples at the Site. These impacts are summarized as follows:

#### Soil Samples

- One VOC, Isopropylbenzene (2,600 µg/kg) was found above Restricted Residential Use SCOs in one deep sample.
- SVOCs, including benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, fluoranthene, phenanthrene, and pyrene were detected above Restricted Residential Use SCOs in three shallow and one deep soil samples. Most of elevated SVOCs were detected at sample location VHB SB-3 (0-2' and 14-16'), representing a hot spot.
- Metals including arsenic, lead, and mercury exceeded Restricted Residential Use SCOs.

#### Groundwater

- No VOCs, SVOCs, pesticides, or PCBS were detected above the GQS.

- Several metals were identified, but only antimony, manganese, and sodium were detected above their respective GQS.

### Soil Vapor

- Soil vapor results detected trace to high levels of petroleum related compounds.
- The chlorinated solvents tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected at trace concentrations, below the monitoring level ranges established within the NYSDOH Final Guidance on Soil Vapor Intrusion.

### AOCs

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

As previously indicated, shallow and deeper soil impacts were identified at the Site. These impacts were characterized into representative AOCs which are included in Figure 5 of this RAP. The soil impacts are described, by AOC, below:

AREA 1: Corresponds to sample VHB SB-1 in the RIR. Shallow SVOC and metal impacts were identified that exceeded both Track One and Track Two SCOs. Metal impacts (lead and mercury) were identified at concentrations that exceeded NYSDEC Part 375 Track One UUSCOs within deeper soils at 8'-10' bgs.

AREA 2: Corresponds to sample VHB SB-2. Shallow SVOC and metals impacts were identified that exceed both Track One and Track Two SCOs. Only the metal Aluminum was detected in deeper soils at an elevated concentration that exceeded applicable NYSDEC CP-51 concentrations.

AREA 3: Corresponds to sample VHB SB-3. Shallow and deep SVOC concentrations were detected that exceed Track One and Track Two SCOs. Based upon consultation with NYCOER, Area 3 constitutes a "hot spot." Shallow metal impacts were also identified in these areas. Area 3 will be excavated down to the terminal excavation depth, and beyond in order to potentially achieve Track One or Track Two SCOs. If not feasible, Track 4 SSCOs will be employed at Area 3.

AREA 4: Corresponds to sample VHB SB-4. Metal impacts were identified in shallow soils that exceed NYSDEC Part 375 Track Two RUSCOs. No deeper soil impacts were identified at this location that exceed Track One UUSCOs.

AREA 5: Corresponds to sample VHB SB-5. One pesticide (4'4-DDE) was detected above Track Two concentrations in shallow soils. Furthermore, two metals (calcium and mercury) were identified at concentrations that exceed Track Two concentrations. No additional shallow or deeper impacts were identified in Area 5.

Metals and SVOC detected in soils were not found in groundwater or in soil vapor.

### **Potential Routes of Exposure**

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

1. Ingestion of groundwater or fill/soil
2. Inhalation of vapors or particulates
3. Dermal absorption of groundwater or fill/soil

### **Existence of Human Health Exposure**

Currently, there are no existing site conditions which human exposure to on-site contaminants are present. Implementation of this RAP will either eliminate or greatly minimize the potential for human exposure to existing subsurface impacts at the Site.

### **Receptor Populations**

There are two populations of receptors, on-site and off-site. These two populations are characterized as follows:

On-Site Receptors: During remedial action and construction, on-site receptors include on-site construction workers and contractors, inspectors and other visitors to the Site. Post redevelopment on-site receptors include on-site workers, permanent and part-time maintenance/superintendent staff and on-site residents.

Off-Site Receptors: Off-site receptors during and post redevelopment include pedestrians, neighborhood residents, commercial, residential and industrial workers in the nearby community.

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

Based upon this analysis, exposure pathways are minimized due to the presence of on-site buildings and existing building foundations. The potential exposure pathways appear to exist only during current conditions and during the remedial action phase. However, the Site is currently underutilized and is proposed for redevelopment. Redevelopment of the Site includes a mixed-use building with residential units, site-wide impervious surface cover cap and a subsurface vapor barrier system. Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There are no surface waters in close proximity to the Site that could be impacted or threatened.

During the remedial action, on-site exposure pathways will be eliminated or minimized to the maximum extent practicable by preventing access to the Site, through implementation of soil/materials management, storm water pollution prevention, dust controls, employment of a community air monitoring plan, and implementation of a Construction Health and Safety Plan. After the remedial action is complete, there will be no remaining exposure pathways to on-Site soil/fill, as soils will be removed to achieve Track 4 SCOs, and the Site will also be fully covered with the concrete building slab which will prevent contact with any residual soils. Any exposures to vapors from off-site sources will be prevented by installation of a vapor barrier and by construction and operation of a ventilated parking garage.

## **5.0 REMEDIAL ACTION MANAGEMENT**

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

Principal personnel who will participate in the remedial action will be Lyle Kamesaki of Stellar Management. The Professional Engineer (PE) and Qualified Environmental Professionals (QEP) for this project are Kevin Walsh, P.E. and Stephen Kaplan, Senior Project Manager and Bryan Murty, Project Manager of VHB as QEPs.

### **5.2 SITE SECURITY**

Site security will be handled in accordance with applicable regulations as set forth by the New York City Department of Buildings and other relevant agencies. Site security will likely involve the construction of perimeter fencing with one, or several entry points of secure access along McGuinness Boulevard.

### **5.3 WORK HOURS**

The hours for operation of remedial construction will be from 7:00 AM to 5:00 PM. These hours conform to the New York City Department of Buildings construction code requirements.

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

The Health and Safety Plan is included in Appendix 4. The Site Safety Coordinator will be Stephen Kaplan. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations. The HASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour

refresher training. Site Safety Officer will be responsible for maintaining workers training records.

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

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

## **5.5 COMMUNITY AIR MONITORING PLAN**

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

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. 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.

## **Dewatering**

As groundwater will likely be encountered as part the proposed foundation and elevator shaft installation, dewatering activities will be required. Given the confirmed impacts to groundwater relating to total metals, same will require proper management and handling during dewatering. All groundwater will be purged and stored into 10,000-gallon aboveground frac tanks that will be stored on-site pending off-site disposal. Purged groundwater will be characterized, manifested and disposed at an approved facility capable of accepting same. Facility information will be provided to NYCOER prior to commencement of remedial action.

## **Equipment and Material Staging**

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

## **Stabilized Construction Entrance**

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

## **Truck Inspection Station**

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

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

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of site structures and construction materials and equipment, and dislocation

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

### **Storm Preparedness**

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from holes, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and fortified, including, as necessary: clean and reposition silt fences, haybales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

### **Storm Response**

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to OER at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911. Petroleum spills will be reported to NYS DEC within 2 hours of identification and consistent with State regulations. Emergency and spill conditions will also be reported to OER. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed. Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency

notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will be collected and appropriately managed. Support of excavation structure will be inspected and fortified as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Storm-water control systems and structures will be inspected and maintained as necessary. If soil or fill materials are discharged off site to adjacent properties, property owners and OER will be notified and corrective measure plan designed to remove and clean dislocated material will be submitted to OER and implemented following approval by OER and granting of site access by the property owner. Impacted offsite areas may require characterization based on site conditions, at the discretion of OER. If onsite petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYS DEC's spill hotline at DEC 800-457-7362. If the source of the spill is ongoing and can be identified, it should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYS DEC.

### **Storm Response Reporting**

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

## **5.8 TRAFFIC CONTROL**

Drivers of trucks leaving the NYC VCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site is heading south on McGuinness Boulevard for approximately 0.75 miles to the Brooklyn-Queens Expressway (BQE; a.k.a. Interstate 278 [I-278]). The proposed truck route is included as Figure 7.

## **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;
- Quantity of groundwater purged into on-site frac tanks during dewatering;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP excursions, if any;
- Photograph of notable Site conditions and activities.

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

### **Record Keeping and Photo-Documentation**

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

### **5.11 COMPLAINT MANAGEMENT**

All complaints from citizens will be promptly reported to OER. Complaints will be addressed and outcomes will also be reported to OER in daily reports. Notices to OER will

include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

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

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

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

## 6.0 REMEDIAL ACTION REPORT

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

- Information required by this RAWP;
- As-built drawings for all constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy;
- Site Management Plan (if Track 1 is not achieved);
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results and all material characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action 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.
- Continue registration of the property with an E-Designation by the NYC Department of Buildings.

- 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:

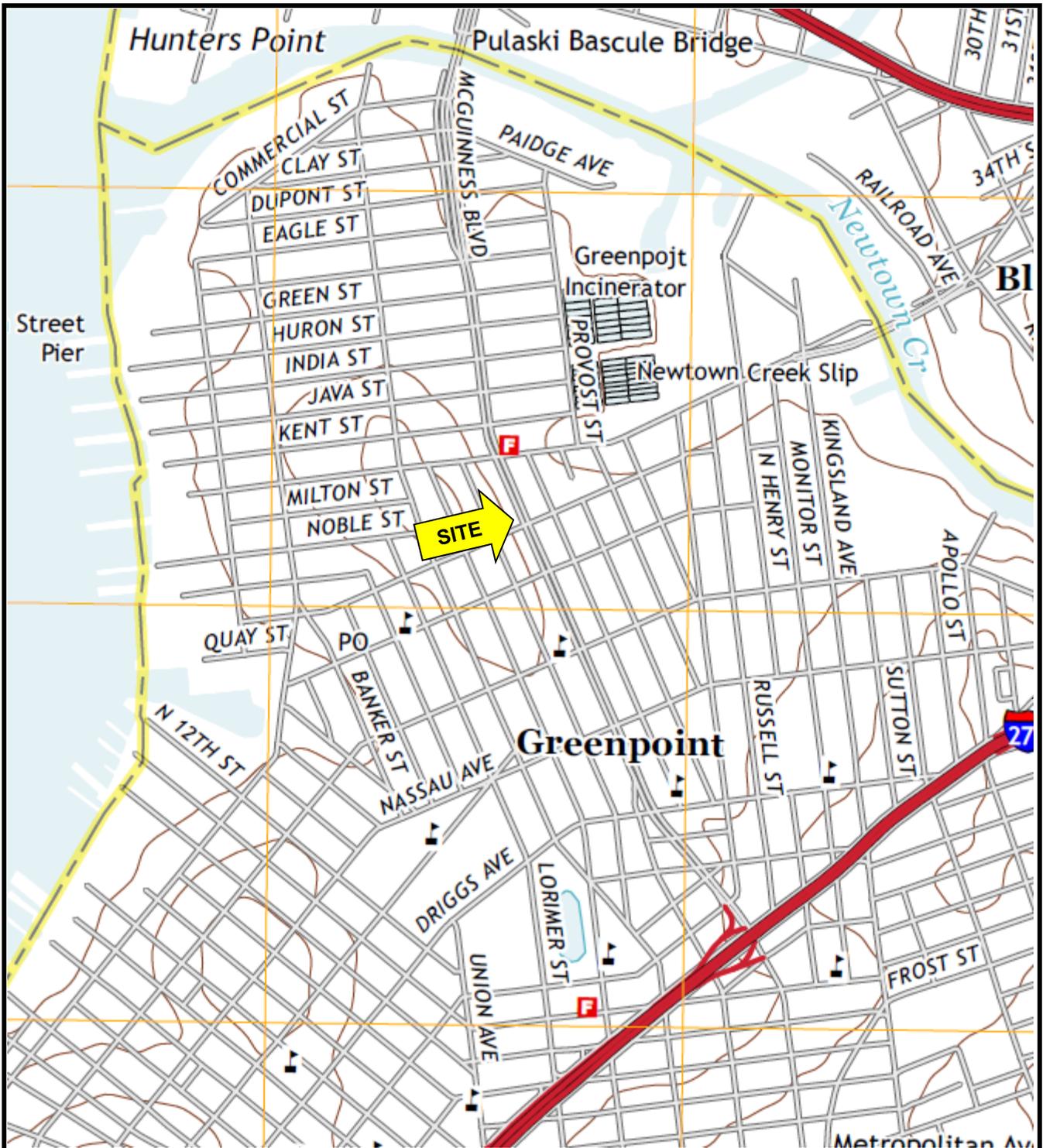
*I, Kevin Walsh, am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 211 McGuinness Boulevard Mixed-Use Development Site 15RAN236K.*

*I, Stephen Kaplan, am a qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the 211 McGuinness Boulevard Mixed-Use Development Site 15RHAN236K. I certify that the OER-approved Remedial Action Work Plan dated March \_\_\_\_, 2015 and Stipulations in a letter dated month day, year; if any were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.*

## 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 four month remediation period is anticipated.

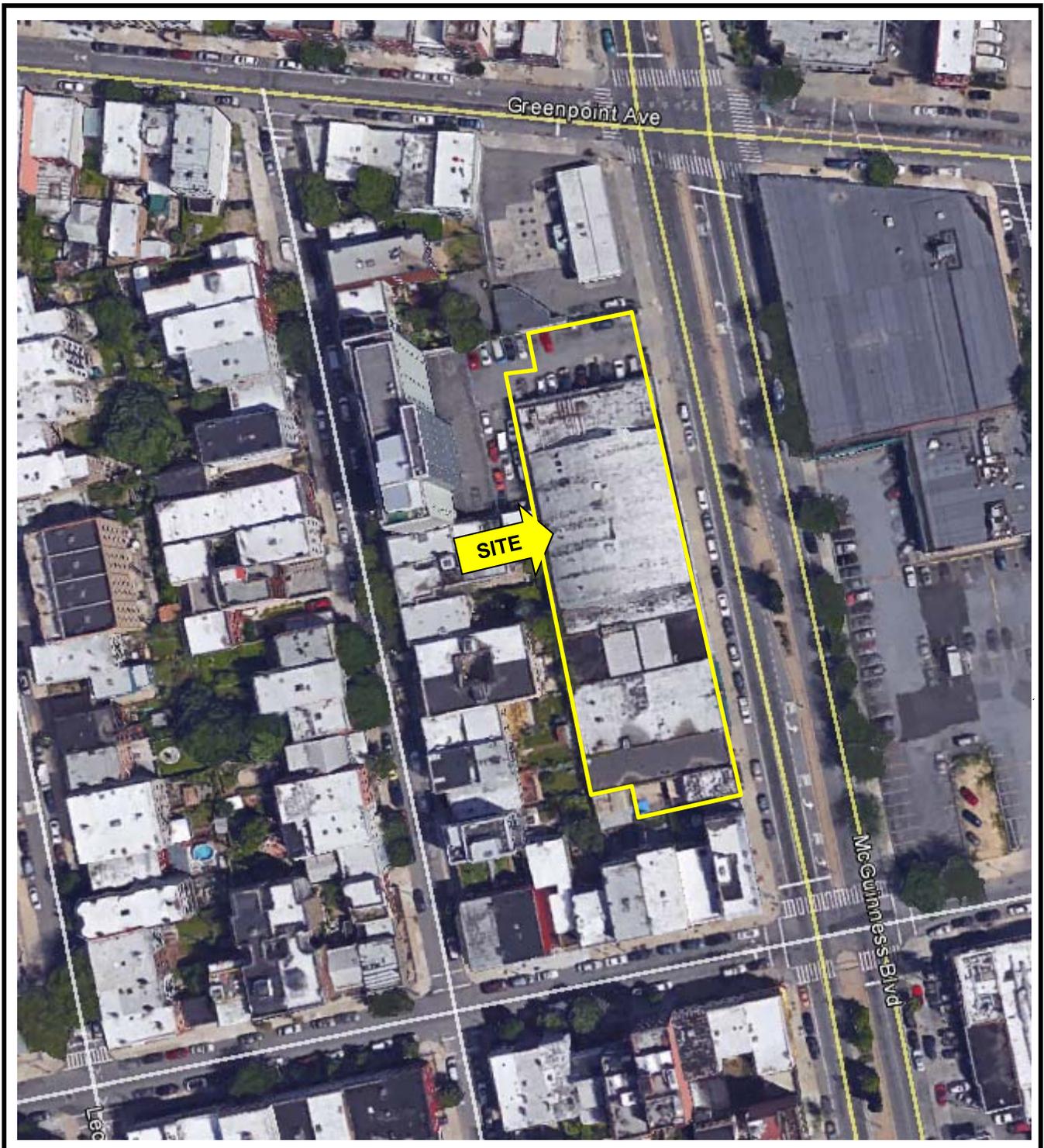
<b>Schedule Milestone</b>	<b>Weeks from Remedial Action Start</b>	<b>Duration (weeks)</b>
OER Approval of RAWP	1	-
Fact Sheet 2 announcing start of remedy	1	-
Mobilization	1	1
Remedial Excavation	1	5
Demobilization	6	1
Submit Remedial Action Report	12	2



**FIGURE 1 – SITE LOCATION MAP**

**SITE NAME:** Mixed-Use Properties  
**STREET ADDRESS** 209, 211-235 McGuinness Boulevard  
**CITY, STATE, ZIP:** Brooklyn, New York 11222  
**PROJECT NUMBER:** 29345.00  
**SOURCE:** United States Geological Survey





**FIGURE 2 – SITE AERIAL**

**SITE NAME:** Mixed-Use Properties  
**STREET ADDRESS** 209, 211-235 McGuinness Boulevard  
**CITY, STATE, ZIP:** Brooklyn, New York 11222  
**PROJECT NUMBER:** 29345.00  
**SOURCE:** Google Earth













**AREA:**  
TOTAL AREA=33,750.00 SQ. FT  
=0.7748 ACRE

**ZONING:**  
THE PROPERTY LIES IN ZONE C2-4

THE NEAREST SUBWAY IS MORE THAN 200' AWAY

- NOTES:**
- ALL ELEVATIONS SHOWN HEREON REFERS TO NAVD83 DATUM.
  - ALL SUBSURFACE UTILITIES SHOWN HEREON WERE OBTAINED FROM CITY DEPARTMENTS & PRIVATE UTILITY COMPANIES & THE LOCATION OF SAID UTILITIES ARE APPROXIMATE ONLY & NOT GUARANTEED BY THE SURVEYOR. CONSULT APPROPRIATE DEPARTMENT OR COMPANY BEFORE DESIGNING ANY CONNECTIONS.
  - NONVISIBLE EASEMENTS, RECORDED OR UNRECORDED, ARE NOT SHOWN.
  - ESTABLISHED GRADES REFER TO CENTER LINE OF STREET.
  - THIS IS TO CERTIFY THAT THERE ARE NO STREAMS NOR NATURAL WATERCOURSES IN THE PROPERTY AS SHOWN ON THE SURVEY.
  - UNDERGROUND FOUNDATIONS OR SUBSTRUCTURES, NOT VISIBLE, NOT SHOWN.

- LEGEND:**
- BC ..... BOTTOM OF CURB ELEVATION
  - CB ..... CATCH BASIN
  - DC ..... DROP CURB (DRIVEWAY)
  - E ..... ELECTRIC MANHOLE
  - EL ..... ELEVATION
  - GV ..... GAS VALVE
  - HYD ..... FIRE HYDRANT
  - LG ..... LEGAL GRADE
  - LP ..... LIGHT POLE
  - S ..... SEWER MANHOLE
  - T ..... TELEPHONE MANHOLE
  - TC ..... TOP OF CURB ELEVATION
  - W ..... WATER MANHOLE
  - WV ..... WATER VALVE
  - 14"TR ..... 14" DIAMETER TREE

SCALE: 1" = 20'



**MAP OF SURVEY  
OF PROPERTY AT  
BROOKLYN**

TAX MAP DESIGNATION:  
SECTION : 9  
BLOCK : 2576  
LOT : 20 & 23

SURVEYED: SEPTEMBER 17, 2014

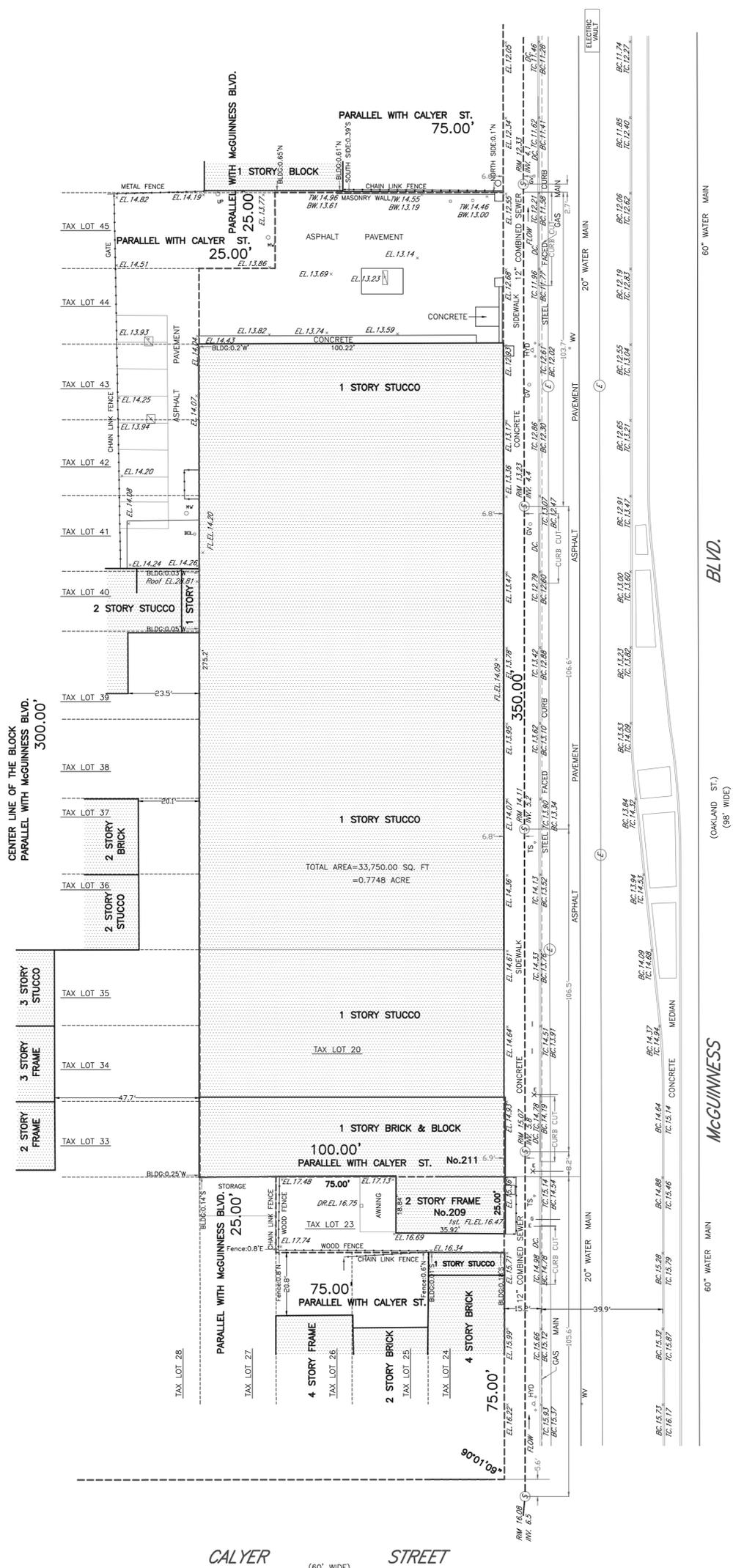
**AUTAR LAND SURVEYING, P.C.**  
214-43 JAMAICA AVENUE  
QUEENS VILLAGE, N.Y. 11428  
TEL (718) 740-1339  
FAX (718) 740-0024  
Email: [adooda@aol.com](mailto:adooda@aol.com)

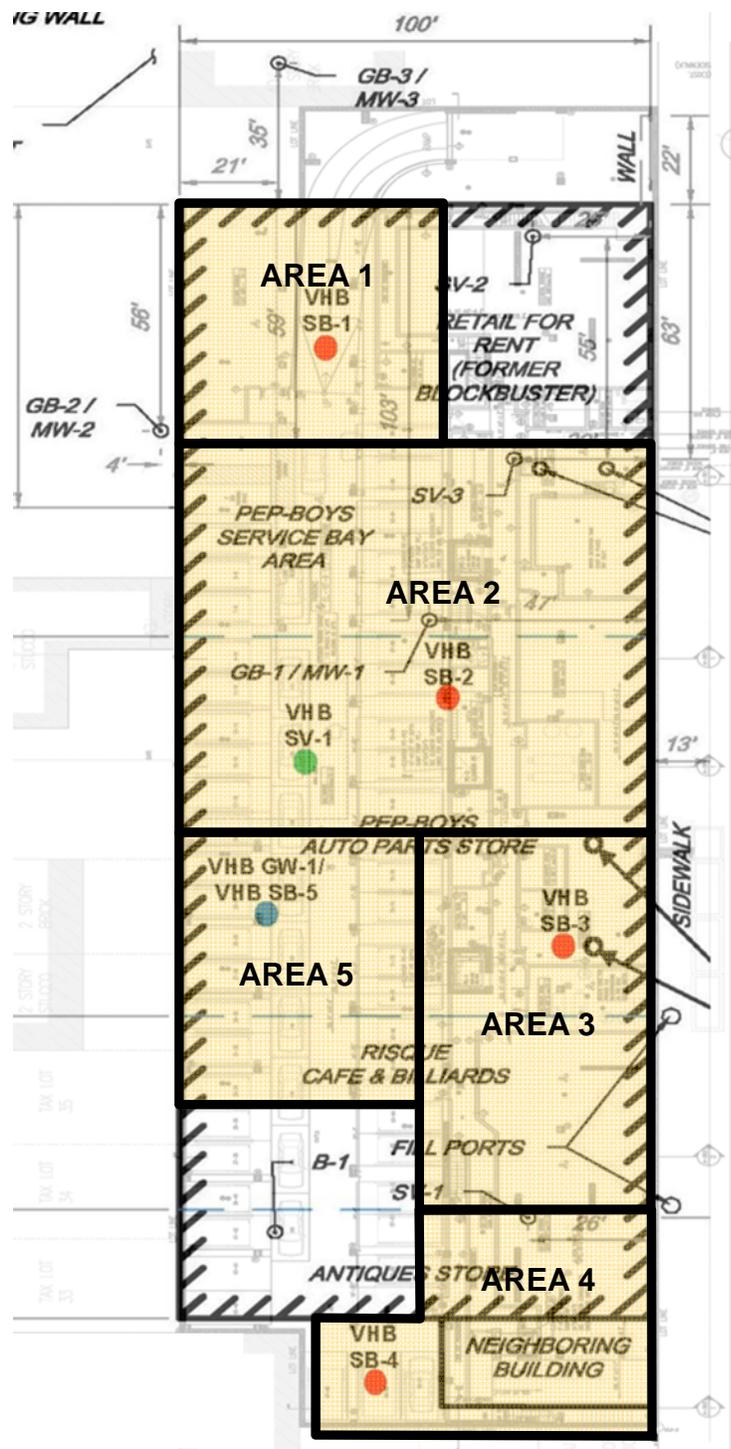
BOROUGH OF BROOKLYN  
COUNTY OF KINGS  
STATE OF NEW YORK

SCALE: 1"=20'

UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 220(2)(b) OF THE NEW YORK STATE EDUCATION LAW.  
ONLY COPIES FROM THE ORIGINAL OF THIS SURVEY, MARKED WITH AN ORIGINAL OF THE LAND SURVEYOR'S HAND SEAL OR FABRICATED SEAL, SHALL BE CONSIDERED A VALID TRUE COPY.  
CERTIFICATIONS INDICATED HEREON SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED AND ON HIS/HER BEHALF TO THE TITLE COMPANY, ENGINEER, ARCHITECT AND LENDING INSTITUTION LISTED HEREON AND TO THE ASSIGNEES OF THE LENDING INSTITUTION.  
CERTIFICATIONS ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OF SUBSEQUENT OWNERS.

5650 SM

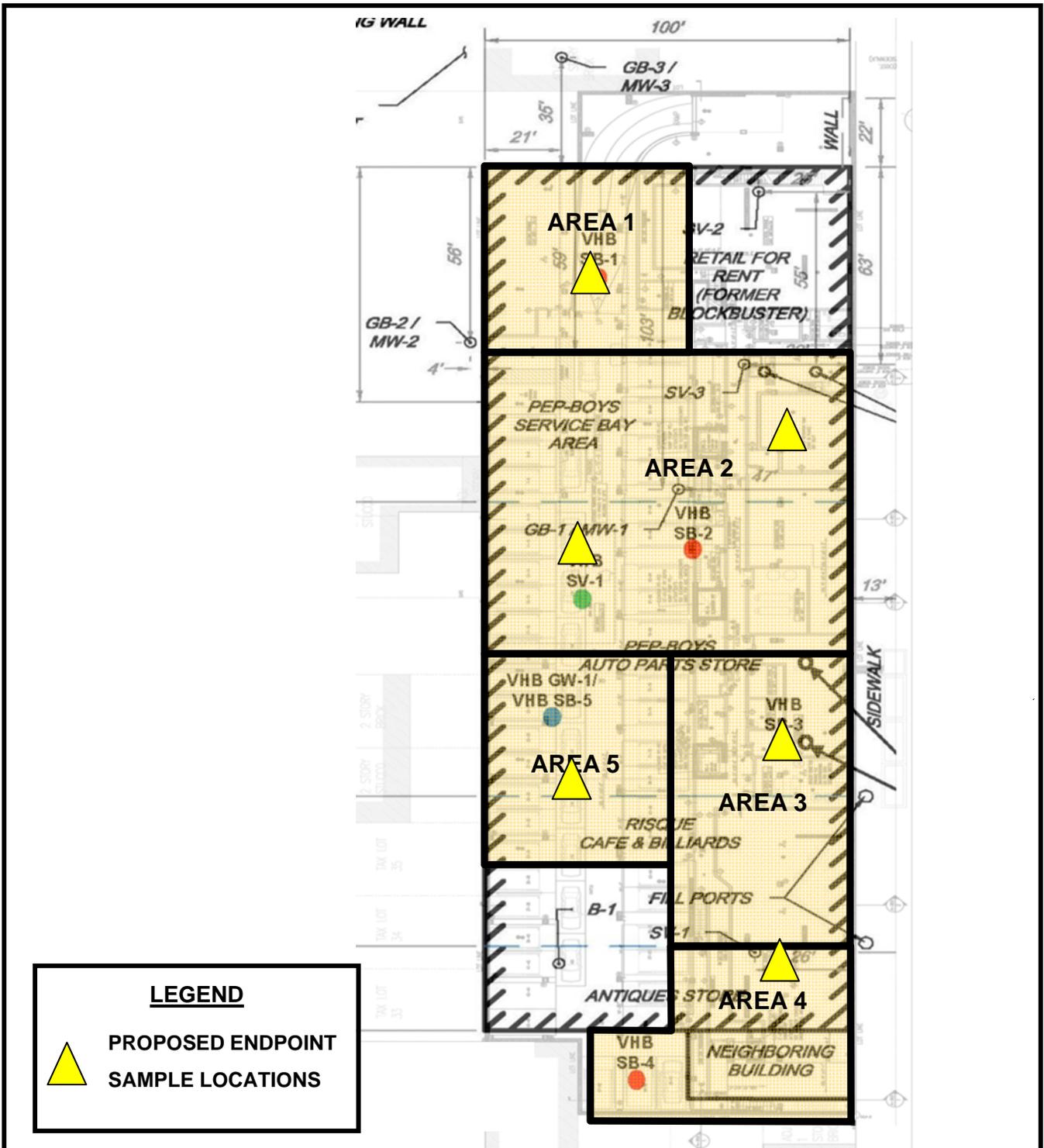




**FIGURE 5 –AREAS OF CONCERN**

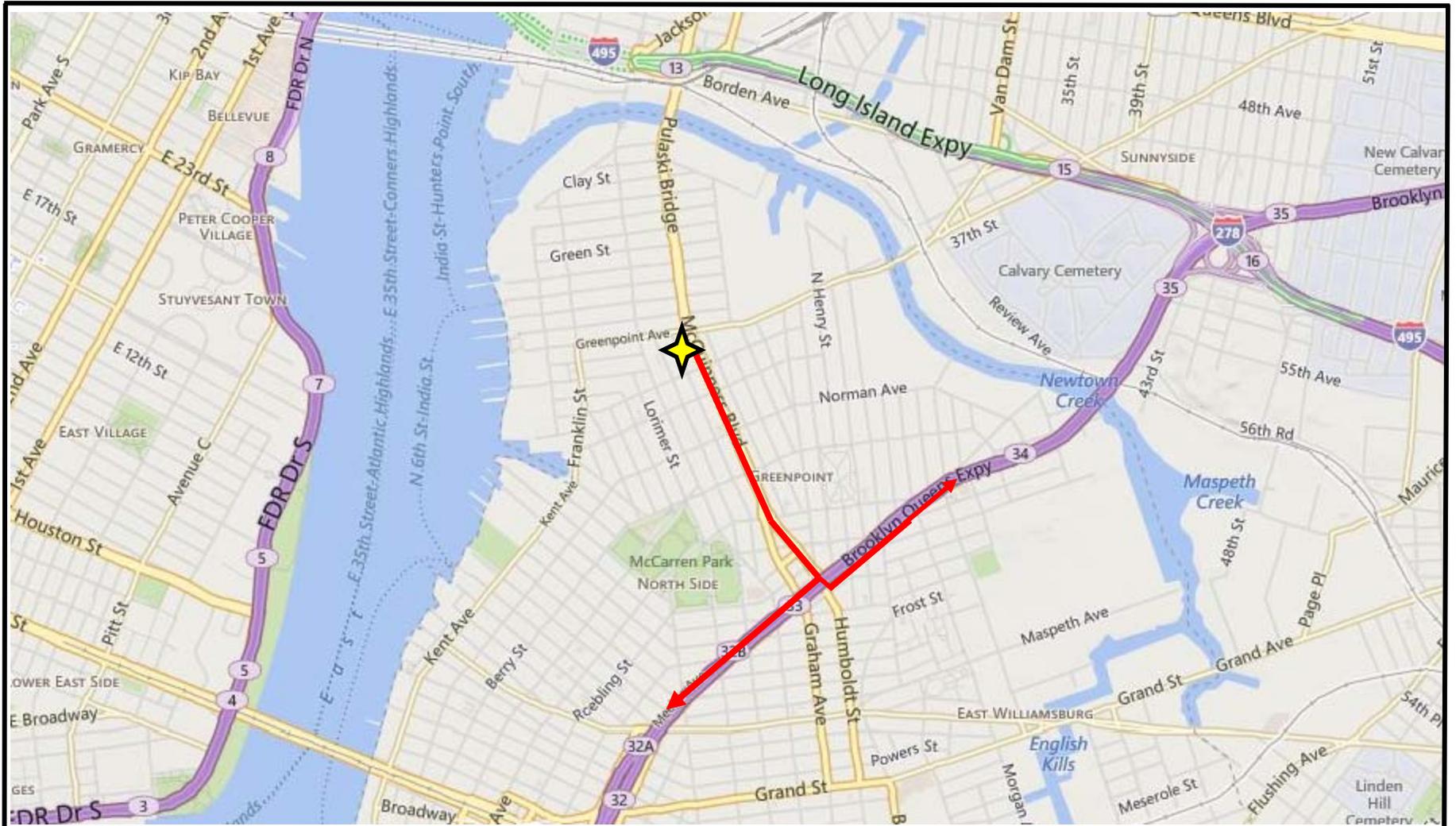
**SITE NAME:** Mixed-Use Properties  
**STREET ADDRESS** 209, 211-235 McGuinness Boulevard  
**CITY, STATE, ZIP:** Brooklyn, New York 11222  
**PROJECT NUMBER:** 29345.00  
**BASE MAP SOURCE:** PVE Sheffler, Stellar Management





**SITE NAME:** Mixed-Use Properties  
**STREET ADDRESS** 209, 211-235 McGuinness Boulevard  
**CITY, STATE, ZIP:** Brooklyn, New York 11222  
**PROJECT NUMBER:** 29345.00  
**BASE MAP SOURCE:** PVE Sheffler, Stellar Management





**FIGURE 7 – PROPOSED TRUCK ROUTE**

**SITE NAME:** 211 McGuinness Boulevard Redevelopment  
**STREET ADDRESS:** 209, 211-235 McGuinness Boulevard  
**CITY, STATE, ZIP:** Brooklyn, New York 11222  
**OER NUMBER:** 12RHAN236K  
**BASE MAP SOURCE:** Bing Maps



**TABLE 1  
TRACK 1 AND TRACK 2 SOIL CLEANUP OBJECTIVES  
209, 211-235 MCGUINNESS BOULEVARD  
BROOKLYN, NEW YORK**

Compounds	Regulatory Criteria	
	NYSDEC Part 375 UUSCO (TRACK ONE SCOs)	NYSDEC Part 375 RUSCO (TRACK TWO SCOs)
<b>TCL VOCs (ug/kg)</b>		
1,2,3-Trichlorobenzene	NA	NA
1,2,4-Trichlorobenzene	20,000*	NA
1,2,4,5-Tetramethylbenzene	NA	NA
1,2,4-Trimethylbenzene	3,600	47,000
1,3,5-Trimethylbenzene	8,400	47,000
1,1,2-Trichloroethane	NA	NA
1,1,1-Trichloroethane	680	100,000
1,2,3-Trichloropropane	20,000*	NA
1,1,1,2-Tetrachloroethane	NA	NA
1,1,2,2-Tetrachloroethane	600*	NA
1,2-Dibromo-3-chloropropane	NA	NA
1,2-Dibromoethane	NA	NA
1,2-Dichlorobenzene	NA	NA
1,3-Dichlorobenzene	2,400	17,000
1,1-Dichloroethene	330	100,000
1,2-Dichloroethene, Total	NA	NA
1,2-Dichloroethane	20	2,300
1,4-Dichlorobenzene	1,800	9,800
1,2-Dichloropropane	700,000*	NA
1,3-Dichloropropane	300*	NA
2,2-Dichloropropane	NA	NA
1,1-Dichloropropene	NA	NA
1,3-Dichloropropene, Total	NA	NA
1,4-Diethylbenzene	NA	NA
2-Butanone (Methyl Ethyl Ketone)	120	100,000
2-Hexanone	NA	NA
Acetone	50	100,000
Acrylonitrile	NA	NA
Benzene	60	2,900
Bromobenzene	NA	NA
Bromochloromethane	NA	NA
Bromodichloromethane	10,000*	NA
Bromoform	NA	NA
Carbon disulfide	2,700*	NA
Carbon Tetrachloride	760	1,400
Chloroform	370	10,000
Chlorobenzene	1,100	100,000
Chloroethane	1,900*	NA
Chloromethane	NA	NA
o-Chlorotoluene	NA	NA
p-Chlorotoluene	NA	NA
cis-1,3-Dichloropropene	NA	NA
cis-1,2-Dichloroethene	250	59,000
Dibromochloromethane	NA	NA
Dibromomethane	NA	NA
Dichlorodifluoromethane	NA	NA
1,4-Dioxane	100	9,800
Isopropylbenzene	2,300*	NA
p-Isopropyltoluene	10,000*	NA
o-Xylene	NA	NA
p- & m- xylenes	NA	NA
Tetrachloroethene (PCE)	1,300	5,500
Xylenes, Total	260	100,000
Bromomethane	NA	NA
Ethylbenzene	1,000	30,000
Ethyl ether	NA	NA
4-Ethyltoluene	NA	NA
Hexachlorobutadiene	NA	NA
4-Methyl-2-pentanone	1,000*	NA
Methylene Chloride	50	51,000
Methyl Tert Butyl Ether (MTBE)	930	62,000
Napthalene	12,000	12,000
n-Butylbenzene	12,000	NA
n-Propylbenzene	3,900	100,000
sec-Butylbenzene	11,000	100,000
Styrene	300,000*	NA
tert-Butylbenzene	5,900	100,000
trans-1,2-Dichloroethene	190	100,000
trans-1,3-Dichloropropene	NA	NA
trans-1,4-Dichloro-2-butene	NA	NA
Toluene	700	100,000
Trichlorofluoromethane	NA	NA
Trichloroethene	470	10,000
Vinyl Acetate	NA	NA
Vinyl chloride	20	210

Notes:

TCL VOCs -Target Compound List for volatile organic compounds.

TCL SVOCs - Target Compound List for semi-volatile organic compounds.

TAL Metals - Target Analyte List for metals.

PCBs - Polychlorinated Biphenyls

NYSDEC Part 375 UUSCO - New York State Department of Environmental Conservation

Unrestricted Use Soil Clean-up Objectives, as outlined in Table 375-6.8(a), December 14, 2006.

NYSDEC Part 375 RUSCO - New York State Department of Environmental Conservation Restricted

Use Soil Clean-up Objectives, as outlined in Table 375-6.8(b), December 14, 2006.

ug/kg - micrograms per kilogram (parts per billion).

mg/kg- milligrams per kilogram (parts per million).

NA - Not analyzed/Not available

\*Analyte not listed in NYSDEC Part 375 UUSCO. NYSDEC Commissioner Policy (CP)-51 Soil Cleanup Guidance, October 21, 2010 used.

**TABLE 1  
TRACK 1 AND TRACK 2 SOIL CLEANUP OBJECTIVES  
209, 211-235 MCGUINNESS BOULEVARD  
BROOKLYN, NEW YORK**

Compounds	Regulatory Criteria	
	NYSDEC Part 375 UUSCO (TRACK ONE SCOs)	NYSDEC Part 375 RUSCO (TRACK TWO SCOs)
<b>TCL SVOCs (ug/kg)</b>		
4-Bromophenyl phenyl ether	NA	NA
Bis(2-chloroisopropyl)ether	NA	NA
Bis(2-chloroethoxy)methane	NA	NA
1,2-Dichlorobenzene	1,100	100,000
1,3-Dichlorobenzene	2,400	17,000
1,4-Dichlorobenzene	1,800	9,800
3,3'-Dichlorobenzidine	NA	NA
2,4-Dichlorophenol	400*	NA
2,4-Dimethylphenol	NA	NA
2,4-Dinitrophenol	200*	NA
2,4-Dinitrotoluene	NA	NA
2,6-Dinitrotoluene	1,000*	NA
4,6-Dinitro-o-cresol	NA	NA
1,2,4-Trichlorobenzene	3,400*	NA
2,4,6-Trichlorophenol	10,000*	NA
2-Chloronaphthalene	NA	NA
4-Chloroaniline	2,200*	NA
4-Chlorophenyl phenyl ether	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA
2,4,5-Trichlorophenol	100*	NA
Acenaphthene	20,000	100,000
Acenaphthylene	100,000	100,000
Acetophenone	NA	NA
Anthracene	100,000	100,000
Benzo(a)anthracene	1,000	1,000
Benzo(a)pyrene	1,000	1,000
Benzo(b)fluoranthene	1,000	1,000
Benzo(g,h,i)perylene	100,000	100,000
Benzo(k)fluoranthene	800	1,000
Bis(2-ethylhexyl)phthalate	435,000*	NA
Bis(2-chloroethyl)ether	NA	NA
Dibenzo(a,h)anthracene	330	NA
3-Methylphenol/4-Methylphenol	NA	NA
Bezoic Acid	2,700*	NA
Benzyl Alcohol	NA	NA
Biphenyl	NA	NA
Butyl benzyl phthalate	122,000*	NA
Carbazole	NA	NA
2-Chlorophenol	800*	NA
Chrysene	1,000	1,000
Dibenzofuran	NA	NA
Di-n-butylphthalate	14*	NA
Di-n-octylphthalate	NA	NA
Diethyl phthalate	7,100*	NA
Dimethyl phthalate	2,700*	NA
Fluoranthene	100,000	100,000
Fluorene	30,000	100,000
Hexachlorobenzene	330	330
Hexachlorobutadiene	NA	NA
Hexachlorocyclopentadiene	10,000*	NA
Hexachloroethane	NA	NA
Isophorone	4,400*	NA
2-Methylnaphthalene	36,400*	NA
2-Methylphenol	NA	NA
3-Methylphenol/4-Methylphenol	NA	NA
Naphthalene	12,000	100,000
2-Nitroaniline	400*	NA
3-Nitroaniline	500*	NA
4-Nitroaniline	NA	NA
Nitrobenzene	170*	NA
n-Nitrosodi-n-propylamine	NA	NA
NitrosoDiPhenylAmine(NDPA)/NPA	NA	NA
2-Nitrophenol	300*	NA
4-Nitrophenol	100*	NA
P-Chloro-M-Cresol	NA	NA
Pentachlorophenol	800	2,400
Phenanthrene	100,000	100,000
Phenol	330	100,000
Indeno(1,2,3-cd)Pyrene	500	500
Pyrene	100,000	100,000

Notes:

TCL VOCs -Target Compound List for volatile organic compounds.

TCL SVOCs - Target Compound List for semi-volatile organic compounds.

TAL Metals - Target Analyte List for metals.

PCBs - Polychlorinated Biphenyls

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NA - Not analyzed/Not available

\*Analyte not listed in NYSDEC Part 375 UUSCO. NYSDEC Commissioner Policy (CP)-51 Soil Cleanup Guidance, October 21, 2010 used.

**TABLE 1  
TRACK 1 AND TRACK 2 SOIL CLEANUP OBJECTIVES  
209, 211-235 MCGUINNESS BOULEVARD  
BROOKLYN, NEW YORK**

Compounds	Regulatory Criteria	
	NYSDEC Part 375 UUSCO (TRACK ONE SCOs)	NYSDEC Part 375 RUSCO (TRACK TWO SCOs)
<b>Pesticides (ug/kg)</b>		
Delta-BHC	40	100,000
Lindane	100	280
Alpha-BHC	20	97
Beta-BHC	36	72
Heptachlor	42	420
Aldrin	5	19
Heptachlor Epoxide	20*	NA
Endrin	14	2,200
Endrin ketone	NA	NA
Dieldrin	5	39
4,4'-DDD	3.3	2,600
4,4'-DDE	3.3	1,800
4,4'-DDT	3.3	1,700
Endosulfan I	2,400	4,800
Endosulfan II	2,400	4,800
Endosulfan sulfate	2,400	4,800
Methoxychlor	1,200*	NA
Toxaphene	NA	NA
cis-Chlordane	NA	NA
trans-Chlordane	NA	NA
Chlordane	94	910
<b>PCBs (mg/kg)</b>	<b>NYSDEC Part 375 UUSCO (TRACK ONE SCOs)</b>	<b>NYSDEC Part 375 RUSCO (TRACK TWO SCOs)</b>
Aroclor 1016	NA	NA
Aroclor 1221	NA	NA
Aroclor 1232	NA	NA
Aroclor 1242	NA	NA
Aroclor 1248	NA	NA
Aroclor 1254	NA	NA
Aroclor 1260	NA	NA
Aroclor 1262	NA	NA
Aroclor 1268	NA	NA
PCBs, Total	0.1	1.0
<b>TAL Metals (mg/kg)</b>	<b>NYSDEC Part 375 UUSCO (TRACK ONE SCOs)</b>	<b>NYSDEC Part 375 RUSCO (TRACK TWO SCOs)</b>
Aluminum	10,000*	NA
Antimony	12*	NA
Arsenic	13	16
Barium	350	350
Beryllium	7.2	14
Cadmium	2.5	2.5
Calcium	10,000*	NA
Chromium	30	36
Cobalt	20*	NA
Copper	50	270
Iron	NA	NA
Lead	63	400
Magnesium	NA	NA
Manganese	1,600	2,000
Mercury	0.18	0.81
Nickel	30	140
Potassium	NA	NA
Selenium	3.9	36
Silver	2	36
Sodium	NA	NA
Thallium	5,000*	NA
Vanadium	39*	NA
Zinc	109	2,200

Notes:

TCL VOCs -Target Compound List for volatile organic compounds.

TCL SVOCs - Target Compound List for semi-volatile organic compounds.

TAL Metals - Target Analyte List for metals.

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\*Analyte not listed in NYSDEC Part 375 UUSCO. NYSDEC Commissioner Policy (CP)-51 Soil Cleanup Guidance, October 21, 2010 used.

## **APPENDIX 1**

### **CITIZEN PARTICIPATION PLAN**

The NYC Office of Environmental Remediation and Stellar Management have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program. This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, Stellar Management 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, Alysha Alfieri, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841

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

manager. If you would like to be added to the Project Contact List, contact NYC OER at (212) 788-8841 or by email at [brownfields@cityhall.nyc.gov](mailto:brownfields@cityhall.nyc.gov).

**Repositories.** A document repository is maintained in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. Stellar Management will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Brooklyn Public Library – Greenpoint  
107 Norman Avenue, Brooklyn, New York  
(718) 349-8504

Monday – 10AM – 6PM, Tuesday – Thursday 10AM – 8PM, Friday 10AM – 6PM, Saturday 10AM – 5PM.**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.

**Identify Issues of Public Concern.** Issues of concern include noise from construction, as well as dust migration off-site and odor from excavation of contaminated media. These items will be mitigated through implementation of a CAMP that will address dust migration and potential on- and off-site impacts related to VOCs in outdoor air. Furthermore, odors and noise generated from construction will be mitigated to the maximum extent practicable and will be limited during daytime hours and weekdays only.

**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 Stellar Management, reviewed and approved by OER prior to distribution and mailed by Stellar

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

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

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

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

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

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

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

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

## **APPENDIX 2**

### **SUSTAINABILITY STATEMENT**

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

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

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

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

An estimate of the quantity (in tons) of virgin and non-renewable resources, the use of which will be avoided under this plan, will be quantified and reported in the RAR.

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

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

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

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

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

An estimate of the enhanced storm-water retention capability of the redevelopment project will be included in the RAR.

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

Any green building elements to be associated with this brownfield redevelopment property will be reported in the RAR. Any green building space created as a function of this brownfield redevelopment will be quantified for residential and commercial uses in the RAR.

**Paperless Brownfield Cleanup Program.** Stellar Management 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.

## **APPENDIX 3**

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

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

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

#### **1.2 STOCKPILE METHODS**

Although no stockpiling is currently proposed for remedial action, if warranted or required, 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 will leave the site traveling south on McGuinness Boulevard to the BQE (a.k.a. I-287) junction, as shown in Figure 7. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

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

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

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with

disposal of all material will include records and approvals for receipt of the material. This information will be presented in the RAR.

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

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

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. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC VCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed. Currently, no re-use of soil is proposed.

However, should the applicant wish to re-use soil at any point during remedial action, consultation with NYCOER will be warranted for re-use approval.

## **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. Currently, no backfill is proposed to be imported on-site. Should clean backfill be required at any point during remedial action or construction activities, NYCOER will be consulted for approval prior to the use of any backfill on-site.

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

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

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

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.

## **APPENDIX 4**

# **CONSTRUCTION HEALTH AND SAFETY PLAN**

# 211 McGuinness Boulevard Mixed-Use Development

209, 211-235 McGuinness Boulevard  
Brooklyn, New York

PREPARED FOR

---

Stellar Management  
156 William Street  
New York, New York 10058

Attention: Lyle Kamesaki

PREPARED BY



**Engineering, Surveying and  
Landscape Architecture, P.C.**  
100 Motor Parkway, Suite 135  
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March 13, 2015



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	Figure 2 Proposed Cellar Floor Plan
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# 1.0

## Introduction

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### 1.1 General

On behalf of Stellar Management, VHB Engineering, Surveying and Landscape Architecture, P.C. (VHB) has prepared this Community Air Monitoring Plan (CAMP) in association with a Remedial Action Work Plan (RAWP) that will be implemented for the remedial action and redevelopment of a 33,750 square foot (s.f.) site located at 209 and 211-235 McGuinness Boulevard in the Greenpoint section of Brooklyn, New York. In accordance with the RAWP under the New York City Voluntary Cleanup Program (VCP), due to elevated impacts that exceed New York State Department of Environmental Conservation (NYSDEC) Part 375 Track One and Track Two Soil Cleanup Objectives (SCOs), preparation of a CAMP is required and will be implemented as part of remedial action at the Site. This CAMP fulfills the requirements set forth by the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan, dated December 2009, and NYSDEC Fugitive Dust Suppression and Particulate Monitoring Program (under the Technical Assistance and Guidance Memorandum [TAGM] – 4031) (Appendices B and C, respectively). The intent of this CAMP is to provide for a measure of protection for downwind communities from potential airborne releases of constituents of concern during on-site remedial activities. These activities will include excavation and removal of impacted soils from areas of proposed excavation and load-out. This CAMP specifies potential air emissions, air monitoring procedures, monitoring schedule and data collection and reporting.

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### 1.2 Site Description and Background

Based upon the results of subsurface investigations performed by PVE Sheffler and VHB, as summarized in the Remedial Investigation Report (RIR) completed in accordance with New York City Office of Environmental Remediation (NYCOER),



subsurface impacts relating to semi-volatile organic compounds (SVOCs) and metals were identified in shallow and deeper soils. Based upon the proposed redevelopment plans of the Site, excavation and removal of on-site soils is proposed to a terminal depth of approximately 10-feet 9.5-inches below grade surface (bgs), with an additional five-feet eight-inches removed for two elevator shaft locations (basement foundation plan provided as Figure 2 and attached to this CAMP). The purposes of this CAMP is to continuously monitor air quality during remedial action activities in order to minimize any potential inhalation hazards to on-site occupants, and to prevent fugitive dust migration off-site during soil excavation and removal activities.

---

### 1.3 Potential Air Emissions Related to Remedial Action Activities

Certain intrusive remedial activities at the site have the potential to generate localized impacts to air quality. Such activities include the following:

- Excavation, on-site storage and load-out of impacted soils to the terminal excavation depths
- Concrete footings and building foundation pad associated with the proposed new building
- Exhaust and construction dust generated from on-site construction vehicles

---

### 1.4 Air/Odor Emissions and Control Measures

Air emissions control and fugitive dust suppression techniques will be used during the remedial activities identified above, as necessary, to limit the air/odor emissions from the site. Air monitoring for the specific purpose of protecting the community from site activity impacts will take place during both intrusive and non-intrusive site activities.

During intrusive and non-intrusive site activities, odor and dust control measures will be available at the site and used when necessary. The following dust and odor suppression measures may be used during these activities, depending upon specific circumstances and air monitoring results.

- Water spray
- Polyethylene sheeting (as necessary to cover any soils that may require stockpiling)



Polyethylene sheeting will be used to control nuisance odors and volatile organic compound (VOC) emissions, as needed. Dust emissions at the site will be controlled by spraying water on exposed dry surface soil areas and by covering stockpiles. Odor and dust control measures will be implemented based on visual or olfactory observations, and the results of airborne particulate and VOC monitoring.

It should be noted that stockpiling is not allowed by NYCOER. However, provisions in this CAMP have been made to include stockpiling should same be the only feasible alternative.

# 2.0

## Air Monitoring Procedures

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### 2.1 General

Real time air monitoring will be implemented at the site for VOCs, and particulate matter less than 10 microns in diameter (PM<sub>10</sub>). A site boundary will be established for the purpose of air monitoring. Upwind and downwind monitoring locations will be determined and one unit will be placed at each location. This will be adjusted on a daily basis. Additional monitoring with photoionization detectors (PIDs)<sup>1</sup> will occur at the proposed excavation locations. For the duration of the air monitoring, upwind air monitoring will take place at the commencement of daily remediation activities to establish a daily baseline. The monitoring will then commence at both upwind and downwind locations continuously during all earthmoving activities.

All monitoring will be electronically logged in the field instruments that record peak, and a time-weighted average of dust particles and PID readings.

---

### 2.2 VOC Monitoring

As required by the NYSDOH guidance document, VOCs will be monitored continuously during remedial site activities, with instrumentation that is equipped with electronic data-logging capabilities. A Mini-RAE 3000 PID or equivalent will be used to conduct the real-time VOC monitoring.



<sup>1</sup> A PID is a handheld instrument capable of detecting a wide range of VOCs. VOCs are quantified in parts per million (ppm)



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## 2.3 Particulate Matter Monitoring

As required by NYSDOH and NYSDEC guidance, real-time particulate meter will be monitored continuously during site activities using instrumentation equipped with electronic data-logging capabilities. A DR-4000 Dust Monitor (or equivalent) will be used to conduct the real-time PM<sub>10</sub> monitoring.

Fugitive dust migration will be visually assessed during all work activities, and reasonable dust suppression techniques will be used during any site activities that may generate fugitive dust.

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## 2.4 Action Levels

The action levels provided below are to be used to initiate response actions, if necessary.

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### 2.4.1 Action Levels for VOCs

As outlined in the NYSDOH guidance document for CAMPs, if the ambient air concentration of total VOCs exceeds five ppm above the background (upwind location) for a 15-minute average, intrusive site activities will be temporarily halted while monitoring continues. If the total VOC concentration readily decreases below 5 ppm above background, then intrusive site activities can resume.

If the ambient air concentrations of total VOCs persist at levels in excess of 5 ppm above background, intrusive site work activities will be halted, the source of the elevated VOC concentration identified, corrective actions to reduce or abate the emissions undertaken, and air monitoring to be continued.

As previously indicated, at the commencement of daily remediation activities, VHB will begin with an upwind air monitoring location to establish a daily baseline for monitoring operations.

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### 2.4.2 Action Level for PM<sub>10</sub>

As required by NYSDOH and NYSDEC guidance documents, if the ambient air concentration of PM<sub>10</sub> at any one (or more) of the sampling locations is noted at levels in excess of 100 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) above the background (upwind location), or if airborne dust is observed leaving the work area, intrusive site



activities will be temporarily halted. The source of the elevated PM<sub>10</sub> concentration is to be identified, corrective actions to reduce or abate the emissions will be undertaken, and air monitoring will continue. Work may continue following the implementation of dust suppression techniques provided the PM<sub>10</sub> levels do not exceed 150 µ/m<sup>3</sup> over background levels. If levels continue to be elevated, intrusive site activities will be halted and emissions control measures implemented.

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## 2.5 Meteorological Monitoring

Wind direction will be monitored periodically at the site using a windsock or other appropriate equipment. Wind direction will be established at the start of each work day and may be re-established at any time during the work day if a significant shift in wind direction is noted.

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## 2.6 Instrument Calibration

Calibration of the VOC and PM<sub>10</sub> instrumentation will occur in accordance with each of the equipment manufacturer's calibration and quality assurance requirements. The VOC and PM<sub>10</sub> monitors will be calibrated at least daily, and calibrations will be recorded in the field activity book.

# 3.0

## Monitoring Schedule and Data Collection and Reporting

The proposed monitoring schedule and data collection and reporting requirements are discussed below.

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### 3.1 Monitoring Schedule

Real-time VOC and PM<sub>10</sub> monitoring will be performed continuously throughout the remedial action during intrusive site/materials handling activities, until completion of all excavation and earth moving activities. VOC monitoring will also be performed during non-intrusive and/or support-type activities, so long as soils continue to be staged on-site.

---

### 3.2 Data Collection and Reporting

Air monitoring data will be collected continuously from VOC and PM<sub>10</sub> monitors during intrusive site activities by an electronic data-logging system. A Thermo MIE DR-4000 dust monitor, or equivalent, will be used. The Data Real-Time Aerosol Monitor measures mass concentrations of airborne dust, smoke, mists, haze and fumes and provides continuous real-time readouts. Respirable PM-10 correlated measurements will be logged and recorded over the 8-hour work period.

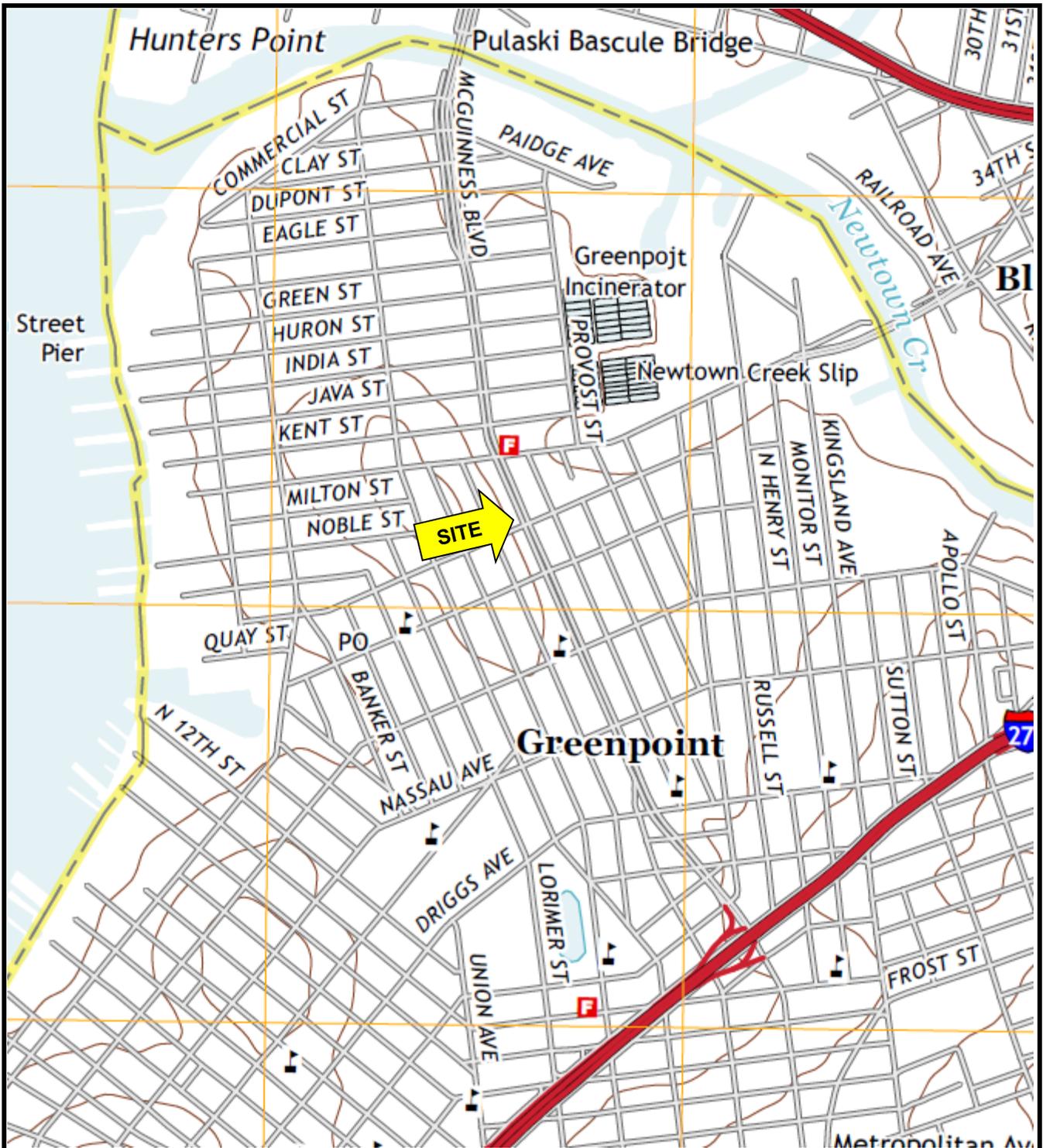
A Mini-RAE 3000 PID, or equivalent, will be used to monitor for VOCs during intrusive field activities.

Air monitoring data, tables and field notes will be provided to NYCOER as part of reporting requirements.



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# ATTACHMENT A



**FIGURE 1 – SITE LOCATION MAP**

**SITE NAME:** Mixed-Use Properties  
**STREET ADDRESS** 209, 211-235 McGuinness Boulevard  
**CITY, STATE, ZIP:** Brooklyn, New York 11222  
**PROJECT NUMBER:** 29345.00  
**SOURCE:** United States Geological Survey







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# ATTACHMENT B

**Appendix 1A**  
**New York State Department of Health**  
**Generic Community Air Monitoring Plan**

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

**Continuous monitoring** will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

**Periodic monitoring** for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

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

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

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

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

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

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\text{mcg}/\text{m}^3$ ) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed  $150 \text{ mcg}/\text{m}^3$  above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than  $150 \text{ mcg}/\text{m}^3$  above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within  $150 \text{ mcg}/\text{m}^3$  of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009



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# ATTACHMENT C



## Fugitive Dust Suppression and Particulate Monitoring Program (TAGM - 4031)

**Issuing Authority:** Michael J. O'Toole, Jr.

**Title:** Director, Division of Environmental Remediation

**Date Issued:** Oct 27, 1989

### 1. Introduction

Fugitive dust suppression, particulate monitoring, and subsequent action levels for such must be used and applied consistently during remedial activities at hazardous waste sites. This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

### 2. Background

Fugitive dust is particulate matter--a generic term for a broad class of chemically and physically diverse substances that exist as discrete particles, liquid droplets or solids, over a wide range of sizes--which becomes airborne and contributes to air quality as a nuisance and threat to human health and the environment.

On July 1, 1987, the United States Environmental Protection Agency (USEPA) revised the ambient air quality standard for particulates so as to reflect direct impact on human health by setting the standard for particulate matter less than ten microns in diameter ( $PM_{10}$ ); this involves fugitive dust whether contaminated or not. Based upon an examination of air quality composition, respiratory tract deposition, and health effects,  $PM_{10}$  is considered conservative for the primary standard--that requisite to protect public health with an adequate margin of safety. The primary standards are  $150 \mu\text{g}/\text{m}^3$  over a 24-hour averaging time and  $50 \mu\text{g}/\text{m}^3$  over an annual averaging time. Both of these standards are to be averaged arithmetically.

There exists real-time monitoring equipment available to measure  $PM_{10}$  and capable of integrating over a period of six seconds to ten hours. Combined with an adequate fugitive dust suppression program, such equipment will aid in preventing the off-site migration of contaminated soil. It will also protect both on-site personnel from exposure to high levels of dust and the public around the site from any exposure to any dust. While specifically intended for the protection of on-site personnel as well as the public, this program is not meant to

replace long-term monitoring which may be required given the contaminants inherent to the site and its air quality.

### 3. Guidance

A program for suppressing fugitive dust and monitoring particulate matter at hazardous waste sites can be developed without placing an undue burden on remedial activities while still being protective of health and environment. Since the responsibility for implementing this program ultimately will fall on the party performing the work, these procedures must be incorporated into appropriate work plans. The following fugitive dust suppression and particulate monitoring program will be employed at hazardous waste sites during construction and other activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Such activities shall also include the excavation, grading, or placement of clean fill, and control measures therefore should be considered.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns ( $PM_{10}$ ) with the following minimum performance standards:

Object to be measured: Dust, Mists, Aerosols

Size range: <0.1 to 10 microns

Sensitivity: 0.001 mg/m<sup>3</sup>

Range: 0.001 to 10 mg/m<sup>3</sup>

Overall Accuracy: ±10% as compared to gravimetric analysis of stearic acid or reference dust

Operating Conditions:

Temperature: 0 to 40°C

Humidity: 10 to 99% Relative Humidity

Power: Battery operated with a minimum capacity of eight hours continuous operation

Automatic alarms are suggested.

Particulate levels will be monitored immediately downwind at the working site and integrated over a period not to exceed 15 minutes. Consequently, instrumentation shall

require necessary averaging hardware to accomplish this task; the P-5 Digital Dust Indicator as manufactured by MDA Scientific, Inc. or similar is appropriate.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the entity operating the equipment to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at  $150 \text{ ug/m}^3$  over the integrated period not to exceed 15 minutes. While conservative, this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of  $150 \text{ ug/m}^3$ , the upwind background level must be measured immediately using the same portable monitor. If the working site particulate measurement is greater than  $100 \text{ ug/m}^3$  above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see Paragraph 7). Should the action level of  $150 \text{ ug/m}^3$  be exceeded, the Division of Air Resources must be notified in writing within five working days; the notification shall include a description of the control measures implemented to prevent further exceedences.
6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure  $\text{PM}_{10}$  at or above the action level. Since this situation has the potential to migrate contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.
7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:
  1. Applying water on haul roads.
  2. Wetting equipment and excavation faces.

3. Spraying water on buckets during excavation and dumping.
4. Hauling materials in properly tarped or watertight containers.
5. Restricting vehicle speeds to 10 mph.
6. Covering excavated areas and material after excavation activity ceases.
7. Reducing the excavation size and/or number of excavations.

Experience has shown that utilizing the above-mentioned dust suppression techniques, within reason as not to create excess water which would result in unacceptable wet conditions, the chance of exceeding the  $150 \text{ ug/m}^3$  action level at hazardous waste site remediations is remote. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

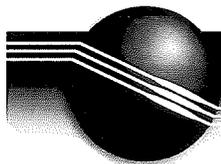
8. If the dust suppression techniques being utilized at the site do not lower particulates to an acceptable level (that is, below  $150 \text{ ug/m}^3$  and no visible dust), work must be suspended until appropriate corrective measures are approved to remedy the situation. Also, the evaluation of weather conditions will be necessary for proper fugitive dust control--when extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended.

There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require appropriate toxics monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.



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# ATTACHMENT D



# MiniRAE 3000

## Portable Handheld VOC Monitor

The MiniRAE 3000 is the most advanced handheld volatile organic compound (VOC) monitor on the market. Its photoionization detector's (PID) extended range of **0 to 15,000 ppm** makes it an ideal instrument for applications from industrial hygiene to leak detection and HazMat.

The **RF modem allows real-time data transmissions** with a base controller located up to 500 feet away from the MiniRAE 3000 (or two miles with optional RAELink3 portable modem). A personal computer can be used as the base station for a MiniRAE 3000 system. The standard ProRAE Remote software is capable of monitoring the input of up to 64 remotely located monitors, including MiniRAE 3000, AreaRAE, etc.



### Key Features

- **Proven PID technology**  
The patented sensor provides the following unique features:
  - 3-second response time
  - Extended range up to 15,000 ppm with improved linearity
  - Humidity compensation with integral humidity and temperature sensors
- **Real-time wireless** data transmission with built-in RF modem or Bluetooth
- **Designed for simple service** Easy access to lamp and sensor in seconds without tools
- **Big graphic display** for easy overview of gas type, Correction Factor and concentration
- **Field-interchangeable battery pack** replaced in seconds without tools
- **Integrated flashlight** for better view in dark conditions
- **User-friendly screens, including dataplot chart view**
- **Integrated RAE Systems Correction Factors list for more than 200 compounds** to measure more chemicals than any other PID
- **Multi-language support** with 12 languages encoded
- **Rugged housing** withstands use in harsh environments
  - IP67 waterproof design for easy cleaning and decontamination in water
  - Strong protective removable rubber boot

### Additional Advantages

- View real-time sensor data and alarm status at headquarters or command center
- Automatic lamp type recognition
- Duty-cycling™ lamp and sensor auto-cleaning technology
- Tough, flexible inlet Flexi-Probe™
- 3 large keys operable with 3 layers of gloves
- Strong, built-in sample pump draws up to 100 feet (30m) horizontally or vertically
- Loud, 95dB audible alarm
- Bright red flashing visual alarm
- Interchangeable drop-in lithium-ion and alkaline battery packs
- Charging cradle doubles as an external battery charger
- Compatible with AutoRAE™ calibration station
- ProRAE Remote software simultaneously controls and displays readings for up to 64 remote detectors
- License-free, ISM band RF transmission with communication range up to 500 feet (2 miles with optional RAELink3 modem)
- Optional RAELink3 modem provides GPS capability to track and display readings from remote detectors and provide up to 2 miles' long-distance transmission
- Datalogging with up to 6 months of data at one-minute intervals
- 3-year 10.6eV lamp warranty



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[www.raesystems.com](http://www.raesystems.com)



ATEX



IECEX



# MiniRAE 3000

## Specifications\*

### Detector Specifications

<b>Size</b>	10" L x 3.0" W x 2.5" H (25.5 cm x 7.6 cm x 6.4 cm)
<b>Weight</b>	26 oz (738 g)
<b>Sensors</b>	Photoionization sensor with standard 10.6 eV or optional 9.8 eV or 11.7 eV lamps
<b>Battery</b>	<ul style="list-style-type: none"> <li>• Rechargeable, external field-replaceable Lithium-Ion battery pack</li> <li>• Alkaline battery adapter</li> </ul>
<b>Operating Hours</b>	16 hours of operation (12 hours with alkaline battery)
<b>Display Graphic</b>	4 lines, 28 x 43 mm, with LED backlight for enhanced display readability
<b>Keypad</b>	1 operation and 2 programming keys, 1 flashlight on/off
<b>Direct Readout</b>	Instantaneous reading <ul style="list-style-type: none"> <li>• VOCs as ppm by volume</li> <li>• High values</li> <li>• STEL and TWA</li> <li>• Battery and shutdown voltage</li> <li>• Date, time, temperature</li> </ul>
<b>Alarms</b>	95 dB (at 30 cm) buzzer and flashing red LED to indicate exceeded preset limits <ul style="list-style-type: none"> <li>• High: 3 beeps and flashes per second</li> <li>• Low: 2 beeps and flashes per second</li> <li>• STEL and TWA: 1 beep and flash per second</li> <li>• Alarms latching with manual override or automatic reset</li> <li>• Additional diagnostic alarm and display message for low battery and pump stall</li> </ul>
<b>EMI/RFI</b>	Highly resistant to EMI/RFI Compliant with EMC Directive 89/336/EEC
<b>IP Rating</b>	<ul style="list-style-type: none"> <li>• IP67 unit off and without flexible probe</li> <li>• IP65 unit running</li> </ul>
<b>Datalogging</b>	Standard 6 months at one-minute intervals
<b>Calibration</b>	Two-point or three-point calibration for zero and span. Calibration memory for 8 calibration gases, alarm limits, span values and calibration dates
<b>Sampling Pump</b>	<ul style="list-style-type: none"> <li>• Internal, integrated flow rate at 500 cc/min</li> <li>• Sample from 100' (30m) horizontally and vertically</li> </ul>
<b>Low Flow Alarm</b>	• Auto pump shutoff at low-flow condition
<b>Communication</b>	<ul style="list-style-type: none"> <li>• Download data and upload instrument set-up from PC through charging cradle or optional Bluetooth™</li> <li>• Wireless data transmission through built-in RF modem</li> </ul>
<b>Frequency</b>	902 to 928 MHz (license-free), 2.400 to 2.4835 GHz (license-free), 433 MHz, 869 MHz
<b>RF Range</b>	Up to 500' (900 MHz, 433 Mhz, 869 Mhz), extendable with RAELink3 Repeater to 2 miles
<b>Hazard Area Approval</b>	<ul style="list-style-type: none"> <li>• <b>US and Canada:</b> UL, cUL, Classified as Intrinsically Safe for use in Class I, Division I Groups A, B, C, D</li> <li>• <b>Europe:</b> ATEX II 1G EEx ia IIC T4 (pending)</li> <li>• <b>IECEX:</b> II 1G EEx ia IIC T4 (pending)</li> </ul>
<b>Temperature</b>	-4° to 113° F (-20° to 50° C)
<b>Humidity</b>	0% to 95% relative humidity (non-condensing)
<b>Attachments</b>	Durable bright yellow rubber boot with belt clip
<b>Warranty</b>	Lifetime on non-consumable components (per RAE Systems Standard Warranty), 3-year warranty for 10.6 eV lamp, 1 year for pump and battery

\*Specifications are subject to change

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	Asia	+852 2669 0828

[www.raesystems.com](http://www.raesystems.com)

### Sensor Specifications

Gas Monitor	Range	Resolution	Response Time T90
VOCs	0 to 999.9 ppm 1000 to 15,000 ppm	0.1 ppm 1 ppm	< 3 s < 3 s

### Monitor only includes:

- MiniRAE 3000 Monitor, Model PGM-7320
- Wireless communication module built in, as specified
- Datalogging with ProRAE Studio Package for Windows™ 95, 98, 2000, NT, ME & XP
- Charging/download adapter
- RAE UV lamp, as specified
- Flex-I-Probe™
- External filter
- Rubber boot
- Alkaline battery adapter
- Lamp-cleaning kit
- Tool kit
- Operation CD-ROM
- Operation & Maintenance manual
- Soft leather case

### Monitor with accessories kit adds:

- Hard transport case with pre-cut foam padding
- Charging/download cradle
- 5 Porous metal filters and O-rings
- Organic vapor zeroing kit
- Gas outlet port adapter and tubing

### Optional calibration kit adds:

- 100 ppm isobutylene calibration gas, 34L
- Calibration regulator and flow controller

### Optional Guaranteed Cost of Ownership Program:

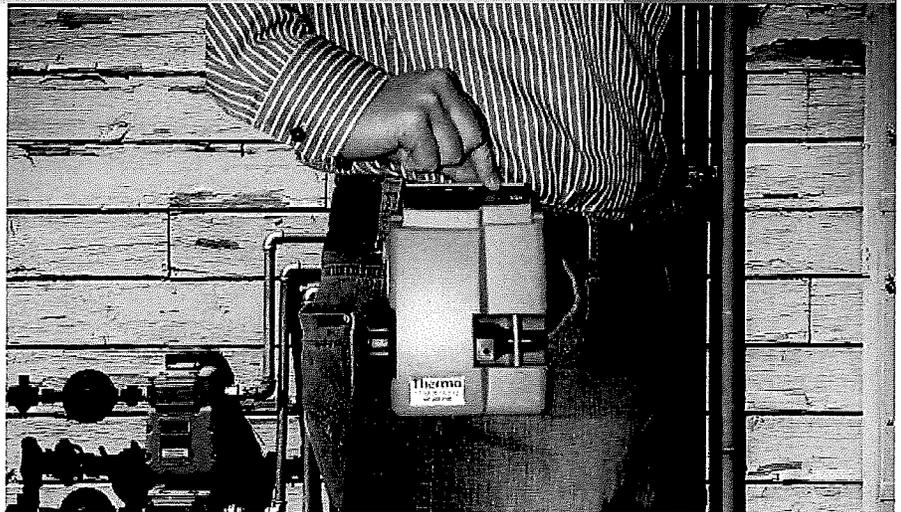
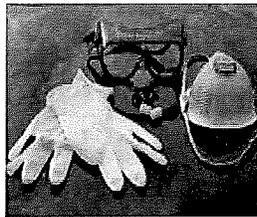
- 4-year repair and replacement guarantee
- Annual maintenance service

DISTRIBUTED BY:



## Thermo Scientific pDR-1500

Active, real-time, personal aerosol monitor/ data logger,  
with aerodynamic sizing



### Key Features / Benefits

- True volumetric flow control
- Interchangeable cyclones for higher accuracy cut points
- Personal aerosol instrument with benchtop performance
- Full compensation for environmental variables
- Flexible data logging routines
- Suitable for NIOSH Methods 0500 and 0600

The pDR-1500 was developed to meet a need for a fully integrated, active sampling personal scale instrument with greater accuracy, increased capabilities, low size and weight, maximum ease-of-use and increased operating time. It was designed for applications such as site remediation, size discrimination, mass validation, exposure modeling, and protection of asthma patients.

A lot gets in the way of accurately measuring aerosol concentration in real-time – temperature, humidity, air pressure and sample representation. The pDR-1500 handles all four – with relative humidity compensation, true

volumetric flow control and legacy pDR nephelometry. An integrated sample filter enables post-gravimetric validation of data.

Superior particle-cut points compared to those achievable using impactors are delivered through volumetric flow control and ACGIH traceable cyclones – available in pairs, for PM10 and PM4 or PM2.5 and PM1. A toroidal entrance assures optimized aerosol aspiration and a representative sample even without a cyclone.

## Thermo Scientific pDR 1500 Specifications

To maintain optimal product performance, you need immediate access to experts worldwide, as well as priority status when your air quality equipment needs repair or replacement. Thermo Scientific offers comprehensive, flexible support solutions for all phases of the product life cycle. Through predictable, fixed-cost pricing, Thermo services help protect the return on investment (ROI) and total cost of ownership of your Thermo Scientific air quality products.

Concentration Measurement Range	0.001 to 400 mg/m <sup>3</sup> range (auto ranging) <sup>1</sup>
Scattered Coefficient Range	1.5 x 10 <sup>-6</sup> to 0.6 m <sup>-1</sup> (approx) @ lambda= 880nm (not displayed)
Precision/ Repeatability Over 30 days (2-sigma) <sup>2</sup>	± 2% of reading or ± 0.005 mg/m <sup>3</sup> , whichever is larger, for 1 second averaging time ± 0.5 of reading or ± 0.0015 mg/m <sup>3</sup> , whichever is larger, for 10 second averaging time ± 0.2% of reading or ± 0.0005 mg/m <sup>3</sup> , whichever is larger, for 60 second averaging time
Accuracy <sup>1</sup>	± 5% of reading ± precision (traceable to SAE Fine Test Dust)
Resolution	0.1% of reading or 0.001 mg/m <sup>3</sup> , whichever is larger
Particle Size Range of Max. Response	0.1 to 10 µm
Flow Rate Range	1.0 to 3.5 liters/minute
Aerodynamic Particle Cut-Point Range	1.0 to 10 µm
Concentration Display Updating Interval	1 second
Concentration Display Averaging Time <sup>3</sup>	1 to 60 seconds (user selectable)
Data logging Averaging Periods <sup>3</sup>	1 second to 1 hour
Total # of Data Points That Can Be Logged in Memory	> 500,000
Number of Data Tags	99 (maximum)
Logged Data	averaging concentration, temperature, RH, barometric pressure, time/date, and data point number
Readout Display	LCD 16 characters (4 mm height) x 2 lines
Serial Interface	USB / RS-232, 19, 200 baud
Computer Requirements	IBM-PC compatible, 486 or higher, Windows 95® or higher, ≥ 8 MB memory, hard disc drive 3.5" floppy, VGA or higher resolution monitor
Real Time Analog Signal	0 to 5V and 4 to 20 mA. Selectable full scale ranges of: 0 - 0.1, 0 - 0.4, 0 - 1.0, 0 - 4.0, 0 - 10, 0 - 40, 0 - 100, and 0 - 400
Internal Battery Run Time with Backlight off	4 AA alkaline, > 24 hr run time, 5 V peak-to-peak @ 1.2 L/min; > 6 hour @ 3.5 L/min
Run Time @25 deg C	run time may vary with temperature
Current Consumption	70 to 450 mA (in Run Mode); 32 mA (in Ready Mode)
Operation Environment	-10°C to 50°C (14°F to 122°F), 10 to 95% RH, non-condensing
Storage Environment	-20°C to 70°C (-4°F to 158°F)
Dimensions (max external)	181 mm (7.1in) H X 143mm (5.6in) W x 84mm (3.3in) D
Weight	1.2kg (41oz)

### Notes:

1. Referred to gravimetric calibration with SAE Fine (ISO Fine) test dust (mmd = 2 to 3 µm, g = 2.5, as aerosolized)
2. At constant temperature and full battery voltage
3. User selectable



This specification sheet is for informational purposes only and is subject to change without notice. Thermo Fisher Scientific makes no warranties, expressed or implied, in this product summary.

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Instruments  
Air Quality Instruments

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# ATTACHMENT E

**Phase I and II Investigations and UST Closure, Patchogue, NY (2007 – Present)**

Mr. Kaplan conducted Phase I and II ESAs in association with multiple individual parcels owned separately, and acquired separately by one entity for consolidation and redevelopment. The site is located in the downtown area of Patchogue Village and has been developed since the 1800s for many different uses. The site is located on three physical blocks and separated by roadways (one of which that was condemned and incorporated into the footprint of on-site buildings). During the course of these environmental investigations, multiple USTs were identified, removed and abandoned. Mr. Kaplan coordinated with the County DOH and NYSDEC to properly register USTs, and report and close a petroleum-related spill. In addition, Mr. Kaplan prepared a soil management plan for implementation during excavation at the site.

**Phase I and Phase II Investigations, Condo Development, Mineola, NY (2008 – Present)**

Five buildings located on six contiguous parcels and two off-site adjacent properties were investigated by Mr. Kaplan for a site consolidation and redevelopment project. These buildings were historically utilized by an aerospace company for laboratory testing of components utilized in the Manhattan Project. Phase I and II ESAs were performed and included UIC, on-site supply and diffusion well, and UST sampling. Mr. Kaplan coordinated with various government agencies to register, remove, abandon and remediate existing site features including, but not limited to interior and exterior floor drains, supply and diffusion wells, seven USTs and 30 stormwater drywells. The agencies involved included the Village of Mineola, County DOH, NYSDEC and USEPA.

**Phase I and Phase II Investigations, AvalonBay, Mitchel Field, Garden City, NY (2003 – Present)**

Former military housing was acquired by AvalonBay from the U.S. Navy for redevelopment. As part of the project, Mr. Kaplan prepared Phase I and II ESAs prior to the acquisition. He was also instrumental in preparing cost and timeline estimates for AvalonBay with respect to existing conditions and procedures for subdivision redevelopment. Subsequent to acquisition, Soil Management and UIC Work Plans were prepared by Mr. Kaplan and approved by the County DOH. Mr. Kaplan provided oversight during the proper removal of impacted soils, implementation of a UIC remediation project, and abandonment of a 472-foot deep well. A NYSDEC spill was reported and closed, and impacted soils associated with a diesel AST were removed.

**On-Call Environmental Consulting, Long Island MacArthur Airport, Islip, NY (2011 – Present)**

Mr. Kaplan is the Project Manager responsible for an on-call agreement with the Town of Islip to provide environmental consulting services. Monthly groundwater sampling is conducted at various locations of the airport property in accordance with the Town of Islip's NYSDEC SPDES compliance. Other consulting services include Phase I and Phase II investigations, permitting, underground storage tank investigations, wetlands investigations, and remediation. To accomplish the goals of each task order, Mr. Kaplan responds quickly to requests and works closely with the Town of Islip, Suffolk County, and the NYSDEC.

For close to twenty years, Mr. Kaplan has been managing Phase I and Phase II Environmental Site Assessments (ESAs) and remediation projects. Throughout a project, he consults with private clients, lending institutions, legal counsel, and municipalities. As necessary he coordinates approvals, permitting, and remediation efforts with regulatory agencies. Mr. Kaplan has performed ESAs for communications facilities, residential, commercial, industrial properties, and institutions. Often, Mr. Kaplan works on ESAs from the initial investigation, through alternative development scenarios, to construction.

**Due Diligence including Phase I and Phase II Investigations, Champlain, NY (2011 – Present)**

Mr. Kaplan provided Phase I and pre-purchase due diligence services as part of the purchase of six properties. Following the Phase I investigations, Mr. Kaplan provided Phase II investigation services on two of the properties. Phase II services included groundwater and soil sampling as well as coordination with regulatory agencies.

**Remedial Work Plan Preparation and Investigation, Brooklyn, NY (2011 – Present)**

As part of an emergency response team, Mr. Kaplan provided environmental investigation and remediation services. Working closely with a NYSDEC spill contractor, Mr. Kaplan's responsibilities included determining sample locations, field oversight, and developing NYSDEC approved work plan.

**Timber Ridge Phase I Environmental Site Assessment, Holtsville, NY (2006 – 2011)**

A Phase I Environmental Site Assessment was conducted by Mr. Kaplan at Timber Ridge's Country View Estates in Holtsville. The Phase I investigation involved a field inspection, document review, and coordination with the client and Town. Subsequently, Mr. Kaplan prepared a Soil Management Work Plan for the Town, conducted field oversight and sampling, and issued the Closure Report.

**Bishops Lane Soil Management Plan, Southampton, NY (2007 – Present)**

As a follow-up to a Phase I Environmental Site Assessment conducted for Beechwood Homes, Mr. Kaplan prepared a Soil Management Plan (SMP). It was determined that the site, The Ponds at Southampton Village can be redeveloped from a commercial facility (sand mining and contractor yard) to residential usage.

**Phase I and II Investigations at New York State Psychiatric Center Hospital Redevelopment Projects, Central Islip, Brentwood, Melville and Dover Knolls, NY (2000 – Present)**

Mr. Kaplan coordinated site redevelopment issues with multiple parties following initial Phase I and II ESAs. Coordination included working with County DOH, NYSDEC and the USEPA. Mr. Kaplan's involvement with these projects included managing the removal of an electrical substation; remediation of PCB-contaminated soil; demolition of four out-of-service 500,000-gallon fuel oil ASTs; and remediation of fuel oil contamination. At one site, a soil management plan developed by Mr. Kaplan addressed heavy metal and pesticide impacts at a former agricultural-use section. In addition, a portion of one former psychiatric center was developed as senior affordable housing which required that Mr. Kaplan prepare various documents to satisfy HUD financing requirements.

**Phase I Environmental Site Assessments at Cellular Sites for Verizon Wireless, NY (2000 – Present)**

At many cellular sites in the New York area, Mr. Kaplan has performed Phase I Environmental Site Assessments (ESA). The ESAs are usually required as part of the planning, zoning, and impact analysis. Typically, the Phase I ESAs for the proposed location includes a review of site information, health department and NYSDEC documentation for the area, and visual inspections.

**Phase I and Phase II Investigations, Lowe's, Bay Shore, NY (2001 – 2005)**

As Project Manager for this retail redevelopment project, Mr. Kaplan conducted a comprehensive Phase I and II ESA, with asbestos and lead-based paint surveys of five structures. Based upon results, Mr. Kaplan coordinated with the County DOH, New York State Department of Labor, USEPA and various environmental remediation subcontractors to remediate the existing structures/infrastructure prior to construction. Phase II activities included assessment/remediation of over 250 stormwater drywells and six on-site sanitary systems, asbestos management, aboveground and underground fuel oil storage tank removals, and impacted soil disposal.

**Phase I and Phase II Investigations, North Shore Central School District Bus Maintenance Facility, Glenwood Landing, NY (2004 – 2008)**

Mr. Kaplan conducted Phase I and II ESAs at this vacant site which was adjacent to a Long Island Power Authority (LIPA) power plant and substation, and an oil storage tank farm. Based upon the results of the Phase II investigation, which included a geophysical survey, test pits, soil and groundwater sampling, soil vapor sampling, significant petroleum-impacted groundwater was found on the subject property. Working with the NYSDEC and County DOH, Mr. Kaplan was successful in suitably remediating on-site soils to permit site development activities.

**Phase I Environmental Site Assessment, South Oaks Hospital Amityville/Massapequa, NY (2000 – 2011)**

Mr. Kaplan has prepared multiple Phase I ESAs for various parcels located at this former hospital site. Since portions of the site are located within two counties, two townships and one village, the project required extensive coordination. Mr. Kaplan coordinated site redevelopment remediation for redevelopment by two separate entities. Remediation activities included the removals of fuel oil and gasoline USTs, NYSDEC spill closures, groundwater sampling, and impacted sediment removal.

**Phase I and Phase II Environmental Site Assessments, Former Fairchild Jet Engine Testing Facility, Bay Shore, New York (2001 – 2003)**

As Project Manager, Mr. Kaplan conducted Phase I and II ESAs that identified environmental concerns at this former industrial site. A No. 4 fuel oil spill was detected, prompting test pits and delineation of soil/groundwater impacts. Remediation was successful and the NYSDEC spill investigation was closed. The County DOH declared no further remedial action was necessary.

**Yachtsman's Cove Marina, Freeport, NY (2007 – 2008)**

NYSDEC spill reported at marina property prior to Mr. Kaplan's involvement. Mr. Kaplan prepared a NYSDEC-approved remediation work plan to successfully remove the gasoline UST and impacted soils, and install groundwater monitoring wells.

**Phase I and Phase II Environmental Site Assessment, Lowe's Redevelopment of the Huntington Town House, Huntington Station, NY (2006 – Present)**

Mr. Kaplan conducted a Phase I and II ESA, inclusive of asbestos and lead surveys at this former catering establishment. Investigation activities determined the existence of two unidentified out-of-service USTs and three in-service USTs. Mr. Kaplan worked with the Suffolk County DOH and NYSDEC to resolve UST and UIC issues.

**Phase I Environmental Site Assessment, Lighthouse Nassau Coliseum Redevelopment Project, Uniondale, NY (2002 – Present)**

Mr. Kaplan prepared a Phase I Environmental Site Assessment report for the Nassau Coliseum redevelopment project identified environmental conditions pertaining to former site use and proposed development. The scope of work addressed former sewage treatment beds associated with the previous Army Air Corps' airfield, existing and removed USTs, and groundwater quality.

**Phase II Remediation at Bronco Charlie's Restaurant, Oakdale, NY (2004 – 2006)**

Multiple sanitary leaching structures with elevated concentrations of VOCs in bottom sediments required remediation at this historic town site. Mr. Kaplan coordinated with the County DOH and NYSDEC for oversight of UIC-related structures, fuel oil UST removals and groundwater contamination. As a result, the County DOH and NYSDEC officially closed their investigations.

**Phase I and Phase II Environmental Site Assessments, Island Hills Golf and Country Club Litigation Support, Sayville, NY (2007)**

As Project Manager, Mr. Kaplan reviewed Phase I and II ESAs prepared on behalf of the property to provide litigation support. Mr. Kaplan conducted a successful UIC closure project resulting in a County DOH no further action declaration. Mr. Kaplan's knowledge of the USEPA UIC Program and contaminants identified in the remediation project was instrumental in a successful legal defense.

**Education**

BA, Economics, State University of New York at Geneseo, 1992

OSHA Lead in Construction Training, September 2003

Princeton Groundwater, Inc., Groundwater and Pollution Hydrology Course, February 2006

**Professional Registrations/ Certifications**

Certified Asbestos Inspector, 2001

OSHA, 40-Hour Hazardous Materials and Site Investigation, Certified 2004

**Employment History**

MTS EnviroSurv, Inc. 1992 – 1995 (conducted Phase I ESAs)

Wilsearch Information Network, Inc. 1995 – 2000 (conducted Phase I ESAs)

Freudenthal & Elkowitz Consulting Group, Inc. (operations acquired by VHB Engineering, Surveying and Landscape Architecture, P.C., effective January 1, 2009) 2000 – Present

## Bryan Murty

Project Manager

### United States Armed Forces Reserve Center/Nike Missile Base, Amityville, NY

Performed Phase I and Phase II Environmental Site Assessments for the closure and redevelopment of the former United States Armed Forces Reserve Center and Nike Missile Base located in Amityville, New York. Mr. Murty evaluated all environmental conditions at the property including sub-slab soil vapor and ambient air quality analyses, multi-depth soil sampling, underground injection control (UIC), as well as groundwater and wastewater sampling within abandoned missile silos.

### Former Bay Shore Armory, Bay Shore, NY

Performed a Phase II Environmental Site Assessment for the re-use and redevelopment of the former New York State Armory property. Mr. Murty coordinated with sub-contractors and provided field oversight for a geophysical survey, the sampling from several large leaching fields, abandoned underground structures including vehicle lifts, tanks and an oil/water separator.

### Polytechnic Institute of New York University, Brooklyn, NY

Mr. Murty assisted in the design and implementation of a large-scale groundwater remediation system associated with a former leaking underground storage tank located at the Polytechnic Institute in Brooklyn. The groundwater remediation system is designed to collect and capture contaminated groundwater and recover product floating on the groundwater table. In order to achieve this, Mr. Murty coordinated with various additional team consultants in order to gather information needed to produce a New York State Department of Environmental Conservation-approved remedial action work plan.

### T.C. Dunham Paint Company, Yonkers, NY

Mr. Murty provided consulting services including emergency response, and production and oversight of an approved remedial action work plan associated with a 4-alarm paint warehouse fire that impacted a large area in Yonkers. Mr. Murty teamed with various consultants and coordinated with various regulatory agencies, including the City of Yonkers, New York State Department of Environmental Conservation and the United States Environmental Protection Agency to generate various approved documents including a remedial action work plan, health and safety plan (HASp) and community air monitoring program (CAMP) plan.

### Country Point at Plainview, Plainview, NY

Mr. Murty conducted a Phase I Environmental Site Assessment on the former Nassau County Sanatorium and associated recreational playing fields in Plainview, New York. Mr. Murty used this information to provide integrated services and incorporated same into a Draft Environmental Impact Statement to analyze existing conditions, potential impacts and mitigation measures associated with the redevelopment of the former Nassau County Sanatorium to a multi-family residential subdivision.

### Queen of Peace Cemetery and Residential Subdivision, Old Westbury, NY

Preparation of the FEIS for the development of a cemetery for the Diocese of Rockville Centre.

### Nassau Coliseum Redevelopment, Lighthouse at Long Island, Uniondale, NY

Assisted in preparation of the DGEIS for the redevelopment of the existing Nassau County Veterans Memorial Coliseum to a multi-use entertainment and residential complex in the Town of Hempstead.

### EIS for Heartland Town Square Redevelopment, Brentwood, NY

Assisted in preparation of the EIS for the rezoning and redevelopment of the 475± acre former

Mr. Murty manages and conducts Phase I and Phase II Environmental Site Assessments. In addition, Mr. Murty performs various environmental services including soil vapor sampling/ambient air quality analysis, design, oversight and technical support of small and large-scale remediation projects, as well as noise studies. Mr. Murty also participates in various environmental planning activities, including preparation of Draft and Final Environmental Impact Statements.

7 years of professional experience



Pilgrim Psychiatric Center as a Smart Growth Community.

**Sheltair Aviation, Republic Airport, Farmingdale, NY**

Assisted in preparation of the Hazardous Materials section of DEIS for proposed redevelopment and improvement of a former residential subdivision as a private jet terminal.

**Costco, Hicksville, NY**

Prepared Phase I and Phase II Environmental Site Assessment and assisted in preparation of the revised FEIS for the redevelopment of the property at West John Street and Charlotte Avenue.

**Pulte Homes, Courthouse Commons, Central Islip, NY**

Prepared Phase I and Phase II Environmental Site Assessment and assisted in the monitoring of a large-scale remediation of a landfill at the former Central Islip Psychiatric Facility under the direction of the Suffolk County Department of Health Services and the New York State Department of Environmental Conservation for the ultimate redevelopment of the property as a residential condominium complex.

**Lowe’s Home Centers, Various Nassau County and Suffolk County Sites, NY**

Prepared Phase I and Phase II Environmental Site Assessments for several Lowe’s stores throughout Long Island.

**Verizon Wireless Phase I & Phase II Environmental Site Assessments, Various, NY**

Mr. Murty also prepared Phase I and/or Phase II Environmental Site Assessments throughout Long Island and the five boroughs of New York City for Verizon Wireless service expansion. Supported Phase II ESAs by performing soil sampling, groundwater investigations/monitoring and soil vapor monitoring. Also provided remedial investigation support.

**PANYNJ Passenger Facility Charge, Newark, NJ, New York, NY, New Windsor, NY**

Assisted in developing and administering the 2010 PFC application for the Port Authority of New York and New Jersey for Newark Liberty International Airport, John F. Kennedy International Airport, LaGuardia Airport and Stewart International Airport. This application includes \$570 million in capital development projects that incorporate terminal expansion, runway and taxiway pavement rehabilitation and security enhancements. Working with Port Authority staff, assisted in developing each project description justification through detailed meetings with a variety of Port Authority staff (technical services, accounting, planning) throughout the agency. The application received considerable support by the airlines and worked diligently with Port Authority staff and the FAA to the eventual approval of the application.

**Education** BA, Environmental Studies, SUNY Binghamton, 2005

**Professional Registrations/ Certifications** OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER), Certified 2006, 8-hour Refresher (current)  
OSHA 10-Hour Construction Safety, 2012

**Affiliations/ Memberships** American Association of Airport Executives, 2010 - Present

## **APPENDIX 5**

### **COMMUNITY AIR MONITORING PLAN**

# ***211 McGuinness Boulevard Mixed-Use Development***

209-235 McGuinness Boulevard  
Brooklyn, New York  
NYCOER Project Number 15RHAN236K  
E-Designation E-287

---

**Prepared for:** Steller Management  
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**Attention:** Mr. Adam Roman  
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**Prepared by:**

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**March 11, 2015**



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B	Site Safety Plan Acknowledgement Form
C	Site Safety Plan Amendments
D	Heat/Cold Stress Protocols
E	Chemical Hazards
F	Confined Space Entry Checklist/Permit
G	Emergency Telephone Numbers
	Hospital Information and Map
	Field Accident Report

## **Glossary of Common Acronyms**

ACGIH - American Conference of Governmental Industrial Hygienists  
ANSI - American National Standards Institute  
APR - Air Purifying Respirator  
C&D – Construction and Demolition  
CFR - Code of Federal Regulations  
CGI - Combustible Gas Indicator  
CSEP - Confined Space Entry Permit  
DECON – Decontamination  
ESA - Environmental Site Assessment  
ESI – Environmental Site Investigation  
FID - Flame Ionization Detector  
HEPA – High Efficiency Particulate Air  
HASP - Health and Safety Plan  
IDLH - Immediately Dangerous to Life and Health  
LEL - Lower Explosive Limit  
MSDS - Material Safety Data Sheets  
NIOSH - National Institute for Occupational Safety and Health  
OSHA - Occupational Safety and Health Administration  
OVA - Organic Vapor Analyzer  
PID - Photoionization Detector  
PEL - Permissible Exposure Limit  
PPB – Parts Per Billion  
PPE - Personal Protective Equipment  
PPM – Parts Per Million  
REC – Recognized Environmental Condition  
SCBA - Self Contained Breathing Apparatus  
SOP - Standard Operating Procedure  
SPCC - Spill Prevention Controls and Countermeasures  
SVOC – Semi-Volatile Organic Compound  
TLV - Threshold Limit Value  
TWA - Time Weighted Average  
UEL - Upper Explosive Limit  
UIC - Underground Injection Control

# Statement of Commitment

On-site employees may be exposed to risks from hazardous conditions related to remedial activities conducted as part of the Remedial Action Work Plan (RAWP) and construction and development activities for the 211 McGuinness Boulevard Mixed-Use Development project, located at 209 through 235 McGuinness Boulevard in the Greenpoint neighborhood of Brooklyn, New York (hereinafter referred to as the “subject property” or the “site”, see Attachment A, Figure 1). VHB Engineering, Surveying and Landscape Architecture’s (VHB’s) policy is to minimize the possibility of work-related injury through aware and qualified supervision, health and safety training, medical monitoring, use of appropriate personal protective equipment, and the activity-specific safety protocols contained in this Construction Health and Safety Plan (CHASP). VHB has established a guidance program to implement this policy in a manner that protects personnel to the maximum reasonable extent. This CHASP has been developed to meet the requirements of the Occupational Safety and Health Administration (OSHA) regulation, Title 29, Code of Federal Regulations, Part 1910.120 (20 CFR 1910.120), “Hazardous Waste Operations and Emergency Response.” It is intended for the protection of on-site workers.

This CHASP, which applies to personnel actually or potentially exposed to safety or health hazards, describes emergency response procedures for actual and potential physical and chemical hazards. This CHASP is also intended to inform and guide all personnel entering the work area or exclusion zone. All persons are to acknowledge that they understand the potential hazards and the contents of this CHASP by signing off upon receipt of their individual copy of the document. A copy of that Site Safety Plan Acknowledgement Form is included in Attachment B of this CHASP. Contractors and suppliers are retained as independent contractors and are responsible for ensuring the health and safety of their own employees.

VHB may require that its personnel, subcontractors, clients and visitors take certain precautions in accordance with this CHASP.

# 1.0

## Introduction and Site Entry Requirements

VHB has prepared this CHASP for activities associated with remediation and mitigation activities to be conducted as part of the RAWP at the subject property, and for construction and development activities proposed for the subject property. This CHASP addresses the potential physical and chemical hazards that VHB's workers and other on-site personnel may face while performing the planned site activities. It establishes procedures to minimize worker's exposures through personal protective equipment and safe work practices. The protocols and procedures outlined herein will be used for all planned field activities at the site. A copy of the CHASP will be available on site during all field activities and all personnel will be familiar with the document and its requirements.

This CHASP has been developed to meet the requirements of the Occupational Safety and Health Administration (OSHA) regulation, title 29, Code of Federal Regulations, Part 1910.120 (20 CFR 1910.120), "Hazardous Waste Operations and Emergency Response." It is intended for the protection of on-site workers. A copy of the CHASP will be available on-site during all site construction and remedial activities, and all personnel conducting on-site activities will be familiar with the document and its requirements. It is recommended that anyone else entering the site, such as subcontractors, clients and visitors, also review the CHASP and follow its procedures.

This site-specific CHASP is based on information available at the time the plan was prepared. The CHASP will be revised when new information is received or as conditions change. A written amendment will be prepared for any activities not covered herein and document all changes made to the CHASP. A copy of the Site Safety Plan Amendment form is included in Attachment C of this CHASP. The Site Safety Officer and Project Manager (as identified within this CHASP) will acknowledge all amendments to the CHASP.

---

## 1.1 Site Safety Plan Acceptance Acknowledgement

The Construction Project Manager or Site Safety Officer (SSO) will be responsible for providing a copy of this plan to all personnel that are or may reasonably be expected to work at the site and will request that each person sign the Safety Plan Acknowledgment Form in Attachment B. By signing the Site Safety Plan Acknowledgment Form, personnel are recognizing the actual or potential on-site hazards and the policies and procedures that design personnel will take to minimize exposure and risk. Site Safety Plan Acknowledgment Forms will also be signed for any Safety Plan Amendments that may be completed during this work. Safety Plan Amendment forms are included in Attachment C.

---

## 1.2 Daily Safety Meetings

Each day before work begins, the Construction Project Manager or SSO will hold safety (tailgate or tool box) meetings to ensure that all on-site personnel understand the site conditions and operating procedures, to ensure that personal protective equipment is being used correctly and to address safety questions and concerns. Meeting minutes and attendance will be recorded. All personnel eligible to enter the exclusion and decontamination zones must attend the meetings. Project staff will discuss and remedy any health and safety issues at these meetings.

---

## 1.3 Key Personnel

The key construction personnel will be determined prior to the start of field activities. The following identifies the key VHB personnel involved with the work, their title, and contact telephone number:

<u>Personnel</u>	<u>Title</u>	<u>Firm</u>	<u>Telephone</u>
Stephen Kaplan	Project Manager	VHB	631-787-3400
Kyle Winter	Site Safety Officer	VHB	631-787-3400
Hugh O’Riordon	Alt. Site Safety Officer	VHB	631-787-3400

If VHB replaces any of the above, the CHASP will be modified accordingly.

---

## 1.4 Roles and Responsibilities

The VHB Project Manager is responsible for overall project administration and, with guidance from the VHB SSO, for supervising the implementation of this CHASP. When the Project Manager is absent from the site, the SSO will assume the on-site responsibilities of the

Project Manager. All relevant OSHA health and safety standards will apply. The SSO will conduct daily (tail gate or tool box) safety meetings at the project site and oversee daily safety issues. Each contractor, 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, the Project Manager will be consulted.

The VHB SSO is also responsible for coordinating and enforcing health and safety activities on-site. The SSO must meet the emergency response and hazardous materials training requirements of OSHA 29 CFR Part 1910.120, must have completed OSHA supervisor training, pursuant to 29 CFR 1910.120 (e) 4; and must have appropriate experience to the related site work. The SSO is authorized to suspend the site work based on safety concerns, and is responsible for the following:

- Educating personnel about all of the information in this CHASP and any 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.
- Coordinating site safety decisions with the project superintendent and the Project Manager.
- Designating exclusion, decontamination and support zones on a daily basis.
- Monitoring the condition and status of known on-site hazards and maintaining and implementing the air quality monitoring program specified in this HASP.
- Maintaining the exclusion zone entry/exit log and site entry/exit log.
- Maintaining records of safety problems, corrective measures and documentation of any 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).

Any 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 SSO or appropriate key personnel.

---

## 1.5 Training Requirements

All personnel entering the exclusion zone or decontamination zone must meet the training requirements for hazardous waste site operations and emergency response operations in accordance with OSHA 29 CFR 1910.120(e).

Each subcontractor and supplier working on the job must provide the SSO with training documentation for its personnel. This documentation will be reviewed by the SSO to ensure

compliance with site-specific health and safety rules. The SSO may require modifications to the contractor, subcontractor or suppliers safety training documentation if it does not conform to site-specific requirements.

---

## **1.6 Medical Monitoring Requirements**

All personnel and visitors entering the exclusion zone or decontamination zone must have completed appropriate medical monitoring required under OSHA 29 CFR 1910.120(f). Medical monitoring enables a physician to monitor each employee's health, physical condition, and his fitness to wear respiratory protective equipment and carry out on-site tasks.

Evidence of compliance with any additional medical monitoring requirements for this site must also be included. Contractors, subcontractors and suppliers working on the job must provide the SSO with documentation on their medical monitoring programs.

---

## **1.7 Fit-Testing Requirements**

All personnel and visitors entering the exclusion zone or decontamination zone using a negative pressure air purifying respirator (APR) must have successfully passed a qualitative respirator fit test in accordance with OSHA 29 CFR 1910.134 or the American National Standards Institute (ANSI).

Fit testing documentation is the responsibility of each contractor and subcontractor. Documentation of VHB's personnel fit-testing is maintained on file.

# 2.0

## Site Background and Scope of Work

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### 2.1 Site Background

The site is located in the Greenpoint section of Brooklyn, New York and is identified as Block 2576 and Lot Nos. 20 and 23 on the New York City tax maps. The site is 33,750-square feet and is bounded by McGuinness Boulevard to the east, a gasoline filling station to the north along Greenpoint Avenue, a residential apartment building with ground-floor retail to the south along Calyer Street, a multi-tenant commercial shopping center and associated parking lot across McGuinness Boulevard to the east, and multi-family residences and multi-unit residential apartment buildings to the west along Eckford Street. Currently, Lot No. 23 is developed with three vacant connected, one-story commercial buildings that were formerly utilized as an auto part store and service garage, a billiards hall, an antiques retailer and a vacant commercial space with basement. Lot No. 20 is improved with a two-story, two-family residence with basement.

Based upon previous Phase I Environmental Site Assessments (ESAs) completed for the subject property, a portion of Lot 20 was historically developed as a porcelain manufacturing facility dating from 1887 at least 1916. Activities on-site included a machine shop, mixing and molding, porcelain painting, coal storage, and operation of numerous kilns. During the porcelain manufacturing process, various metals may have been used in the glazing processes. Subsequent to initial redevelopment of Lot 20, the northern portion of the parcel was developed as an automobile service facility, which has been operating on the parcel under different ownership since at least 1942.

A history of Lot No. 23 was established dating back to 1887, when the parcel was vacant. By 1905, the parcel was improved with the existing two-story two-family residence with two small accessory structures (likely sheds). Between 1916 and 1942, the accessory sheds were presumably removed and replaced with a one-story detached garage located on the western portions of the subject property. The detached garage is no longer present, but was likely demolished between 2007 and present.

A remedial investigation was performed and the results are documented in a companion document called “Remedial Investigation Report, 211 McGuinness Boulevard Mixed-Use Development”(RIR).

The Areas of Concern identified in the Phase I ESAs produced for the respective parcels include portions of the site where underground storage tanks (USTs) were previously located, along with areas along the northern portions of the subject property proximate to the adjacent gasoline filling station. Furthermore, given the historically industrial nature of the subject and surrounding properties, a potential for soil, groundwater and soil vapor impacts at the subject property was identified.

Given the potential for subsurface impacts, a subsurface investigation was performed by PVE Sheffler, LLC (PVE Sheffler) on Lot No. 20. Based upon the results of the PVE Sheffler subsurface investigation, along with consultation with the New York City Office of Environmental Remediation (NYCOER), VHB conducted a supplemental subsurface investigation on Lot No. 20, along with additional subsurface investigation on Lot No. 23 to satisfy the E-Designation requirements for HazMat.

Based upon the results of the aforementioned subsurface investigations, the following was determined:

- Depth to groundwater is confirmed at approximately 12-to-14 feet below grade surface (bgs).
- Groundwater presumably flows from southeast to northwest beneath the Site.
- Bedrock was not encountered during the PVE Sheffler and VHB subsurface investigations.
- The stratigraphy of the site, from the surface down, revealed the presence of fill (i.e., brick, asphalt, concrete, etc.) uniformly within the top three-feet, followed by a mixture of light and medium brown sand with traces of gravel within deeper areas. Some additional minor quantities of fill materials were encountered (approximately nine-feet bgs).
- Soil/fill samples collected during 2014 Phase II and 2014 RI were compared to NYSDEC Unrestricted Use Soil Cleanup Objectives and Restricted Residential Use Soil Cleanup Objectives as presented in 6NYCRR Part 375-6.8 and CP51. No PCBs were detected above Unrestricted Use SCOs. One VOC, Isopropylbenzene, was found above Restricted Residential Use SCOs in one deep sample. Ten SVOCs, including benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, fluoranthene, phenanthrene, and pyrene were detected above Restricted Residential Use SCOs in three shallow and one deep soil samples. Naphthalene was also detected in one shallow soil sample at a concentration above Unrestricted Use SCOs. Most of elevated SVOCs were detected at sample location VHB SB-3 (0-2’ and 14-16’), representing a hot spot. Metals including arsenic, cadmium, copper, lead, mercury, and zinc were detected above Unrestricted Use SCOs in the shallow soil samples. Of these metals, arsenic, lead, and mercury also exceeded Restricted Residential Use SCOs. One pesticide, 4,4-DDE was detected above Unrestricted Use SCOs in one shallow soil sample.

- ▶ Groundwater samples collected during the 2014 Phase II and 2014 RI were compared to NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (GQS) for Class GA (drinking water). No VOCs, SVOCs, pesticides, or PCBS were detected above the GQS. The dissolved metals antimony, manganese, and sodium were detected above their respective GQS.
- ▶ Soil vapor samples collected during the 2014 Phase II and 2014 RI were compared to the compounds in Table 3.1 Air Guidance Valued derived by the New York State of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion (October 2006). Soil vapor results detected trace to high levels of petroleum related compounds including benzene, toluene, ethylbenzene, xylenes, hexane, and cyclohexane.

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.

Based upon the confirmed subsurface impacts at the site, this CHASP has been prepared to address these and other site- and activity-specific hazards to be encountered during the implementation of the RAWP and on-site demolition and construction activities.

---

## 2.2 Scope of Work

Tasks to be performed at the subject property under this CHASP include site demolition and redevelopment activities, and activities outlined in the RAWP, inclusive of the excavation of impacted soils, collection of endpoint soil samples and waste characterization samples, and removal of any encountered USTs.

The proposed development consists of an approximately 213,000 gross square foot (gsf) mixed-use building. The building will contain 197 residential units, of which 40 will be affordable units pursuant to the Inclusionary Housing program, and 18,366 square feet of ground floor commercial space. Ground floor uses include a lobby, a lounge, and a library associated with the residential component of the building, and local retail space. Additionally, the cellar level of the building will have an 18,450 square foot, attended parking garage with 110 parking spaces one floor below-grade. The cellar level will also include storage areas for building tenants as well as bicycle storage. The new building will be approximately 80 feet tall and have 8 above-grade floors. The existing buildings on the site will be demolished to make way for the new construction.

A construction/excavation contractor will be responsible for the excavation of contaminated soils, as outlined in the RAWP. The aforementioned contractor will be responsible to ensure that all materials introduced into the work area and all installation equipment will be environmentally suitable and does not contain potential contaminants.

In the event that additional unknown contaminated soils and/or groundwater are encountered (i.e., if the presence of staining, sheens, odors or other physical evidence of contamination is noted) during the completion of the aforementioned tasks, work activities will be suspended

and the VHB Project Manager will be notified. Site activities will then proceed only at the direction of the VHB Project Manager and/or the VHB Site Safety Officer. Care will be exercised during the continued work activities to mitigate the further movement of any contamination, and equipment will be periodically cleaned during appropriate work stages, as needed to prevent the spread of contaminants.

The Site Safety Officer shall incorporate awareness of trip/fall hazards and hazards associated with the operation of heavy equipment into the daily tailgate safety meetings. In addition, following the completion of the daily activities, the Site Safety Officers shall inspect the site for excavations and other trip/fall hazards. If identified, the Site Safety Officer will be responsible for having these areas secured.

Activity-specific hazards associated with site operations and the standard operating procedures (SOPs) that will be implemented to reduce these hazards are discussed in Section 3.0 (Hazard Assessment) below.

# 3.0

## Hazard Assessment

This Hazard Assessment identifies the activity-specific hazards associated with site operations and the SOPs that will be implemented to reduce the hazards. This section identifies general physical hazards that can be expected, and presents an analysis of documented or potential chemical hazards likely to be encountered at the site. Every effort will be made to reduce or eliminate these hazards. Hazards that cannot be eliminated must be managed through engineering controls and/or personal protective equipment.

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### 3.1 Activity-Specific Hazards and Standard Operating Procedures

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#### 3.1.1 Operation of Heavy Equipment

OSHA guidelines will be followed for operating heavy equipment as outlined in 29 CFR 1926.602.

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#### 3.1.2 Excavation/Earthwork

According to the site-specific scope of work proposed in the RAWP, excavation/earthwork activities will be conducted in order to remove contaminated soils from the subject property and in order to complete the proposed development activities. On-site personnel will follow the earthwork protocols described below.

Equipment, including earth-moving equipment or other heavy machinery, will be operated in compliance with the manufacturer's instructions and limitations as well as any applicable regulations. The operator is responsible for inspecting the equipment daily to verify that it is functioning properly and safely.

Operation of equipment at the site poses physical hazards. The following precautions should be observed whenever heavy equipment is in use:

- PPE, including steel-toed boots, safety glasses, reflective vests and hard hats must be worn.
- Personnel must be aware of the location and operation of heavy equipment and take precautions to avoid getting in the way of its operation.
- Workers must never assume that the equipment operator sees them; eye contact and hand signals should be used to inform the operator of intent. Personnel should not walk directly in back of, or to the side of heavy equipment without the operator's knowledge. Always make the heavy equipment operator aware of your presence.
- High visibility traffic safety vests are required to be worn when working in high traffic zones or where heavy equipment is being operated.
- The heavy equipment operation work area must be coned off to distinctly mark the boundaries.
- All non-essential personnel and pedestrians must be kept out of the work area.

The OSHA 29 CFR 1926.651 (February 20, 1990) established construction industry standards relating to excavation work. These standards include shoring and cutback requirements, equipment specifications, entry requirements, etc. To avoid exposure to site-specific contaminants and to ensure acceptable atmospheric conditions, the following additional requirements apply:

- Air quality will be tested before employees enter excavations over four feet deep if a hazardous atmosphere exists or is suspected to exist. If the Site Safety Officer determines that excavations are, by OSHA's definition, "confined space," the confined space entry policy (Section 8.0) will be followed.
- Open excavations will be backfilled as soon as practicable. However, based upon the proposed site activities, some shallow excavations may remain open pending the receipt of laboratory analytical results. While excavations remain open, appropriate warnings will be posted and barricades will be erected to protect pedestrian and worker safety. Where possible, excavation side walls will be cut at a gradual slope to maximize egress and access. Workers may need to enter shallow excavations in order to collect endpoint soil samples. However, workers will not enter excavations at any other time, unless absolutely required. In addition, workers will not, under any circumstances, enter an excavation which contains standing water.
- To ensure atmospheric quality, tests shall be conducted as often as necessary as determined by the Site Safety Officer. This includes tests for flammable gas and oxygen deficiency.

- When the Site Safety Officer identifies hazardous atmospheres, emergency rescue equipment and PPE must be on the work site (Level C PPE) and readily accessible to employees (29 CFR 1926.651(g)(2)(i)).
- Daily site safety inspections of all excavations will be conducted by the Site Safety Officer and/or by a qualified contractor.

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### 3.1.3 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. On-site personnel will follow the heat and cold stress safety protocols described in Attachment D.

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### 3.1.4 Drilling and Probing Operations

Drilling and probing are not currently included in the site-specific scope of work. However, should the scope of work be changed to include drilling operations, this CHASP will be amended and on-site personnel will follow the drill rig operation safety protocols.

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### 3.1.5 Dust Control and Monitoring During Earthwork

Dust generated during site activities may contain contaminants associated with the site characteristics. Dust control measures will be implemented as necessary, including wetting of soils with water, and applying calcium chloride if the problem cannot be controlled with water. Site workers will not be required to wear APR's unless dust concentrations are consistently over 150  $\mu\text{g}/\text{m}^3$  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. The primary sources of dust will be equipment, vehicular traffic, and excavation activities.

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## 3.2 General Site Hazards

Although not all of these hazards may be encountered at the site, employees should be aware of the potential of encountering these hazards during site work:

### Fire

Site personnel will not perform or allow any act on the property which involves the creation of a fire or explosion hazard. Non sparking tools and fire extinguishers shall be used or

available as appropriate. Sources of ignition shall be removed from work areas. When necessary, explosion proof instruments and/or bonding and grounding will be used.

### Electricity

Applicable OSHA 29 CFR 1910.120(m) standards for illumination shall apply. All work is to be conducted during daylight hours whenever possible.

Overhead and underground utilities shall be identified and/or inspected prior to conducting operations involving potential contact or interference. As per OSHA 1910.333, for unqualified persons working on the ground near overhead energized lines, the minimum permissible distance requirements are as follows:

- For voltages to ground 50kV or below – 10 feet
- For voltages to ground over 50kV - 10 feet plus 4 inches for every 10kV over 50 kV

Live power sources will be locked and tagged out by authorized personnel. In these instances verification that power sources have been appropriately de-energized will be provided by Con Edison. All drilling equipment will be securely grounded when working within or around the electrical substation.

All electrical power to the work site must run through a ground fault circuit interrupter as an integral part of the circuit. All equipment must be suitable and approved for the class of hazard. Applicable OSHA 29 CFR 1926 Subpart K standards for electrical use shall apply.

### Noise Protection

Workers will wear appropriate hearing protection when operating or working near heavy equipment. The use of heavy equipment may generate noise above the OSHA permissible exposure limit for noise of 90 dB(A) for an 8-hour time weighted average. If loud noise is present or normal conversation becomes difficult, hearing protection in the form of earplugs or the equivalent is required. In addition, the NYCDEP requires contractors utilizing construction equipment to have notarized Construction Noise Mitigations Plans.

### Underground and Overhead Utilities

The locations of underground pipes, fuel lines, electrical conductors, water, sewer, telecom and natural gas lines must be determined prior to any intrusive activities such as excavations. Hand-operated equipment shall not be used in areas with known electrical hazards. A minimum distance of 20 feet from overhead utility lines such as power lines is required.

By law, excavators and contractors working in the five boroughs of New York City and Nassau and Suffolk Counties on Long Island must contact New York 811 at (800) 272-4480, at least 48 hours prior to beginning and mechanized digging or excavation work to ensure that underground utility lines are marked. The Site Safety Officer will ensure that the contractor has a valid One Call Ticket No. prior to the start of field activities.

If an underground utility is damaged during work at the subject property, mechanized equipment will immediately be shut down until the damage can be assessed. Depending on the type of utility involved, the appropriate local entity will be notified.

#### Trip/Fall Hazards

Work, where a fall of over four feet is possible, will be performed by appropriately using ladders and/or fall protection (i.e. body harness, lifeline, and suitable anchorage).

The Site Safety Officer shall incorporate awareness of trip/fall hazards into the daily tailgate safety meetings and conduct periodic inspections of the site to identify potential trip/fall hazards. In addition, following the completion of the daily activities, the Site Safety Officers shall inspect the site for open, excavations and other trip/fall hazards. If identified, the Site Safety Officer will be responsible for having these areas secured.

Proper housekeeping practices should be utilized, including the removal of debris, tools, cords, etc. from the work area in order to minimize trip hazards. If trip hazards cannot be removed from the work area, same should be secured and cones should be utilized to identify the hazards.

#### Poison Ivy

Although it is recommended that workers learn to recognize the poison ivy plant, in practice, it is hard to do, since poison ivy and its relatives are often mixed in with other vegetation and not noticed until after an exposure has occurred. Keeping the skin covered in situations in which exposure is hard to avoid is the best way to prevent the problem. Long pants and long sleeves will be worn while working in vegetated areas.

#### Poisonous Insects

Common examples include bees and wasps. Hives can be located above, below or on the ground. If necessary, an insecticide may be recommended for control; check with the Site Safety Officer. Long sleeves and long pants will offer some protection against inadvertent contact. On-site personnel who have insect allergies are instructed to inform the Site Safety Officer prior to field activities. **In addition, all personnel with potentially life threatening insect allergies are required to bring their epi pens or rescue medicines to the field with them for use in the event of a sting.**

#### Ticks

Ticks like to rest on low-lying brush and 'catch a ride' on a passing animal or person. Workers should exercise caution when working in vegetated wilderness areas where ticks may be present. To reduce the chance of getting a tick-bite, workers should wear light-colored clothing and conduct frequent tick-checks. Light-colored clothing allows ticks to be seen more easily on clothing and gives the opportunity to remove them before they can attach to

the skin and feed. As required above, long-sleeve shirt and long pants will also aid in the prevention of tick bites by reducing the amount of skin exposed to the ticks. Also, shirts should be tucked into the pants and pants legs tucked into the socks. This keeps the ticks on the outside of the clothing and restricts the tick's efforts to crawl onto the skin. Frequent tick-checks should be conducted which include a visual inspection of the clothing and exposed skin, followed by a naked, full-body examination in a private location. Workers should be sure to check the scalp, behind and in the ears, and behind any joints.

### Heavy Traffic Areas

Vehicular traffic represents one of the most common hazards that cause serious injury or death when working at sites. Risk from vehicular traffic may be minimized by safe operating practices by the employee during Site work.

Site personnel will wear highly visibility orange safety vests in areas of heavy traffic. Employees should make an effort to be aware of their surroundings and potentially dangerous traffic areas at all times. If work is being done that will in any way inhibit the employees' ability to continuously be aware of their surroundings, such as crouching down to sample a monitoring well or taking notes, tall orange cones should be placed around the employee to make motorists aware of their presence. Tall orange traffic cones should also be placed in work areas considered to be highly dangerous traffic areas. Any work performed in a road or on the shoulder of the road should require a police detail to monitor worker safety in vehicular traffic in addition to the use of orange vests and orange traffic cones.

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## **3.3 Chemical Hazards**

Based upon the results of subsurface investigations completed at the subject property, subsurface soils, groundwater and soil vapor contain concentrations of constituents of concern above applicable standards. The specific compounds are discussed in Section 2.1, above. As such, contaminated media in contravention of applicable regulatory standards may be encountered during work activities. Accordingly, all excavation and sampling activities will be performed in Level D or Level C protection, as determined by the Site Safety Officer.

As described in Sections 3.3.2 and 5.1, air monitoring with a photoionization detector (PID) will be conducted by the Site Safety Officer during all excavation activities, in order to determine if organic vapor concentrations are present and exceed action levels. Although it is not anticipated, if air monitoring results indicate that work cannot proceed because of atmospheric conditions, the work will be stopped and an amendment to this CHASP will be prepared to include procedures for engineering controls and increased levels of personal protection.

Copies of the MSDS for the contaminants of concern are included in Attachment E.

Attachment E will be supplemented if additional site-specific chemicals are identified.

Potential routes of exposure of these materials include:

- Inhalation of airborne particulate and vapor
- Dermal contact
- Incidental ingestion

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### 3.3.1 Asbestos Containing Materials

Asbestos is the name given to a group of fibrous silicate minerals, typically those of the serpentine group. The tensile strength, flexibility, and non-flammability of asbestos have led to many uses including structural materials, brake linings, insulation, and pipe manufacture. Asbestos is of concern as an air pollutant because when inhaled it may cause asbestosis, mesothelioma, and bronchogenic carcinoma. In 1989, the USEPA announced regulations that would phase out most uses of asbestos by 1996.

Based upon the age of the existing on-site structures, materials within same may contain ACM. As such, prior to the start of demolition activities, ACM should be removed in accordance with all applicable federal, state and local regulations.

Workers must have New York State Department of Labor (NYSDOL) and New York City Department of Environmental Protection (NYCDEP) certifications. Workers must have OSHA training, and personal air sampling (breathing zone) is required for workers only. The proper fulfillment of these requirements and oversight of such activities are the responsibility of the contractor.

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### 3.3.2 Lead Based Paint

In 1978, the U.S. Product Safety Commission issued a ban on paints or surface coatings that contain greater than 0.06 percent lead. Lead-based paint (LBP) is defined by the USEPA and Housing and Urban Development (HUD) guidelines as paint or other surfaces coating that contains lead equal to or greater than 0.5 percent, 5,000 parts per million (ppm) or 1.0 milligram per square centimeter (mg/cm<sup>2</sup>) as measured by laboratory analysis or X-ray fluorescence (XRF). Based upon the age of the existing on-site structures, there is a potential for LBP to be present within same.

In addition, lead containing paint (LCP), which contains concentrations of lead less than 5,000 ppm may also be present within the subject building. Due to the relatively low concentrations of lead in LCP, there are no applicable or relevant USEPA, State or Local regulations regarding LCP disturbance. However, OSHA does regulate the exposure of lead to workers due to the disturbance of LCP.

The Action Level and Permissible Exposure Limit (PEL), set forth by OSHA Lead in Construction 1926.62 regulations for worker safety are defined in units of air measurement. The interim final standard establishes an Action Level of 30 micrograms per cubic meter

(ug/m<sup>3</sup>) averaged over an eight-hour day. The Action Level triggers several ancillary provisions of the standard such as exposure monitoring, medical surveillance and training.

If lead is present in the workplace at any quantity, the contractor is required to make an initial determination whether a worker's exposure to lead exceeds the Action Level (30 ug/m<sup>3</sup> averaged over an eight-hour day). Employee exposure is that exposure which would occur if the employee were not using a respirator. This initial determination requires the employer to monitor workers' exposures unless he or she has objective data that demonstrates conclusively that no employee will be exposed to lead in excess of the Action Level.

OSHA has established a PEL of 50 ug/m<sup>3</sup> of lead, averaged over an eight-hour workday, which is referred to as a time weighted average (TWA). This is the highest level of lead in air to which a worker may be permissibly exposed over an eight-hour workday.

Based upon the foregoing, the contractor is required to make an initial determination for the proposed construction activities, and the contractor should address worker health and safety (personal protection, monitoring, etc.) if warranted.

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### 3.3.3 Polychlorinated Biphenyl Containing Materials

PCBs were used until 1978 and are a group of compounds formed by the chlorination of biphenyl. PCBs have extremely high physical and chemical stabilities which led to their being used in many applications, including heat transfer fluids, hydraulic fluids, and dielectrics. PCBs are often found in transformers, capacitors and hydraulic systems. Fluorescent light fixtures may contain PCB-containing light ballasts. PCBs may also be present in materials such as cable insulation, caulking, thermal insulation materials, adhesives, oil based paints and floor finishes that were produced before the 1978 ban. There is the potential for PCB-containing materials to be present within the existing on-site structures.

Because of the health hazard associated with PCBs, they are regulated under the Toxic Substances Control Act (TSCA). PCBs are subject to federal disposal regulations and any suspect PCB-containing materials identified within the subject building should be properly handled during the on-site demolition and construction activities.

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### 3.3.4 Petroleum or Other Contaminants

In the event that previously unidentified contaminated soils are encountered (i.e., if the presence of staining, sheens, odors or other physical evidence of contamination is noted), on-site activities will be suspended and the Project Manager and the SSO will be notified (if not already present). Proper notification of the NYSDEC Spills Hotline will commence, if applicable. Construction and/or excavation activities will then proceed only at the direction of the Project Manager and the SSO. Any petroleum impacted soils will be removed and

properly disposed of in accordance with all NYSDEC regulations. The CHASP will also be updated to reflect the newly identified chemical hazards associated with the contamination.

In the event that any underground storage tanks (USTs) are encountered (including dispensers, piping and fill ports), same must be properly removed/closed in accordance with all applicable NYSDEC regulations.

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### 3.3.5 **Respirable Dust**

Dust may be generated from vehicular traffic, construction and/or excavation activities. If visible observation 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 increasing the amount of water applied to the material and if this is not effective, requiring workers to wear APRs with efficiency particulate air (HEPA) cartridges.

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### 3.3.6 **Organic Vapors**

Excavation activities can cause the release of organic vapors to the atmosphere. However, based upon the results of the December 2010 subsurface investigation activities, it is not anticipated that organic vapors will be generated during construction activities. However, if previously unknown contaminants are encountered at the site, the SSO will monitor organic vapors with a PID during site activities to determine whether organic vapor concentrations exceed action levels. Additional information regarding air monitoring activities is included in Section 5.0, below.

# 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 and/or ANSI-approved (as appropriate) 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 significant difference among the levels of protection from D thru B is the addition of the type of respiratory protection.

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### 4.1 Activity-Specific Levels of Personal Protection

The required level of PPE is specific to the activity being conducted, the contaminants expected to be encountered (Section 3.3), and may be based on air monitoring results (Section 5.0).

Based upon the results of the Phase II ESA and the nature of the work to be performed, the scope of work will be performed in Level D or Level C protection, as determined by the Site Safety Officer. Air monitoring with a PID will be conducted by the Site Safety Officer during all excavation activities, in order to determine if organic vapor concentrations are present and exceed action levels. The results will be monitored and recorded, in order to determine whether acceptable atmospheric conditions are being sustained. If determined necessary by the Safety Officer, air monitoring may be amended to also include the concentrations of oxygen (O<sub>2</sub>), the concentrations of flammable gases with respect to the lower explosive limit (LEL) and the concentration of carbon monoxide (CO) and hydrogen sulfide (H<sub>2</sub>S).

Although it is not anticipated, if air monitoring results indicate that work cannot proceed because of atmospheric conditions, the work will be stopped and an amendment to this CHASP will be prepared to include procedures for engineering controls and increased levels of personal protection.

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## 4.2 General PPE

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### 4.2.1 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 uniform, 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

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### 4.2.2 Level C

Level C PPE shall be donned when the concentrations of measured total organic vapors in the breathing zone exceed background concentrations (using a portable OVA, or equivalent), but are less than 5 ppm, or otherwise when required by SOPs or VHB's Respiratory Protection Policy. 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 work boots
- 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
- ankles/wrists taped with duct tape

The Site Safety Officer will verify if Level C is appropriate by checking organic vapor concentrations using a PID or compound and/or class-specific detector tubes.

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### 4.2.3 Level B

Level B PPE shall be donned when the contaminants have not been identified and/or the concentrations of unknown measured total organic vapors in the breathing zone exceed 5 ppm (using a portable OVA, or equivalent). Level B PPE shall be donned if the IDLH of a known contaminant is exceeded. If a contaminant is identified or is expected to be encountered for which NIOSH and/or OSHA recommend the use of a positive pressure self-contained breathing apparatus (SCBA) when that contaminant is present, Level B PPE shall be donned even though the total organic vapors in the breathing zone may not exceed 5 ppm. Level B shall be donned for confined space entry, and when the atmosphere is oxygen deficient (oxygen less than 19.5%) or potentially oxygen deficient. If Level B PPE is required for a task, at least three people shall be donned in Level B at any one time during that task. PPE shall only be donned at the direction of the Site Safety Officer. Level B PPE consists of:

- supplied air SCBA or air line system with five minute egress system
- chemical resistant coveralls
- steel-toe and steel-shank work boots
- chemical resistant overboots or disposable boot covers
- disposable inner gloves
- disposable outer gloves
- hard hat
- ankles/wrists taped

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

# 5.0

## Air Monitoring and Action Levels

Pursuant to 29 CFR 1910.120(h), air monitoring shall be conducted to identify and quantify levels of airborne hazardous substances and health hazards, and to determine the appropriate level of worker protection.

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### 5.1 Air Monitoring Requirements

Based upon known contaminants at the subject property, and the nature of the work to be performed, air monitoring will be conducted by the Site Safety Officer during all remedial activities. Monitoring will be conducted using direct-reading instruments to evaluate the conditions in the work area. Based on current knowledge of the work operations and potential site conditions, the testing will be conducted using the following instrument:

- A PID calibrated to detect of Volatile Organic Compound (VOCs) at a minimum concentration of 0.1 part per million (ppm). The PID will be used during all drilling and soil/groundwater sampling activities.

If determined necessary by the Site Safety Officer, air monitoring may be amended to also include the following instrument:

- Four Gas Meter (O<sub>2</sub>/LEL/CO/H<sub>2</sub>S) or equivalent, to determine the concentrations of oxygen (O<sub>2</sub>), the concentrations of flammable gases with respect to the lower explosive limit (LEL) and the concentration of carbon monoxide (CO) and hydrogen sulfide (H<sub>2</sub>S). The PID will be used during all drilling and soil/groundwater sampling activities, if determined necessary by the Site Safety Officer.

All air monitoring data will be documented in a site logbook. Air monitoring instruments will be calibrated and maintained by the VHB Site Safety Officer in accordance with the manufacturer's specifications. When tasks are performed, the concentration of contaminants (for example, VOCs) shall be measured in employees' breathing zones several times during the task using the direct reading instrument. The specific frequency of the monitoring shall vary with the task to be performed; more frequently during operations having a greater potential for exposure.

Measurements with the PID and Four Gas Meter will also be taken prior to personnel entering a confined space, however, based upon the site-specific scope of work, confined space entries will not be necessary. Should the scope of work be amended to include confined space entry, an amendment to this CHASP will be prepared.

In addition, a Community Air Monitoring Program (CAMP) has been prepared for the subject property, which fulfills the requirements set forth by the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan, dated December 2009, and NYSDEC Fugitive Dust Suppression and Particulate Monitoring Program (under the Technical Assistance and Guidance Memorandum [TAGM] – 4031). The intent of the CAMP is to provide for a measure of protection for downwind communities from potential airborne releases of constituents of concern during on-site remedial activities. These activities will include excavation and removal of impacted soils from areas of proposed excavation and load-out. The CAMP specifies potential air emissions, air monitoring procedures, monitoring schedule and data collection and reporting.

## 5.2 Air Monitoring Results and Actions

The results of the air monitoring and sampling will be compared, for most stressors, to applicable OSHA Permissible Exposure Limits (PELs). The following table identifies applicable OSHA criteria and the action levels used to make decisions about changing the requirements for personal protective equipment.

Stressor	OSHA PEL	Action Level
Flammable Gases	0 – 1% of the LEL 1 – 10% of the LEL	Work continues Work continues; increase monitoring frequency
Oxygen	> 10% of the LEL <19% 19 – 23.5% > 23.5%	Work stops Leave area immediately Work continues Work stops; ventilate area before returning.
VOCs	1 ppm sustained for 5 min. 10 ppm sustained for 5 min.	Screen for benzene using Draeger tubes Work stops; ventilate area before returning.
Carbon Monoxide	10 ppm sustained for 30 min. 35 ppm	Upgrade to Level C. 25 ppm - Leave area and ventilate
Hydrogen Sulfide	10 ppm	10 ppm - Leave area and ventilate

Although it is not anticipated, if air monitoring results indicate that work cannot proceed because of atmospheric conditions, the work will be stopped and an amendment to this

CHASP will be prepared to include procedures for engineering controls and increased levels of personal protection.

# 6.0

## Site Control

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### 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.

Tasks requiring OSHA 40-hour Hazardous Waste Operations and Emergency Response Operations training are carried out in the exclusion zone. 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 Safety Officer) is conducted in the exclusion zone; all other decontamination is performed in the decontamination zone or trailer.

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 according to the procedures outlined in Section 7.0. All personnel and equipment shall 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.

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## 6.2 General Field Safety and Standard Operating Procedures

Hazards on the site can be controlled by limiting entrance to exclusion zones to essential personnel and by implementing the following rules:

- Non-essential (as judged by the SSO) personnel and unauthorized persons will not enter the exclusion or decontamination zone.
- Before entering the exclusion or decontamination zones, all personnel must be familiar with emergency response procedures (Section 9.0), site safety locations, first aid and communication equipment, and the location of the map to the hospital and the list of emergency telephone numbers.
- The buddy system will be used at all times by field personnel in the exclusion zone; no one is to perform work within the exclusion zone alone. When in Level D or C, visual contact or radio contact shall be maintained at all times. In Level B, visual contact shall be maintained at all times, and radio contact shall be maintained with the decontamination and/or support zone.
- Contact with contaminated and potentially contaminated surfaces should be avoided. Walk around (not through) puddles and discolored surfaces. Do not kneel on the ground or place equipment on the ground. Protect equipment from contamination.
- All personnel exiting the exclusion zone must exercise the decontamination procedures described in Section 7.0 of this CHASP.
- Beards or other facial hair that interferes with respirator fit will preclude admission to the exclusion zone. Contact lenses shall not be worn in the exclusion or decontamination zones, or if the worker may be expected to enter these zones under routine or emergency situations.
- Eating, drinking, or smoking is permitted only in designated areas in the support zone.
- Each worker must be supplied with and maintain his/her own personal protective equipment.

Note: These policies will be enforced by the designated SSO

# 7.0

## Decontamination Procedures

Prior to the start of the field activities, the Site Safety Officer will be responsible for the designation of the work zone, support zone, and clean zone. The work zone will be an area surrounding the immediate work being performed where the greatest potential hazards exist. Only the necessary workers required to perform the work will be permitted in this zone. A support zone will be established for the storage of equipment and personnel decontamination. A clean zone will be established for site control of visitors, equipment deliveries, and communications.

In general, everything that may come in contact with contaminated media must either be decontaminated or discarded prior to exit. In addition to worker protection, care must be taken to avoid cross-contamination of samples and other facility areas.

All support and sampling equipment which has or may have contacted contaminated materials will be cleaned with detergent/water solution and rinsed with water in wash tubs or buckets. The wash water, rinse water and residues will be collected and properly stored until sampling results are received and final disposition of the waste can be determined. Monitoring equipment that comes into will be decontaminated according to manufacturer specifications. Decontamination is done in the exclusion or decontamination zones. Rented equipment is photographed after decontamination.

Disposable PPE and equipment will be properly bagged and disposed of.

Employees will wash their hands and faces with detergent and water prior to eating or smoking. Smoking will not be permitted in the work and support zones.

The minimum measures for Level B doffing and decontamination are:

- deposit equipment on plastic drop cloths.
- scrub outer boots and gloves with a water and detergent solution and rinse.
- remove outer boots and outer gloves. Discard disposable outer garments in receptacle provided.
- remove SCBA and face piece and place on rack provided
- remove tyvek/outer garment and place in receptacle provided
- remove inner gloves and deposit in receptacle provided

- shower/wash face and hands

The minimum measures for Level C doffing and decontamination are:

- deposit equipment on plastic drop cloths.
- scrub outer boots and gloves (if worn) with a water and detergent solution and rinse.
- remove outer boots and outer gloves. Discard disposable outer garments in receptacle provided.
- remove tyvek/outer garment and place in receptacle provided.
- remove first pair of inner gloves
- remove respirator (using "clean" inner gloves) and place on rack provided
- remove last pair of inner gloves and deposit in receptacle provided
- shower/wash face and hands

The second to last item to be removed is the APR, and the last item to be removed is the last of several pairs of surgical gloves. Wearing several pairs of inner gloves permits layers to be removed as needed during various stages of the doffing procedure, and if the APR inadvertently becomes contaminated, inner gloves guard against bare hands contacting the APR.

# 8.0

## Confined Space

According to OSHA 29 CFR 1910.146, a confined space is a space which is large enough and so configured that an employee can bodily enter and perform assigned work, has limited or restricted means for entry or exit, and is not designed for employee occupancy. Based upon the site-specific scope of work, confined space entries will not be necessary. However, should the scope of work be amended to include confined space entry, an amendment to this CHASP will be prepared. The following protocol will be followed when employees must enter a confined space:

- The Site Safety Officer evaluates the space and site conditions to determine whether the space must be considered "confined".
- If so, the Site Safety Officer monitors the space for hazardous atmospheres prior to entry and fills out a pre-entry checklist (Attachment F) to determine whether an entry-permit is required.
- If there is no hazardous atmosphere, the space will be continuously monitored during the entry to assure that the atmosphere remains non-hazardous.
- If the space contains a hazardous atmosphere, an entry permit (Attachment F) will be prepared and the space will only be entered in accordance with 29 CFR 1910.146.

---

### 8.1 Rescue and Emergency Services

When practical, non-entry rescue is the preferred method of rescue, even for horizontal entries. To help permit-required confined space non-entry rescue, each authorized entrant will use a full body or chest harness with a retrieval line attached to a mechanical device or fixed point outside the permit-required confined space. Mechanical devices to retrieve personnel will be used for vertical spaces more than five feet deep.

---

### 8.1.1 **On-Site Rescue Services**

Qualified personnel will be available on-site to conduct confined space entry rescue, if needed. All essential equipment (SCBA/air lines, hoist, etc.) needed to effect rescue will also be staged on-site during all confined space activities. Rescue personnel will extract the confined space worker to the nearest available safe location so that emergency first aid may be performed. In the event of a confined space rescue, the Attendant will be responsible to notify First Responder Medical Care, the Site Safety Officer, and the Project Manager immediately.

---

### 8.1.2 **Subcontractor Entry Operations**

Based on the site-specific scope of work, on-site personnel will not have to enter confined spaces. However, in the event that completing the work requires on-site personnel to enter a confined space, entry will only be made by personnel who have received the training required to correctly perform their assigned duties.

# 9.0

## Contingency Plan/Emergency Response Plan

It is essential that site personnel be prepared for an emergency. Emergencies can take many forms; sudden illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather.

A list of emergency telephone numbers and hospital travel routes to the nearest hospital with an emergency capacity will be posted on site in the field vehicle. Site personnel must be familiar with the emergency incident procedures, and the locations of site safety, first aid, and communication equipment.

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### 9.1 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 vehicle/heavy equipment
Fire Extinguisher:	On-site vehicle/heavy equipment

\*Horns – Air Horns will be supplied to personnel at the discretion of the Project Manager or Site Safety Officer.

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### 9.2 Emergency Telephone Numbers and Hospital Information

Emergency telephone numbers and routes to the nearest hospital with an emergency capacity are as follows:

General Emergencies:	911
NYPD	911
FDNY:	911
First Responder Medical Care:	911
National Response Center	1-800-424-8802
NYC Regional Poison Control Center	1-800-222-1222
Project Manager	1-631-787-3400 or 1-631-316-4892
Site Safety Officer	1-631-787-3400 or 1-631-697-4754
Alternate Health and Safety Officer	1-631-787-3400

For Non-Emergency Care – (Emergencies must call 911)

Nearest Hospital: The Brooklyn Hospital Center  
121 Dekalb Avenue  
Brooklyn, New York 11201  
1-718-250-8000

**Directions to The Brooklyn Hospital Center (Approximately 4 miles from the site):**

**Head southeast of McGuinness Boulevard toward Calyer Street. In 0.7 mile, merge onto I-278W / Brooklyn Queens Expressway W. In 1.4 miles, take exit 31 toward Wythe Avenue / Kent Avenue. After 0.2 mile, merge onto Williamsburg Street W and proceed for 0.3 mile, then turn right onto Flushing Avenue. In 0.3 mile, turn left onto Washington Avenue. In 0.6 mile, turn right onto Dekalb avenue, and the hospital will be on the right in approximately 0.6 mile.**

**A map showing the route to the nearest hospital is provided in Attachment A, Figure 2.**

The emergency telephone numbers and hospital route presented above are also included in Attachment G.

## **9.3 Personnel Responsibilities During an Emergency**

As the administrator of the project, the Project Manager has primary responsibility for responding to and correcting emergency situations. In the absence of the Project Manager, the senior person on-site (e.g., the Site Safety Officer) shall act as the Project Manager's on-site designee. Their responsibilities include:

- Take appropriate measures to protect personnel including: evacuating and securing the site or up-grading or down-grading the level of protective clothing and respiratory protection.

- ▶ Ensure that the client and 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. In the event of an air release of toxic materials, the local authorities and client must be informed in order to assess the need for evacuation. In the event of spill or on-land release of hazardous or toxic materials, the Project Manager will be contacted immediately. The Project Manager will contact the client to determine reporting requirements to the appropriate agency.
- ▶ Ensure appropriate decontamination treatment or testing for exposed or injured personnel.
- ▶ If possible, determine the cause of the incident and make recommendations to prevent recurrence.
- ▶ Ensure that all required reports which may be required by the client and/or regulatory agencies have been prepared and filed.

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## 9.4 Medical Emergencies

Any on-site person who becomes ill or injured must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid (if a qualified and trained provider is part of the field team) administered prior to transport. First aid will be administered while waiting for an ambulance or paramedics. A Field Accident Report (Attachment G) must be filled out for any injury.

**Any person transporting an injured/exposed person to the hospital for treatment should follow the following route to The Brooklyn Hospital Center (Approximately 4 miles from the site):**

**Head southeast of McGuinness Boulevard toward Calyer Street. In 0.7 mile, merge onto I-278W / Brooklyn Queens Expressway W. In 1.4 miles, take exit 31 toward Wythe Avenue / Kent Avenue. After 0.2 mile, merge onto Williamsburg Street W and proceed for 0.3 mile, then turn right onto Flushing Avenue. In 0.3 mile, turn left onto Washington Avenue. In 0.6 mile, turn right onto Dekalb avenue, and the hospital will be on the right in approximately 0.6 mile.**

**A map showing the route to the nearest hospital is provided in Attachment A, Figure 2.**

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## 9.5 Fire or Explosion

In the event of a fire or explosion, the fire department should be summoned immediately. Upon their arrival, the senior staff on-site will advise the fire commander of the location and

nature of on-site hazardous materials that the senior staff is aware of. If it is safe to do so, site personnel may:

- Use firefighting equipment available on site.
- Remove or isolate flammable or other hazardous materials that may contribute to the fire.

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## 9.6 Evacuation Routes

Evacuation routes established by work area locations for each site will be reviewed prior to commencing site operations. As the work areas change, the evacuation routes will be altered accordingly, and the new route will be reviewed.

Under extreme emergency conditions, evacuation is to be immediate without regard for equipment. The evacuation signal will be a continuous blast of a vehicle horn, if possible, and/or by verbal/radio communication. When evacuating the site, personnel will follow these instructions:

- Keep upwind of smoke, vapors, or spill location.
- Exit through the decontamination corridor if possible.
- If evacuation through the decontamination corridor is not possible, personnel should remove contaminated clothing once they are in a safe location and leave it near the exclusion zone or in a safe place.
- The Site Safety Officer will conduct a head count to ensure that all personnel have been 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.

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## 9.7 Spill Control Procedures

In the event of a leak or a release, site personnel will:

Inform their supervisor immediately.

Locate the source of the spillage and stop the flow if it can be done safely.

Begin containment and recovery of the spilled materials.

Subcontractors utilizing heavy equipment will be responsible for maintaining containment equipment, emergency spill kits and oil booms in the immediate vicinity of the work site to address any release of diesel or hydraulic fluid from the equipment.

In the event of a leak or a release, site personnel will immediately inform the Project Manager. The Project Manager will immediately notify the client. Within 24 hours of this verbal notification, the Project Manager will provide the client with a written report. The report will include the events that transpired and any action taken by VHB to protect health and safety as well as the environment. The report will list all those who were notified of the release.

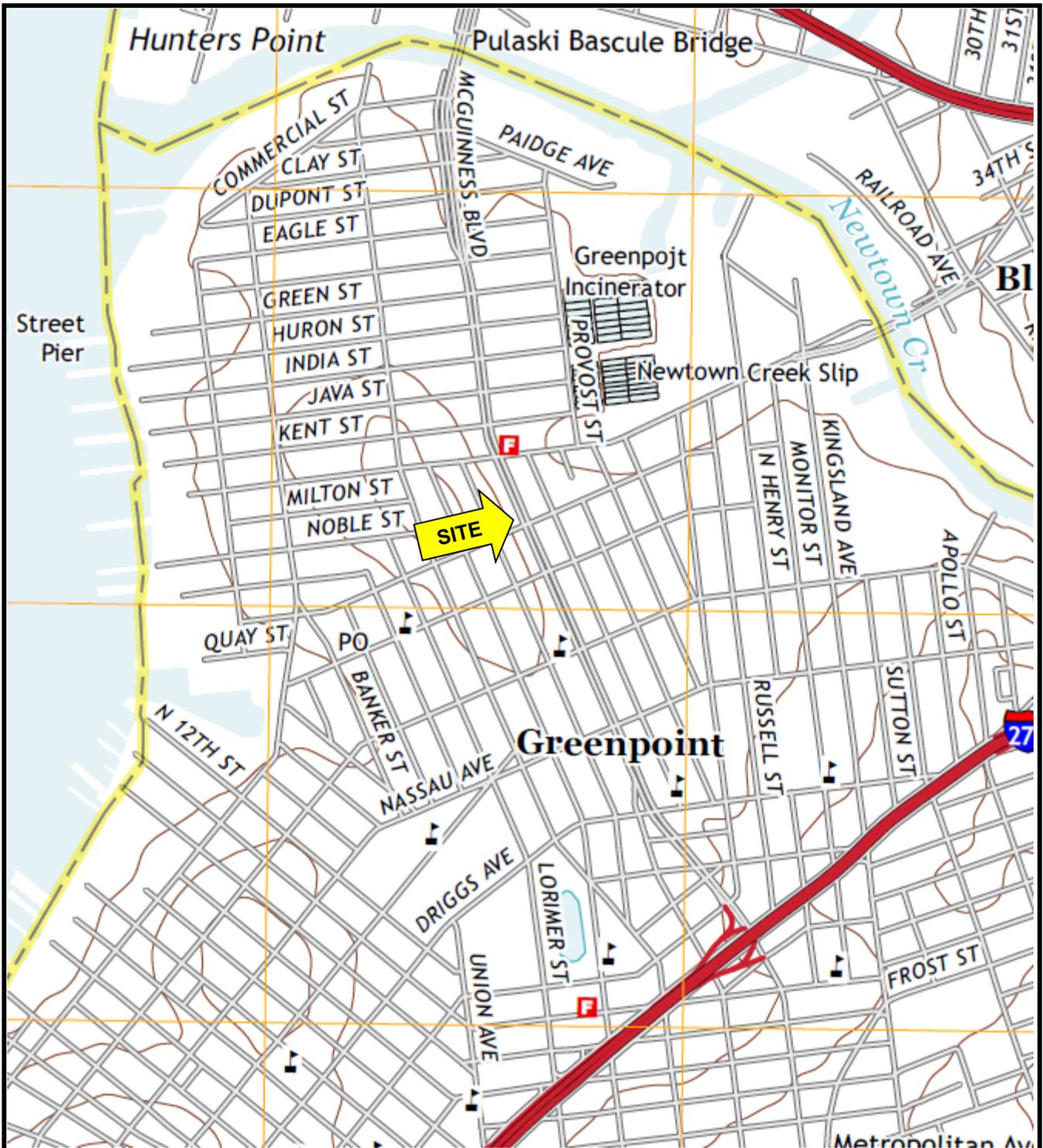
\\vhb\proj\NewYorkCity\29345.00 Stellar McGuinness Blvd\reports\CHASP\McGuinness CHASP.docx



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# **Attachment A**

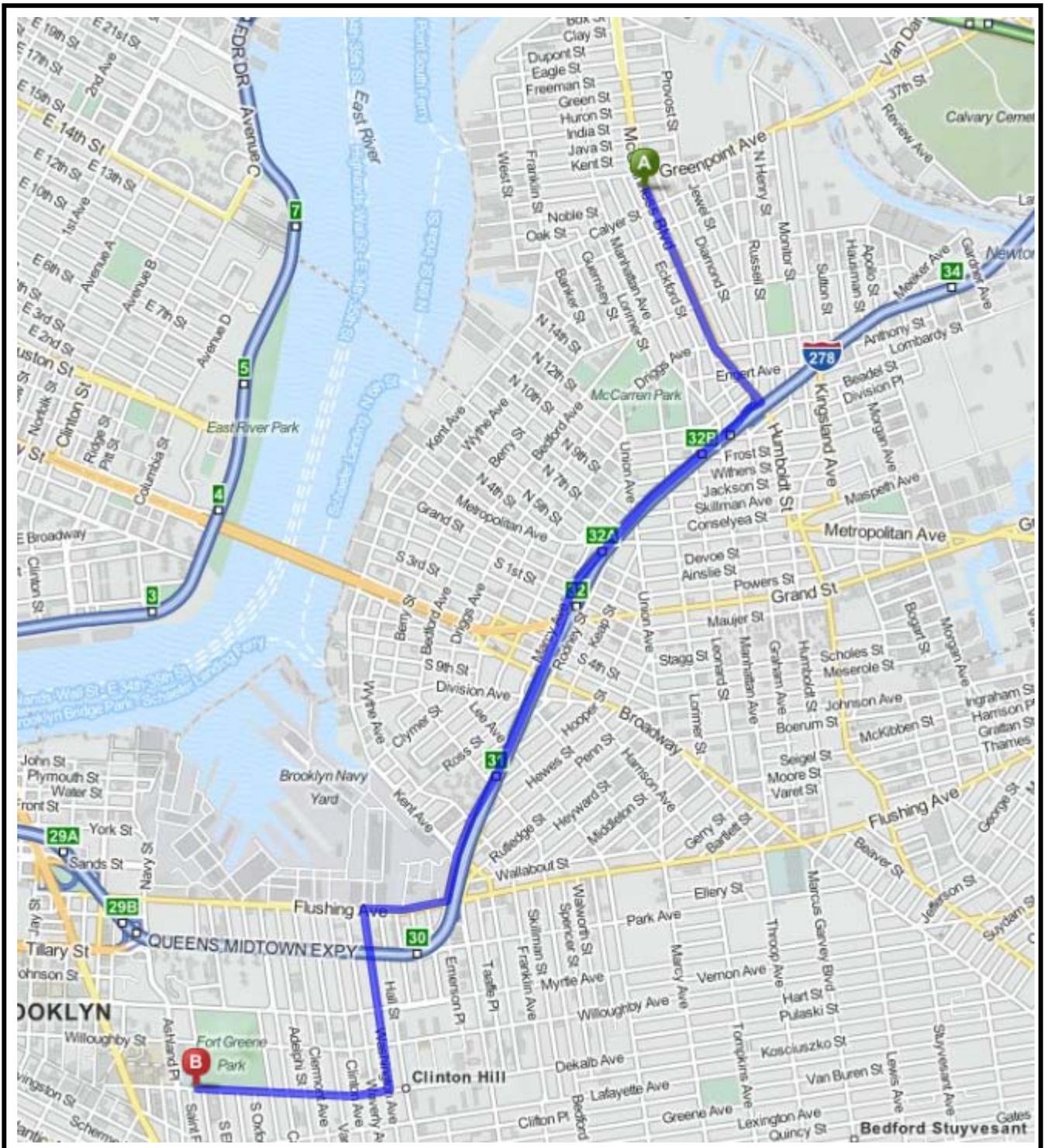
## **Figures**



**FIGURE 1 – TOPOGRAPHIC MAP**

**SITE NAME:** Mixed-Use Properties  
**STREET ADDRESS** 209, 211-235 McGuinness Boulevard  
**CITY, STATE, ZIP:** Brooklyn, New York 11222  
**PROJECT NUMBER:** 29345.00  
**SOURCE:** United States Geological Survey





**FIGURE 2 – HOSPITAL ROUTE**

**SITE NAME:** Mixed-Use Properties  
**STREET ADDRESS** 209, 211-235 McGuinness Boulevard  
**CITY, STATE, ZIP:** Brooklyn, New York 11222  
**PROJECT NUMBER:** 29345.00  
**SOURCE:** MapQuest



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**Attachment B**

**Site Safety Plan Acknowledgement Form**















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# **Attachment C**

## **Site Safety Plan Amendments**

SITE SAFETY PLAN AMENDMENT # \_\_\_\_:

A Site Safety Plan Acknowledgement Form must be signed by the site personnel for each Site Safety Plan Amendment.

REASON FOR AMENDMENT:

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ALTERNATE PROCEDURES:

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REQUIRED CHANGES IN PPE:

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\_\_\_\_\_  
PROJECT MANAGER

\_\_\_\_\_  
(DATE)

\_\_\_\_\_  
SITE SAFETY OFFICER

\_\_\_\_\_  
(DATE)

\_\_\_\_\_  
TECHNICAL SAFETY MANAGER

\_\_\_\_\_  
(DATE)



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# **Attachment D**

## **Heat/Cold Stress Protocols**

## HEAT RELATED EMERGENCIES

Good judgment is essential. Pace yourself by knowing your limitations. Avoid over exertion. You are your best gauge for heat related emergencies.

### HEAT EXPOSURE

The human body stubbornly defends its constant core temperature of 98.6°F. To maintain this constant temperature, heat loss must equal heat gain. If heat loss exceeds heat gain, the body temperature will fall; conversely, if heat production exceeds heat loss, the temperature will rise. In a heat related emergency, the body's mechanisms for temperature regulation are overwhelmed. The body can no longer regulate core temperature, and the core temperature begins to rise. As this rise occurs, the body will begin to show the signs and symptoms of heat related stress. The sequence of illness may start with heat Cramps and progress into a more severe case or may go straight to Heat Stroke. The degree of illness will vary from person to person, depending on the nature of the exposure, physical conditioning and inherited traits.

### PREVENTION

#### General

- While not mandated by corporate requirements, employees should attempt to maintain good physical conditioning and control blood pressure (avoid weight gain, smoking, etc.).
- Eat regularly and properly. Increase salt intake through food consumption during the hot season or hot spells and avoid the use of salt tablets, if possible.
- Avoid alcohol intake the night before if you are going to be working in hot environments, either from ambient conditions or by wearing Chemical Protective Clothing.
- If you are on medication or have a chronic medical history, consult a physician prior to working in a high temperature environment.

#### On-Site/Scene

- Sufficient quantities of water (at least 2 to 4 ounces of water prior to commencing work and during every rest period) should be consumed to help avoid heat related emergencies. A recommended alternative to water is an electrolyte drink split 50/50 with water

## HEAT RELATED EMERGENCIES

### SIGNS AND SYMPTOMS

#### EMERGENCY CARE

#### Heat Rash

Also known as prickly heat, this is a condition affecting the skin. The condition occurs in situations where the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears.

#### Signs and Symptoms

1. Skin rash over affected areas of the body.
2. Tingling or prickling sensation on the affected areas.

#### Emergency Care

1. Take shower after working in heat.
2. Dry the skin thoroughly.
3. Change underwear as needed.
4. Stay in cool place after work hours.
5. Adjust clothing to wear materials that wick moisture away from body (cotton or Gore-Tex, etc.).

#### Heat Cramps

Heat cramps are muscle pains, usually in the lower extremities, the abdomen, or both, which occur secondary to profuse sweating with accompanying salt depletion. Heat cramps most often afflict people in good physical condition, who overwork in conditions of high temperature and humidity. Untreated, heat cramps may progress to heat exhaustion.

Treatment of heat cramps is aimed at eliminating the exposure and restoring the loss of salt and water.

#### Signs and Symptoms

1. Cramps in the extremities and abdomen which come on suddenly during vigorous activity. Heat cramps can be mild with only slight abdominal cramping and tingling in the extremities, but more commonly present intense and incapacitating pain in the abdomen and extremities.
2. Respiration rate will increase, decreasing after the pain subsides.
3. Pulse rate will increase.
4. Skin will be pale and moist.

5. Body temperature will be normal.
6. Loss of consciousness or airway maintenance are seldom problems with this condition.
7. Generalized weakness will be noted as the pain subsides.

#### Emergency Care

1. Move the worker to a cool environment. Have the worker lie down if the worker feels faint.
2. If the worker is not nauseated, the worker may be given 1 or 2 glasses of an electrolyte solution. Have the worker drink slowly. The use of salt tablets is not recommended, as they may precipitate nausea.
3. If the worker is nauseated, avoid giving anything by mouth until the nausea subsides.
4. Avoid massaging the cramping muscles. This rarely helps and may actually aggravate the pain.
5. As the salt and water level is replenished, the worker's pain will subside. The Worker may wish to return to work, however, this is NOT recommended for a period of 12 hours. Further exertion may lead to heat exhaustion or heat stroke.

#### HEAT EXHAUSTION

Heat exhaustion represents a somewhat more severe response to salt and water loss, as well as an initial disturbance in the body's heat-regulating system. Like heat cramps, heat exhaustion tends to occur in persons working in hot environments. Heat exhaustion is likely in dehydrated and hypertensive people. Untreated Heat Exhaustion may progress to Heat Stroke.

Treatment of heat exhaustion is similar in principle to that of heat cramps.

#### Signs and Symptoms

1. Heat Exhaustion may come on suddenly or may be felt as headache, fatigue, dizziness, and nausea with occasional abdominal cramping.
2. Sweating will be profuse.
3. Pulse will be rapid and weak.
4. Respiration rate will be rapid and shallow.
5. The skin will be pale and clammy.
6. The body temperature will be normal or decreased.
7. The worker could be irritable and restless.

#### Emergency Care

1. Move the worker to a cool environment, take off as much of the worker's clothing as possible, and place the worker in a supine position with the worker's legs elevated.
2. Sponge the worker with cool water. If you fan the worker, avoid chilling. When the body chills, the muscles generate energy. When the body shivers, this energy is released as heat and actually can increase the body temperature.
3. If this is a true medical emergency, prompt intervention by Emergency Medical Services is recommended.
4. Monitor the worker's level of consciousness and airway.

## HEAT STROKE

Heat Stroke is caused by a severe disturbance in the body's heat-regulating mechanism and is a profound emergency, with a mortality rate ranging from 25 to 50 percent. It is most common in men over 40, especially in alcoholics. It can also occur in people of any age having too much exposure to the sun or prolonged confinement in a hot atmosphere. Heat stroke comes on suddenly. As the sweating mechanism fails, the body temperature begins to rise precipitously, reaching 106°F (41°C) or higher within 10 to 15 minutes. If the situation is not corrected rapidly, the body cells - especially the very vulnerable cells of the brain - are literally cooked, and irreversible central nervous system damage occurs.

The treatment for Heat Stroke is aimed at maintaining vital functions and causing as rapid a temperature fall as possible.

### Signs and Symptoms

1. The worker's pulse will be strong and pounding.
2. The skin will be hot, dry and flushed.
3. The worker may experience headache, dizziness, and dryness of mouth.
4. Seizures and coma occur.
5. Loss of consciousness and airway maintenance problems can occur.

### Emergency Care

1. Establish an open airway.
2. Move the worker to a cool environment. Take off as much clothing as possible, and place the worker in a semi-reclining position with the head elevated.
3. Use any means to cool the worker. Improvise with whatever is available. A bathtub filled with cold water and ice cubes is ideal. Remember, speed is essential; delay may result in permanent brain

damage. Vigorous efforts to cool the worker must continue until the body temperature is below 103°F (38.9°C).

4. This is a true medical emergency; prompt intervention by Emergency Medical Services is required.

These are only guidelines for the care of Heat Related Emergencies. Actual training in emergency medical care or basic first aid is recommended.

## HEAT STRESS

1. Heart rate (HR) should be monitored by the radial pulse for 30 seconds as soon as possible in the resting period.

If at the beginning of the rest period a worker's radial pulse is measured and his heart rate exceeds 100 beats per minute, the worker's next work period should be reduced by 33%. Therefore, if the original work period was one hour, the following work cycle should be reduced to 40 minutes.

2. Administering salt tablets to prevent heat stress is not recommended due to a number of reasons: (a) sweat is hypotonic, therefore, adding salt to the body would only increase the body's need for water; (b) additional salt may interfere with a worker's predisposed physical condition (i.e., high blood pressure); and (c) increasing the sodium content in the body may cause an imbalance in the body's potassium content. Unless a physician recommends the use of salt tablets, individuals naturally obtain the necessary salt in their normal diet.
3. Heat Stroke is a true medical emergency. First aid should be directed toward immediate measures to cool the body quickly, as well as seeing that the victim receives medical attention as soon as possible.

Prior to medical treatment, remove as much clothing as possible and proceed to cool the victim's body, taking care not to overchill the victim once his temperature falls below 102°F. One of the following cooling measures should be taken: (1) sponge the bare skin with cool water; (b) apply cold packs continuously; (c) wrap the victim in a sheet soaked with water; or (d) immerse the victim in a tub of cold water, while closely monitoring the victim's level of consciousness.

4. Prior to site activity, the field team leader will make arrangements for heat stress monitoring (i.e., monitoring heart rate, body temperature and body water loss) during actual site work if conditions warrant these measures. In addition, the worker would want to ensure that the team members have been acclimatized to the particular environmental conditions and that personnel are aware of the signs and symptoms of heat illness and have been adequately trained in first aid procedures. As field team leader, one could also make sure there is sufficient personnel on site, so as to rotate work assignments, schedule work during hours of reduced temperatures, and ensure personnel drink moderate levels of an electrolyte solution and eat well prior to commencing site work.

5. The worker could be experiencing a condition of heat rash. Allow workers to rest and relieve the itching associated with heat rash rather than return to work too soon. Itching workers may not follow stringent decon procedures or risk cross contamination.

Keeping the skin clean and dry will reduce the incidence of heat rash. This can be accomplished by adjusting clothing to wear materials that wick moisture away from the body (cotton, Gore-Tex or other similar materials) underneath protective clothing. Upon removal of the protective clothing, the worker should wash and dry his skin thoroughly.

6. The sense of thirst is not an adequate regulator of water replacement during heat exposure. Therefore, as a general rule, the amount of water administered should replace the amount of water lost, and it should be administered at regular intervals throughout the day. It is not practical to measure water loss in the field; however, water should be replaced by drinking 2-4 ounce servings during every rest period. A recommended alternative to water is an electrolyte drink split 50/50 with water.
7. Although there is no specific test given during a baseline physical that would identify a person's tolerance to heat, there are physical factors and personal habits which may indicate possible intolerance to heat, such as, whether or not an individual smokes, one's dietary habit, body weight, as well as predisposed physical conditions such as high blood pressure, heart conditions, diabetes, or medication, that may influence an individual's ability to tolerate excessive heat.
8. First aid treatment: remove victim to a cool place and give sips of salted water (1 teaspoon of salt to 1 quart of water) - 4 ounces every 15 minutes over a period of one hour. A commercial preparation, e.g., Gatorade, may be used if split 50/50 with water.

The salted water or solution should mitigate the cramps. Manual pressure should not be applied to the cramped muscles.

TABLE C-1<sup>(1)</sup>

REQUIRED FREQUENCY OF HEAT STRESS MONITORING  
FOR WORKERS IN IMPERMEABLE CLOTHING

Adjusted <sup>(2)</sup> Temperature (°F)	Work Time Allowed Before Monitoring Break (min.)
90 or above	15
87.5-90	30
82.5-87.5	60
77.5-82.5	90
72.5-77.5	120

- (1) Adapted from Eastern Research Group and National Institute for Occupational Safety and Health, Occupational Safety and Health Guidance Manual for Super Activities. September 26, 1984, pp. 8-75.
- (2) Calculate the adjusted air temperature (Ta adj) by using this equation:

$$Ta \text{ adj } ^\circ F = Ta \text{ } ^\circ F + (13 \times \% \text{ sunshine})$$

Measure air temperature (Ta) with a standard thermometer, with the bulb shielded from radiant heat. Then estimate percent sunshine (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows).

TABLE C-2

Heat Stress Indicator	When to Measure	If Exceeds . . .	Action
heart rate (pulse)	beginning of rest period	110 beats per minute	shorten next work period by 33%
oral temperature	beginning of rest period	99°F (after thermometer is under tongue for 3 minutes)	shorten next work period by 33%
		100.6°F	prohibit work in impermeable clothing
body weight	1. before workday begins (a.m.) 2. after workday ends (p.m.)		increase fluid intake

COLD STRESS (HYPOTHERMIA)

Cold stress is a function of cold, wetness and wind. A worker's susceptibility to cold stress can vary according to his/her physical fitness, degree of acclimatization to cold weather, age, and diet.

Prevention

Institute the following steps to prevent overexposure of workers to cold:

1. Maintain body core temperature at 96.8°F or above by encouraging workers to drink warm liquids during breaks (preferably not coffee) and wear several layers of clothing. Wool is recommended since it can keep the body warm even when the wool is wet.
2. Avoid frostbite by adequately covering hands, feet, and other extremities. Clothing such as insulated gloves or mittens, earmuffs, and hat liners should be worn. To prevent contact frostbite (from touching metal and cold surfaces below 20°F), workers should wear anti-contact gloves. Tool handles and control bars should be covered with insulating material.

3. Adjust work schedules if necessary, providing adequate rest periods. When feasible, rotate personnel and perform work during the warmer hours of the day.
4. Provide a heated enclosure for workers close to their work area. Workers should remove their outer layer(s) of clothing while in the shelter to allow for sweat evaporation.
5. In the event that wind barriers are constructed around an intrusive operation (such as drilling), the enclosure must be properly vented to prevent the build-up of toxic or explosive gasses or vapors. Care must be taken to keep any heat source away from flammable substances.
6. Using a wind chill chart such as the one in Table C-4, obtain the equivalent chill temperature (ECT) based on actual wind speed and temperature. Refer to the ECT when setting up work warm-up schedules, planning appropriate clothing, etc. Workers should use warming shelters at regular intervals at or below an ECT of 20°F. For exposed skin, continuous exposure should not be permitted at or below an ECT of -25°F.
7. Workers who become immersed in water or whose clothing becomes wet (from perspiration, rain, etc.) must immediately be provided a change of dry clothing whenever the air temperature is 25.6°F or below.
8. Although not mandated by corporate requirements, employees should strive to maintain an optimal level of worker fitness by encouraging regular exercise, proper diet, etc.

### Monitoring

Personnel should be aware of the symptoms of cold stress. If the following symptoms of systemic hypothermia are noticed in any worker, he/she should immediately go to a warm shelter:

- heavy, uncontrollable shivering;
- excessive fatigue or drowsiness;
- loss of coordination;
- difficulty in speaking; and,
- frostbite (see below).

Frostbite is the generic term for local injury resulting from cold. The stages of frostbite and their symptoms are as follows:

1. frostbite or incipient frostbite:
  - sudden blanching or whitening of the skin.
  
2. superficial frostbite:
  - waxy or white skin which is firm to the touch (tissue underneath is still resilient).
  
3. deep frostbite:
  - tissues are cold, pale, and solid.

TABLE C-4<sup>(1)</sup>

**COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED  
AS AN EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)**

Estimated Wind Speed (in mps)	Actual Temperature Reading (°F)P											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds			
Trenchfoot and immersion foot may occur at any point on this chart.												

Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

(1) Reproduced from American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1985-1986, p. 01.



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# **Attachment E**

## **Chemical Hazards**

## SAFETY DATA SHEET

Version 5.3  
Revision Date 01/02/2015  
Print Date 03/11/2015

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**1. PRODUCT AND COMPANY IDENTIFICATION****1.1 Product identifiers**

Product name : 4,4'-DDE

Product Number : 35487  
Brand : Fluka

CAS-No. : 72-55-9

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses : Laboratory chemicals, Manufacture of substances

**1.3 Details of the supplier of the safety data sheet**

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052

**1.4 Emergency telephone number**

Emergency Phone # : (314) 776-6555

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**2. HAZARDS IDENTIFICATION****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute toxicity, Oral (Category 4), H302  
Carcinogenicity (Category 2), H351  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal word

Warning

Hazard statement(s)

H302

Harmful if swallowed.

H351

Suspected of causing cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P273

Avoid release to the environment.

P281

Use personal protective equipment as required.

P301 + P312	IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P330	Rinse mouth.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Synonyms : 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethene

Formula : C<sub>14</sub>H<sub>8</sub>Cl<sub>4</sub>

Molecular weight : 318.03 g/mol

CAS-No. : 72-55-9

EC-No. : 200-784-6

#### Hazardous components

Component	Classification	Concentration
<b>2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene</b>		
	Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H302, H351, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

#### If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

#### In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

#### In case of eye contact

Flush eyes with water as a precaution.

#### If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed

No data available

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

#### Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### 5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

## 5.4 Further information

No data available

---

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

#### Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

#### Personal protective equipment

##### Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

##### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

##### Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

##### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

- |   |                                   |
|---|-----------------------------------|
| a) Appearance                                   | Form: solid                       |
| b) Odour  | No data available                 |
| c) Odour Threshold                              | No data available                 |
| d) pH   | No data available                 |
| e) Melting point/freezing point                 | 88.0 - 90.0 °C (190.4 - 194.0 °F) |
| f) Initial boiling point and boiling range      | No data available                 |
| g) Flash point                                  | No data available                 |
| h) Evaporation rate                             | No data available                 |
| i) Flammability (solid, gas)                    | No data available                 |
| j) Upper/lower flammability or explosive limits | No data available                 |
| k) Vapour pressure                              | < 0.00001 hPa (< 0.00001 mmHg)    |
| l) Vapour density                               | No data available                 |
| m) Relative density                             | No data available                 |
| n) Water solubility                             | No data available                 |
| o) Partition coefficient: n-octanol/water       | log Pow: 6.51                     |
| p) Auto-ignition temperature                    | No data available                 |
| q) Decomposition temperature                    | No data available                 |
| r) Viscosity                                    | No data available                 |
| s) Explosive properties                         | No data available                 |
| t) Oxidizing properties                         | No data available                 |

### 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents, Strong bases

## 10.6 Hazardous decomposition products

Other decomposition products - No data available  
In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - 880.0 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

#### Reproductive toxicity

No data available

No data available

#### Specific target organ toxicity - single exposure

No data available

#### Specific target organ toxicity - repeated exposure

No data available

#### Aspiration hazard

No data available

#### Additional Information

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.



This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

#### **SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

#### **Massachusetts Right To Know Components**

No components are subject to the Massachusetts Right to Know Act.

#### **Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	1993-04-24

#### **New Jersey Right To Know Components**

	CAS-No.	Revision Date
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	1993-04-24

#### **California Prop. 65 Components**

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	2010-06-11

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

	CAS-No.	Revision Date
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	2010-06-11

---

## **16. OTHER INFORMATION**

### **Full text of H-Statements referred to under sections 2 and 3.**

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H302	Harmful if swallowed.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

#### **HMIS Rating**

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

#### **NFPA Rating**

Health hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

#### **Further information**

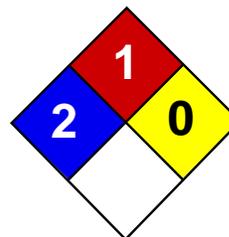
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**Preparation Information**  
Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 5.3

Revision Date: 01/02/2015

Print Date: 03/11/2015



Health	2
Fire	1
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Antimony MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Antimony

**Catalog Codes:** SLA1453, SLA4462

**CAS#:** 7440-36-0

**RTECS:** CC4025000

**TSCA:** TSCA 8(b) inventory: Antimony

**CI#:** Not available.

**Synonym:** Stibium

**Chemical Name:** Not available.

**Chemical Formula:** Sb

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Antimony	7440-36-0	100

**Toxicological Data on Ingredients:** Antimony: ORAL (LD50): Acute: 7000 mg/kg [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys, lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In

case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

### Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 0.5 Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 121.75 g/mole

**Color:** Not available.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 1635°C (2975°F)

**Melting Point:** 630°C (1166°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 6.691 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 7000 mg/kg [Rat].

**Chronic Effects on Humans:** Causes damage to the following organs: blood, kidneys, lungs, the nervous system, liver, mucous membranes.

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Human: passes through the placenta, excreted in maternal milk.

**Special Remarks on other Toxic Effects on Humans:** Not available.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Antimony powder UNNA: UN2871 PG: III

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

Pennsylvania RTK: Antimony Massachusetts RTK: Antimony TSCA 8(b) inventory: Antimony

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:****WHMIS (Canada):**

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):** R36/38- Irritating to eyes and skin.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

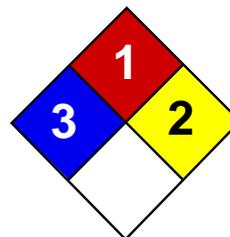
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/11/2005 11:19 AM

**Last Updated:** 05/21/2013 12:00 PM

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Health	3
Fire	1
Reactivity	2
Personal Protection	E

## Material Safety Data Sheet Arsenic MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Arsenic

**Catalog Codes:** SLA1006

**CAS#:** 7440-38-2

**RTECS:** CG0525000

**TSCA:** TSCA 8(b) inventory: Arsenic

**CI#:** Not applicable.

**Synonym:**

**Chemical Name:** Arsenic

**Chemical Formula:** As

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

**Toxicological Data on Ingredients:** Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

**Potential Chronic Health Effects:**

**CARCINOGENIC EFFECTS:** Classified A1 (Confirmed for human.) by ACGIH. **MUTAGENIC EFFECTS:** Not available.

**TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance is toxic to kidneys, lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:**

Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 0.01 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Lustrous solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 74.92 g/mole

**Color:** Silvery.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** Not available.

**Melting Point:** Sublimation temperature: 615°C (1139°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 5.72 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Reactive with oxidizing agents, acids, moisture.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 145 mg/kg [Mouse].

**Chronic Effects on Humans:**

**CARCINOGENIC EFFECTS:** Classified A1 (Confirmed for human.) by ACGIH. Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Arsenic UNNA: UN1558 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic Pennsylvania RTK: Arsenic Massachusetts RTK: Arsenic TSCA 8(b) inventory: Arsenic

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:****WHMIS (Canada):**

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R22- Harmful if swallowed. R45- May cause cancer.

**HMIS (U.S.A.):**

**Health Hazard:** 3

**Fire Hazard:** 1

**Reactivity:** 2

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 3

**Flammability:** 1

**Reactivity:** 2

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

**Section 16: Other Information****References:**

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérigènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 04:16 PM

**Last Updated:** 05/21/2013 12:00 PM

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## SAFETY DATA SHEET

Version 5.6  
Revision Date 02/28/2015  
Print Date 03/11/2015

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**1. PRODUCT AND COMPANY IDENTIFICATION****1.1 Product identifiers**

Product name : Benz[*a*]anthracene

Product Number : B2209  
Brand : Aldrich  
Index-No. : 601-033-00-9

CAS-No. : 56-55-3

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses : Laboratory chemicals, Manufacture of substances

**1.3 Details of the supplier of the safety data sheet**

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052

**1.4 Emergency telephone number**

Emergency Phone # : (314) 776-6555

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**2. HAZARDS IDENTIFICATION****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Carcinogenicity (Category 1B), H350  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal word

Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P273

Avoid release to the environment.

P281

Use personal protective equipment as required.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P391

Collect spillage.

P405

Store locked up.

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none****3. COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substances**

Synonyms : 1,2-Benzanthracene  
Tetraphene

Formula : C<sub>18</sub>H<sub>12</sub>  
Molecular weight : 228.29 g/mol  
CAS-No. : 56-55-3  
EC-No. : 200-280-6  
Index-No. : 601-033-00-9

**Hazardous components**

Component	Classification	Concentration
<b>Benz[a]anthracene</b>	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

**4. FIRST AID MEASURES****4.1 Description of first aid measures****General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

**If inhaled**

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**

Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**

Flush eyes with water as a precaution.

**If swallowed**

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**4.2 Most important symptoms and effects, both acute and delayed**

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**

No data available

**5. FIREFIGHTING MEASURES****5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**5.2 Special hazards arising from the substance or mixture**

Carbon oxides

Nature of decomposition products not known.

**5.3 Advice for firefighters**

Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**

No data available

---

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.  
For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid formation of dust and aerosols.  
Provide appropriate exhaust ventilation at places where dust is formed.  
For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

#### Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

#### Personal protective equipment

##### Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

##### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

##### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

##### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### **Body Protection**

impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### **Respiratory protection**

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### **Control of environmental exposure**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

---

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

- |   |  |
|---|--|
| a) Appearance                                   | Form: solid                                      |
| b) Odour  | No data available                                |
| c) Odour Threshold                              | No data available                                |
| d) pH   | No data available                                |
| e) Melting point/freezing point                 | Melting point/range: 157 - 159 °C (315 - 318 °F) |
| f) Initial boiling point and boiling range      | 437.6 °C (819.7 °F)                              |
| g) Flash point                                  | No data available                                |
| h) Evaporation rate                             | No data available                                |
| i) Flammability (solid, gas)                    | No data available                                |
| j) Upper/lower flammability or explosive limits | No data available                                |
| k) Vapour pressure                              | No data available                                |
| l) Vapour density                               | No data available                                |
| m) Relative density                             | No data available                                |
| n) Water solubility                             | No data available                                |
| o) Partition coefficient: n-octanol/water       | No data available                                |
| p) Auto-ignition temperature                    | No data available                                |
| q) Decomposition temperature                    | No data available                                |
| r) Viscosity                                    | No data available                                |
| s) Explosive properties                         | No data available                                |
| t) Oxidizing properties                         | No data available                                |

### **9.2 Other safety information**

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - > 200 mg/kg

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)

NTP: Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

#### Reproductive toxicity

No data available

No data available

#### Specific target organ toxicity - single exposure

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

---

**12. ECOLOGICAL INFORMATION****12.1 Toxicity**

No data available

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.  
Very toxic to aquatic life.

---

**13. DISPOSAL CONSIDERATIONS****13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

---

**14. TRANSPORT INFORMATION****DOT (US)**

Not dangerous goods

**IMDG**

UN number: 3077      Class: 9      Packing group: III      EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benz[a]anthracene)  
Marine pollutant:yes

**IATA**

UN number: 3077      Class: 9      Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[a]anthracene)

**Further information**

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

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**15. REGULATORY INFORMATION****SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

### New Jersey Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

### California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	2007-09-28

---

## 16. OTHER INFORMATION

### Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

### HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

### NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

### Further information

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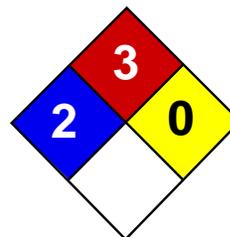
### Preparation Information

Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 5.6

Revision Date: 02/28/2015

Print Date: 03/11/2015



Health	2
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet

### Benzene MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Benzene

**Catalog Codes:** SLB1564, SLB3055, SLB2881

**CAS#:** 71-43-2

**RTECS:** CY1400000

**TSCA:** TSCA 8(b) inventory: Benzene

**CI#:** Not available.

**Synonym:** Benzol; Benzine

**Chemical Name:** Benzene

**Chemical Formula:** C6-H6

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Benzene	71-43-2	100

**Toxicological Data on Ingredients:** Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

**Potential Chronic Health Effects:**

**CARCINOGENIC EFFECTS:** Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. **MUTAGENIC EFFECTS:** Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 497.78°C (928°F)

**Flash Points:** CLOSED CUP: -11.1°C (12°F). (Setaflash)

**Flammable Limits:** LOWER: 1.2% UPPER: 7.8%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:**

Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of oxidizing materials, of acids.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

**Special Remarks on Fire Hazards:**

Extremely flammable liquid and vapor. Vapor may cause flash fire. Reacts on contact with iodine heptafluoride gas. Dioxygenyl tetrafluoroborate is as very powerful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition. Contact with sodium peroxide with benzene causes ignition. Benzene ignites in contact with powdered chromic anhydride. Vigorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

**Special Remarks on Explosion Hazards:**

Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction

of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid ( or its explosive anhydride, dimanganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powerful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

**Storage:**

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States] TWA: 1.6 STEL: 8 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] TWA: 0.1 STEL: 1 from NIOSH TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States] TWA: 10 (ppm) from OSHA (PEL) [United States] TWA: 3 (ppm) [United Kingdom (UK)] TWA: 1.6 (mg/m<sup>3</sup>) [United Kingdom (UK)] TWA: 1 (ppm) [Canada] TWA: 3.2 (mg/m<sup>3</sup>) [Canada] TWA: 0.5 (ppm) [Canada] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:**

Aromatic. Gasoline-like, rather pleasant. (Strong.)

**Taste:** Not available.

**Molecular Weight:** 78.11 g/mole

**Color:** Clear Colorless. Colorless to light yellow.

**pH (1% soln/water):** Not available.

**Boiling Point:** 80.1 (176.2°F)

**Melting Point:** 5.5°C (41.9°F)

**Critical Temperature:** 288.9°C (552°F)

**Specific Gravity:** 0.8787 @ 15 C (Water = 1)

**Vapor Pressure:** 10 kPa (@ 20°C)

**Vapor Density:** 2.8 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 4.68 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil;  $\log(\text{oil/water}) = 2.1$

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether, acetone.

**Solubility:**

Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone. Very slightly soluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources, incompatibles.

**Incompatibility with various substances:** Highly reactive with oxidizing agents, acids.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid ( or its explosive anhydride, dimanganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powerful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 930 mg/kg [Rat]. Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

**Chronic Effects on Humans:**

**CARCINOGENIC EFFECTS:** Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. **MUTAGENIC EFFECTS:** Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **DEVELOPMENTAL TOXICITY:** Classified Reproductive system/toxin/female [POSSIBLE]. Causes damage to the following organs: blood, bone marrow, central nervous system (CNS). May cause damage to the following organs: liver, Urinary System.

**Other Toxic Effects on Humans:**

Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects. May affect genetic material (mutagenic). May cause cancer (tumorigenic, leukemia) Human: passes the placental barrier, detected in maternal milk.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism, and urinary system. Eyes: Causes eye irritation. Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Benzene UNNA: 1114 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value) California prop. 65: This product contains the following ingredients

for which the State of California has found to cause cancer which would require a warning under the statute: Benzene Connecticut carcinogen reporting list.: Benzene Connecticut hazardous material survey.: Benzene Illinois toxic substances disclosure to employee act: Benzene Illinois chemical safety act: Benzene New York release reporting list: Benzene Rhode Island RTK hazardous substances: Benzene Pennsylvania RTK: Benzene Minnesota: Benzene Michigan critical material: Benzene Massachusetts RTK: Benzene Massachusetts spill list: Benzene New Jersey: Benzene New Jersey spill list: Benzene Louisiana spill reporting: Benzene California Director's list of Hazardous Substances: Benzene TSCA 8(b) inventory: Benzene SARA 313 toxic chemical notification and release reporting: Benzene CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R11- Highly flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer. R62- Possible risk of impaired fertility. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:35 PM

**Last Updated:** 05/21/2013 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*



Material Safety Data Sheet

Benzo[a]pyrene, 98%

MSDS# 37175

Section 1 - Chemical Product and Company Identification

MSDS Name: Benzo[a]pyrene, 98%  
Catalog Numbers: AC105600000, AC105600010, AC105601000, AC377200000, AC377200010, AC377201000  
Synonyms: 3,4-Benzopyrene; 3,4-Benzpyrene; Benzo[def]chrysene.

Company Identification: Acros Organics BVBA  
Janssen Pharmaceuticaaan 3a  
2440 Geel, Belgium  
Acros Organics  
One Reagent Lane  
Fair Lawn, NJ 07410  
Company Identification: (USA)  
For information in the US, call: 800-ACROS-01  
For information in Europe, call: +32 14 57 52 11  
Emergency Number, Europe: +32 14 57 52 99  
Emergency Number US: 201-796-7100  
CHEMTREC Phone Number, US: 800-424-9300  
CHEMTREC Phone Number, Europe: 703-527-3887

Section 2 - Composition, Information on Ingredients

-----  
CAS#: 50-32-8  
Chemical Name: Benzo[a]pyrene  
%: >96  
EINECS#: 200-028-5  
-----

Hazard Symbols:



Risk Phrases:

T N



45 46 60 61 43 50/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Danger! May cause allergic skin reaction. Cancer hazard. May cause harm to the unborn child. May impair fertility. May cause eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. May cause heritable genetic damage. Target Organs: Reproductive system, skin.

Potential Health Effects

Eye: May cause eye irritation.  
Skin: May cause skin irritation. May be harmful if absorbed through the skin. May cause an allergic reaction in certain individuals.  
Ingestion: May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated. May be harmful if swallowed.  
Inhalation: May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. May be harmful if inhaled.

Chronic: May cause cancer in humans. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects.

#### Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion: Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

#### Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.

Autoignition Temperature: Not available.

Flash Point: Not available

Explosion Limits: Lower: Not available

Explosion Limits: Upper: Not available

NFPA Rating: health: 2; flammability: 0; instability: 0;

#### Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

#### Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

#### Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzo[a]pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA	0.2 mg/m3 TWA (benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Benzo[a]pyrene: 0.2 mg/m3 TWA (benzene soluble fraction) (listed under Coal tar pitches)

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Personal Protective Equipment

- Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
- Skin: Wear appropriate protective gloves to prevent skin exposure.
- Clothing: Wear appropriate protective clothing to prevent skin exposure.
- Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

#### Section 9 - Physical and Chemical Properties

Physical State: Powder

Color: yellow to brown

Odor: faint aromatic odor

pH: Not available

Vapor Pressure: Not available

Vapor Density: Not available

Evaporation Rate: Not available

Viscosity: Not available

Boiling Point: 495 deg C @ 760 mm Hg ( 923.00°F)

Freezing/Melting Point: 175 - 179 deg C

Decomposition Temperature: Not available

Solubility in water: 1.60x10<sup>-3</sup> mg/l @25°C

Specific Gravity/Density:

Molecular Formula: C<sub>20</sub>H<sub>12</sub>

Molecular Weight: 252.31

#### Section 10 - Stability and Reactivity

- |  |   |
|--|---|
| Chemical Stability:                    | Stable under normal temperatures and pressures. |
| Conditions to Avoid:                   | Dust generation.                                |
| Incompatibilities with Other Materials | Strong oxidizing agents.                        |
| Hazardous Decomposition Products       | Carbon monoxide, carbon dioxide.                |
| Hazardous Polymerization               | Has not been reported.                          |

#### Section 11 - Toxicological Information

RTECS#: CAS# 50-32-8: DJ3675000

LD50/LC50: RTECS: Not available.

Carcinogenicity: Benzo[a]pyrene - ACGIH: A1 - Confirmed Human Carcinogen (Coal tar pitches). California: carcinogen, initial date 7/1/87 NTP: Suspect carcinogen IARC: Group 1 carcinogen

Other: The toxicological properties have not been fully investigated.

#### Section 12 - Ecological Information

Not available

#### Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

#### Section 14 - Transport Information

US DOT

Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOL (Benzo{a} pyrene)

Hazard Class: 9

UN Number: UN3077

Packing Group: III

Canada TDG

Shipping Name: Not available

Hazard Class:

UN Number:

Packing Group:

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: T N

Risk Phrases:

R 45 May cause cancer.

R 46 May cause heritable genetic damage.

R 61 May cause harm to the unborn child.

R 43 May cause sensitization by skin contact.

R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

R 60 May impair fertility.

Safety Phrases:

S 53 Avoid exposure - obtain special instructions before use.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 60 This material and its container must be disposed of as hazardous waste.

S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 50-32-8: Not available

Canada

CAS# 50-32-8 is listed on Canada's DSL List

Canadian WHMIS Classifications: D2A, D2B

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

CAS# 50-32-8 is listed on Canada's Ingredient Disclosure List

US Federal

TSCA

CAS# 50-32-8 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 9/02/1997

Revision #8 Date 7/20/2009

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages howsoever arising, even if the company has been advised of the possibility of such damages.

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## SAFETY DATA SHEET

Version 5.5  
Revision Date 02/28/2015  
Print Date 03/11/2015

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**1. PRODUCT AND COMPANY IDENTIFICATION****1.1 Product identifiers**

Product name : Benzo[*b*]fluoranthene

Product Number : 275336  
Brand : Aldrich  
Index-No. : 601-034-00-4

CAS-No. : 205-99-2

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses : Laboratory chemicals, Manufacture of substances

**1.3 Details of the supplier of the safety data sheet**

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052

**1.4 Emergency telephone number**

Emergency Phone # : (314) 776-6555

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**2. HAZARDS IDENTIFICATION****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Carcinogenicity (Category 1B), H350  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal word

Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P273

Avoid release to the environment.

P281

Use personal protective equipment as required.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P391

Collect spillage.

P405

Store locked up.

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none****3. COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substances**

Synonyms : 3,4-Benzofluoranthene  
Benz[e]acephenanthrylene  
2,3-Benzofluoranthene  
3,4-Benz[e]acephenanthrylene  
Benzo[b]fluoranthene  
Benzo[e]fluoranthene  
NSC 89265

Formula : C<sub>20</sub>H<sub>12</sub>  
Molecular weight : 252.31 g/mol  
CAS-No. : 205-99-2  
EC-No. : 205-911-9  
Index-No. : 601-034-00-4

**Hazardous components**

Component	Classification	Concentration
<b>Benz[e]acephenanthrylene</b>		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

**4. FIRST AID MEASURES****4.1 Description of first aid measures****General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

**If inhaled**

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**

Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**

Flush eyes with water as a precaution.

**If swallowed**

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**4.2 Most important symptoms and effects, both acute and delayed**

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**

No data available

**5. FIREFIGHTING MEASURES****5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**5.2 Special hazards arising from the substance or mixture**

Carbon oxides

**5.3 Advice for firefighters**

Wear self-contained breathing apparatus for firefighting if necessary.

## 5.4 Further information

No data available

---

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

#### Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

#### Personal protective equipment

##### Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

##### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact  
Material: Nitrile rubber  
Minimum layer thickness: 0.11 mm  
Break through time: 480 min  
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### **Body Protection**

impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### **Respiratory protection**

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### **Control of environmental exposure**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

---

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

- |   |   |
|---|---|
| a) Appearance                                   | Form: solid   |
| b) Odour  | No data available                                       |
| c) Odour Threshold                              | No data available                                       |
| d) pH   | No data available                                       |
| e) Melting point/freezing point                 | Melting point/range: 163 - 165 °C (325 - 329 °F) - lit. |
| f) Initial boiling point and boiling range      | No data available                                       |
| g) Flash point                                  | No data available                                       |
| h) Evaporation rate                             | No data available                                       |
| i) Flammability (solid, gas)                    | No data available                                       |
| j) Upper/lower flammability or explosive limits | No data available                                       |
| k) Vapour pressure                              | No data available                                       |
| l) Vapour density                               | No data available                                       |
| m) Relative density                             | No data available                                       |
| n) Water solubility                             | No data available                                       |
| o) Partition coefficient: n-octanol/water       | No data available                                       |
| p) Auto-ignition temperature                    | No data available                                       |
| q) Decomposition temperature                    | No data available                                       |
| r) Viscosity                                    | No data available                                       |

- s) Explosive properties      No data available
- t) Oxidizing properties      No data available

## 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

TDL<sub>o</sub> Oral - Mouse - 7.57 mg/kg

Remarks: Liver:Changes in liver weight. Endocrine:Changes in thymus weight.

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:      2B - Group 2B: Possibly carcinogenic to humans (Benz[e]acephenanthrylene)

NTP:      Reasonably anticipated to be a human carcinogen (Benz[e]acephenanthrylene)

OSHA:      No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**

No data available

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

---

**12. ECOLOGICAL INFORMATION****12.1 Toxicity**

Toxicity to daphnia and other aquatic invertebrates     Immobilization EC50 - Daphnia magna (Water flea) - > 1.024 mg/l - 24 h

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life.

---

**13. DISPOSAL CONSIDERATIONS****13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

---

**14. TRANSPORT INFORMATION****DOT (US)**

Not dangerous goods

**IMDG**

UN number: 3077     Class: 9     Packing group: III     EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.  
(Benz[e]acephenanthrylene)  
Marine pollutant:yes

**IATA**

UN number: 3077

Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[e]acephenanthrylene)

**Further information**

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

**15. REGULATORY INFORMATION****SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

**SARA 311/312 Hazards**

Chronic Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

**California Prop. 65 Components**

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-09-28

**16. OTHER INFORMATION****Full text of H-Statements referred to under sections 2 and 3.**

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

**HMIS Rating**

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

**NFPA Rating**

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

**Further information**

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**Preparation Information**

Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 5.5

Revision Date: 02/28/2015

Print Date: 03/11/2015

## SAFETY DATA SHEET

Version 3.9  
Revision Date 02/28/2015  
Print Date 03/11/2015

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**1. PRODUCT AND COMPANY IDENTIFICATION****1.1 Product identifiers**

Product name : Benzo[k]fluoranthene

Product Number : 392251  
Brand : Aldrich  
Index-No. : 601-036-00-5

CAS-No. : 207-08-9

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses : Laboratory chemicals, Manufacture of substances

**1.3 Details of the supplier of the safety data sheet**

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052

**1.4 Emergency telephone number**

Emergency Phone # : (314) 776-6555

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**2. HAZARDS IDENTIFICATION****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Carcinogenicity (Category 1B), H350  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal word

Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P273

Avoid release to the environment.

P281

Use personal protective equipment as required.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P391

Collect spillage.

P405

Store locked up.

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none****3. COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substances**

Formula	: C <sub>20</sub> H <sub>12</sub>
Molecular weight	: 252.31 g/mol
CAS-No.	: 207-08-9
EC-No.	: 205-916-6
Index-No.	: 601-036-00-5

**Hazardous components**

Component	Classification	Concentration
<b>Benzo[k]fluoranthene</b>	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

**4. FIRST AID MEASURES****4.1 Description of first aid measures****General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

**If inhaled**

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**

Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

**If swallowed**

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**4.2 Most important symptoms and effects, both acute and delayed**

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**

No data available

**5. FIREFIGHTING MEASURES****5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**5.2 Special hazards arising from the substance or mixture**

Carbon oxides

**5.3 Advice for firefighters**

Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**

No data available

**6. ACCIDENTAL RELEASE MEASURES****6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

## 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

## 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

## 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

#### Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

#### Personal protective equipment

##### Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

##### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

##### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

##### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

### Body Protection

impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

- |   |   |
|---|---|
| a) Appearance                                   | Form: crystalline                                       |
| b) Odour  | No data available                                       |
| c) Odour Threshold                              | No data available                                       |
| d) pH   | No data available                                       |
| e) Melting point/freezing point                 | Melting point/range: 215 - 217 °C (419 - 423 °F) - lit. |
| f) Initial boiling point and boiling range      | No data available                                       |
| g) Flash point                                  | No data available                                       |
| h) Evaporation rate                             | No data available                                       |
| i) Flammability (solid, gas)                    | No data available                                       |
| j) Upper/lower flammability or explosive limits | No data available                                       |
| k) Vapour pressure                              | No data available                                       |
| l) Vapour density                               | No data available                                       |
| m) Relative density                             | No data available                                       |
| n) Water solubility                             | No data available                                       |
| o) Partition coefficient: n-octanol/water       | No data available                                       |
| p) Auto-ignition temperature                    | No data available                                       |
| q) Decomposition temperature                    | No data available                                       |
| r) Viscosity                                    | No data available                                       |
| s) Explosive properties                         | No data available                                       |
| t) Oxidizing properties                         | No data available                                       |

### 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

## 10.2 Chemical stability

Stable under recommended storage conditions.

## 10.3 Possibility of hazardous reactions

No data available

## 10.4 Conditions to avoid

No data available

## 10.5 Incompatible materials

Strong oxidizing agents

## 10.6 Hazardous decomposition products

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

Carcinogenicity - Rat - Implant

Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Lungs, Thorax, or Respiration: Tumors.

Tumorigenic: Tumors at site or application.

Carcinogenicity - Mouse - Skin

Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Skin and Appendages: Other: Tumors.

Tumorigenic: Tumors at site or application.

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benzo[k]fluoranthene)

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: Reasonably anticipated to be a human carcinogen (Benzo[k]fluoranthene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

#### Reproductive toxicity

No data available

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: DF6350000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

No data available

### 12.2 Persistence and degradability

No data available

### 12.3 Bioaccumulative potential

No data available

### 12.4 Mobility in soil

No data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.  
Very toxic to aquatic life.

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

**Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

**DOT (US)**

UN number: 3077      Class: 9      Packing group: III  
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Benzo[k]fluoranthene)  
Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

**IMDG**

UN number: 3077      Class: 9      Packing group: III      EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo[k]fluoranthene)  
Marine pollutant:yes

**IATA**

UN number: 3077      Class: 9      Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[k]fluoranthene)

**Further information**

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

**15. REGULATORY INFORMATION****SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1994-04-01

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1994-04-01

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1994-04-01

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1994-04-01

**California Prop. 65 Components**

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	2007-09-28

**16. OTHER INFORMATION****Full text of H-Statements referred to under sections 2 and 3.**

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

**HMIS Rating**

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

**NFPA Rating**

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

**Further information**

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or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 3.9

Revision Date: 02/28/2015

Print Date: 03/11/2015



Health	3
Fire	1
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Cadmium MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Cadmium

**Catalog Codes:** SLC3484, SLC5272, SLC2482

**CAS#:** 7440-43-9

**RTECS:** EU9800000

**TSCA:** TSCA 8(b) inventory: Cadmium

**CI#:** Not applicable.

**Synonym:**

**Chemical Name:** Cadmium

**Chemical Formula:** Cd

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Cadmium	7440-43-9	100

**Toxicological Data on Ingredients:** Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

**Potential Chronic Health Effects:**

**CARCINOGENIC EFFECTS:** Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.

**MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance is toxic to kidneys, lungs, liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

### Section 4: First Aid Measures

**Eye Contact:** No known effect on eye contact, rinse with water for a few minutes.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:** Not available.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

**Ingestion:**

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** 570°C (1058°F)

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:**

Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:**

Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

**Storage:**

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 0.01 (ppm) Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Lustrous solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 112.4 g/mole

**Color:** Silvery.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 765°C (1409°F)

**Melting Point:** 320.9°C (609.6°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 8.64 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Not considered to be corrosive for metals and glass.

**Special Remarks on Reactivity:** Reacts violently with potassium.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 890 mg/kg [Mouse]. Acute toxicity of the dust (LC50): 229.9 mg/m<sup>3</sup> 4 hour(s) [Rat].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. The substance is toxic to kidneys, lungs, liver.

**Other Toxic Effects on Humans:**

Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

**Special Remarks on other Toxic Effects on Humans:** May cause allergic reactions, exzema and/or dehydration of the skin.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:**

**Identification:**

**Special Provisions for Transport:**

## Section 15: Other Regulatory Information

### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium Pennsylvania RTK: Cadmium Massachusetts RTK: Cadmium TSCA 8(b) inventory: Cadmium SARA 313 toxic chemical notification and release reporting: Cadmium CERCLA: Hazardous substances.: Cadmium

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

### Other Classifications:

#### WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

#### DSCL (EEC):

R26- Very toxic by inhalation. R45- May cause cancer.

#### HMIS (U.S.A.):

**Health Hazard:** 3

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** E

#### National Fire Protection Association (U.S.A.):

**Health:** 3

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

#### Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

## Section 16: Other Information

### References:

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 04:29 PM

**Last Updated:** 05/21/2013 12:00 PM

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## SAFETY DATA SHEET

Version 5.4  
Revision Date 02/28/2015  
Print Date 03/11/2015

**1. PRODUCT AND COMPANY IDENTIFICATION****1.1 Product identifiers**

Product name : Chrysene

Product Number : BCR269  
Brand : Fluka  
Index-No. : 601-048-00-0

CAS-No. : 218-01-9

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses : Laboratory chemicals, Manufacture of substances

**1.3 Details of the supplier of the safety data sheet**

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052

**1.4 Emergency telephone number**

Emergency Phone # : (314) 776-6555

**2. HAZARDS IDENTIFICATION****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Germ cell mutagenicity (Category 2), H341  
Carcinogenicity (Category 1B), H350  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal word

Danger

Hazard statement(s)

H341

Suspected of causing genetic defects.

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P273

Avoid release to the environment.

P281

Use personal protective equipment as required.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P391 Collect spillage.  
P405 Store locked up.  
P501 Dispose of contents/ container to an approved waste disposal plant.

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

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### 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1 Substances

Formula : C<sub>18</sub>H<sub>12</sub>  
Molecular weight : 228.29 g/mol  
CAS-No. : 218-01-9  
EC-No. : 205-923-4  
Index-No. : 601-048-00-0

#### Hazardous components

Component	Classification	Concentration
<b>Chrysene</b>	Muta. 2; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H341, H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

### 4. FIRST AID MEASURES

#### 4.1 Description of first aid measures

##### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

##### If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

##### In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

##### In case of eye contact

Flush eyes with water as a precaution.

##### If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

#### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

#### 4.3 Indication of any immediate medical attention and special treatment needed

No data available

---

### 5. FIREFIGHTING MEASURES

#### 5.1 Extinguishing media

##### Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

#### 5.2 Special hazards arising from the substance or mixture

Carbon oxides

#### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

#### 5.4 Further information

No data available

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.  
For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.  
Provide appropriate exhaust ventilation at places where dust is formed.  
For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Recommended storage temperature 2 - 8 °C

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Confirmed animal carcinogen with unknown relevance to humans		
Chrysene	218-01-9	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen		

		NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C See Appendix A
--	--	---

### Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Chrysene	218-01-9	1-Hydroxypyrene (1-HP)		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

## 8.2 Exposure controls

### Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

### Personal protective equipment

#### Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

#### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

#### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

#### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### Body Protection

impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

a) Appearance	Form: solid
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 252 - 254 °C (486 - 489 °F)
f) Initial boiling point and boiling range	448 °C (838 °F)
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	insoluble
o) Partition coefficient: n-octanol/water	log Pow: 5.73
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

### 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - > 320 mg/kg

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

In vitro tests showed mutagenic effects

#### Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Chrysene)

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: OSHA specifically regulated carcinogen (Chrysene)

#### Reproductive toxicity

No data available

No data available

#### Specific target organ toxicity - single exposure

No data available

#### Specific target organ toxicity - repeated exposure

No data available

#### Aspiration hazard

No data available

#### Additional Information

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

---

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates      EC50 - Daphnia magna (Water flea) - 1.90 mg/l - 2 h

## 12.2 Persistence and degradability

No data available

## 12.3 Bioaccumulative potential

No data available

## 12.4 Mobility in soil

No data available

## 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## 12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

No data available

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

#### Contaminated packaging

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

Not dangerous goods

### IMDG

UN number: 3077      Class: 9      Packing group: III      EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chrysene)  
Marine pollutant:yes

### IATA

UN number: 3077      Class: 9      Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Chrysene)

### Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

### SARA 311/312 Hazards

Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

## New Jersey Right To Know Components

Chrysene

CAS-No.  
218-01-9

Revision Date  
1994-04-01

## California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

Chrysene

CAS-No.  
218-01-9

Revision Date  
2007-09-28

---

## 16. OTHER INFORMATION

### Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

### HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

### NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

### Further information

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### Preparation Information

Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 5.4

Revision Date: 02/28/2015

Print Date: 03/11/2015



Health	1
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet Cyclohexane MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Cyclohexane

**Catalog Codes:** SLC3520, SLC2305

**CAS#:** 110-82-7

**RTECS:** GU6300000

**TSCA:** TSCA 8(b) inventory: Cyclohexane

**CI#:** Not applicable.

**Synonym:** Benzene, hexahydro-; Hexahydrobenzene; Hexamethylene; Hexanaphthene

**Chemical Name:** Cyclohexane

**Chemical Formula:** C6-H12

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Cyclohexane	110-82-7	100

**Toxicological Data on Ingredients:** Cyclohexane: ORAL (LD50): Acute: 12705 mg/kg [Rat]. 813 mg/kg [Mouse]. DERMAL (LD): Acute: >18000 mg/kg [Rabbit].

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Slightly hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, cardiovascular system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

If swallowed, do NOT induce vomiting. Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Aspiration hazard if swallowed- can enter lungs and cause damage. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 245°C (473°F)

**Flash Points:** CLOSED CUP: -18°C (-0.4°F). (Setaflash)

**Flammable Limits:** LOWER: 1.3% UPPER: 8.4%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Highly flammable in presence of open flames and sparks, of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks.

**Fire Fighting Media and Instructions:**

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

**Special Remarks on Fire Hazards:** Vapor may travel considerable distance to source of ignition and flash back.

**Special Remarks on Explosion Hazards:** When mixed hot with liquid dinitrogen tetroxide an explosion can result.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid, insoluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

**Storage:**

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 300 (ppm) from ACGIH (TLV) [United States] TWA: 300 (ppm) from OSHA (PEL) [United States] TWA: 1050 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] TWA: 100 STEL: 300 (ppm) [United Kingdom (UK)] TWA: 350 STEL: 1050 (mg/m<sup>3</sup>) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:**

Chloroform-like odor; solvent odor; mild sweet odor

**Taste:** Not available.

**Molecular Weight:** 84.16 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 80.7°C (177.3°F)

**Melting Point:** 6.47°C (43.6°F)

**Critical Temperature:** 280.4°C (536.7°F)

**Specific Gravity:** 0.7781 (Water = 1)

**Vapor Pressure:** 12.9 kPa (@ 20°C)

**Vapor Density:** 2.98 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 25 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 3.4

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, methanol.

**Solubility:**

Soluble in methanol. Insoluble in cold water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources, incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Not considered to be corrosive for metals and glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

### Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 813 mg/kg [Mouse].

**Chronic Effects on Humans:** May cause damage to the following organs: kidneys, liver, cardiovascular system, central nervous system (CNS).

**Other Toxic Effects on Humans:** Slightly hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Dose: LCL[Mouse] - Route: Inhalation; Dose: 70000 mg/m<sup>3</sup>/2H LCL[Rabbit] - 89600 mg/m<sup>3</sup>/1H

**Special Remarks on Chronic Effects on Humans:**

Human: passes the placental barrier, detected in maternal milk. May affect genetic material (mutagenic)

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: It may cause skin irritation. It may be absorbed through the skin. Eyes: It may cause eye irritation. Inhalation: It may cause respiratory tract (nose, throat) irritation. Exposure to high concentrations of vapor may cause nausea, increased respiration rate. It may also affect behavior/central nervous system(dizziness, lethargy, somnolence, lightheadedness, seizures/convulsions, weakness, loss of coordination and judgement, trembling, drowsiness). Unconsciousness and death may occur at high exposures. In experimental animals there is a narrow margin between doses causing narcosis, loss of reflexes and death. Generalized vascular damage/collapse and degenerative changes were seen in the heart, lung, liver kidneys and brain of experimental animals exposed to lethal concentrations by inhalation or ingestion. Ingestion: May cause gastrointestinal irritation and diarrhea. May affect behavior/central nervous system with symptoms similar that that of inhalation. May cause liver and kidney damage. Aspiration of cyclohexane into the lungs may cause chemical pneumonitis. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may cause drying, cracking and chapping of exposed areas. Ingestion and Ingestion: Prolonged or repeated inhalation or ingestion may cause liver and kidney damage. It may also affect behavior/central nervous system with symptoms similar to that of acute ingestion or inhalation.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Cyclohexane UNNA: 1145 PG: II

**Special Provisions for Transport:** Not available.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

Connecticut hazardous material survey.: Cyclohexane Illinois toxic substances disclosure to employee act: Cyclohexane Illinois chemical safety act: Cyclohexane New York release reporting list: Cyclohexane Rhode Island RTK hazardous substances: Cyclohexane Pennsylvania RTK: Cyclohexane Minnesota: Cyclohexane Massachusetts RTK: Cyclohexane Massachusetts spill list: Cyclohexane New Jersey: Cyclohexane New Jersey spill list: Cyclohexane Louisiana spill reporting: Cyclohexane TSCA 8(b) inventory: Cyclohexane SARA 313 toxic chemical notification and release reporting: Cyclohexane CERCLA: Hazardous substances.: Cyclohexane: 1000 lbs. (453.6 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

**DSCL (EEC):**

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:17 PM

**Last Updated:** 05/21/2013 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*

## SIGMA-ALDRICH

## MATERIAL SAFETY DATA SHEET

Date Printed: 11.03.2015

Date Updated: 07.05.2009

Version 1.4

## Section 1 - Product and Company Information

Product Name 1,2:5,6-DIBENZANTHRACENE, 97% (NO BULK  
ORDERS ALLOWED)  
Product Number D31400  
Brand ALDRICH

Company Sigma-Aldrich  
Address 3050 Spruce Street  
SAINT LOUIS MO 63103 US

Technical Phone: 800-325-5832  
Fax: 800-325-5052  
Emergency Phone: 314-776-6555

## Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1,2:5,6-DIBENZANTHRACENE	53-70-3	Yes

Formula C22H14  
Synonyms 1,2:5,6-Benzanthracene \* DB(a,h)A \* 1,2,5,6-DbA \*  
1,2,5,6-Dibenzanthracene (Dutch) \*  
1,2:5,6-Dibenzanthracene \*  
1,2:5,6-Dibenz(a)anthracene \*  
Dibenzo(a,h)anthracene \*  
1,2:5,6-Dibenzoanthracene \* RCRA waste number U063  
RTECS Number: HN2625000

## Section 3 - Hazards Identification

## EMERGENCY OVERVIEW

Toxic. Dangerous for the environment.  
May cause cancer. Very toxic to aquatic organisms, may cause  
long-term adverse effects in the aquatic environment.  
Target organ(s): Lungs. Liver. Calif. Prop. 65 carcinogen.

## HMIS RATING

HEALTH: 2\*  
FLAMMABILITY: 0  
REACTIVITY: 0

## NFPA RATING

HEALTH: 2  
FLAMMABILITY: 0  
REACTIVITY: 0

\*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

## Section 4 - First Aid Measures

---

#### ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

#### INHALATION EXPOSURE

If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

#### DERMAL EXPOSURE

In case of contact, immediately wash skin with soap and copious amounts of water.

#### EYE EXPOSURE

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

---

### Section 5 - Fire Fighting Measures

---

#### FLASH POINT

N/A

#### AUTOIGNITION TEMP

N/A

#### FLAMMABILITY

N/A

#### EXTINGUISHING MEDIA

Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

#### FIREFIGHTING

Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.  
Specific Hazard(s): Emits toxic fumes under fire conditions.

---

### Section 6 - Accidental Release Measures

---

#### PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL

Evacuate area.

#### PROCEDURE(S) OF PERSONAL PRECAUTION(S)

Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Wear disposable coveralls and discard them after use.

#### METHODS FOR CLEANING UP

Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

---

### Section 7 - Handling and Storage

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#### HANDLING

User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

#### STORAGE

Suitable: Keep tightly closed.

---

Section 8 - Exposure Controls / PPE

---

ENGINEERING CONTROLS

Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.

Hand: Compatible chemical-resistant gloves.

Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash contaminated clothing before reuse. Wash thoroughly after handling.

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	0.004 MG/M3
Poland		NDSch	-
Poland		NDSP	-

---

Section 9 - Physical/Chemical Properties

---

Appearance Physical State: Solid

Property	Value	At Temperature or Pressure
Molecular Weight	278,3500 AMU	
pH	N/A	
BP/BP Range	524,000 °C	760,000 mmHg
MP/MP Range	262,000 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	

Solubility N/A

N/A = not available

---

Section 10 - Stability and Reactivity

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STABILITY

Stable: Stable.

Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

---

Section 11 - Toxicological Information

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ROUTE OF EXPOSURE

Skin Contact: May cause skin irritation.

Skin Absorption: May be harmful if absorbed through the skin.

Eye Contact: May cause eye irritation.

Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.

Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)

Lungs. Liver.

SIGNS AND SYMPTOMS OF EXPOSURE

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

CHRONIC EXPOSURE - CARCINOGEN

Result: This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Species: Rat

Route of Application: Intratracheal

Dose: 100 MG/KG

Result: Tumorigenic: Carcinogenic by RTECS criteria. Lungs, Thorax, or Respiration: Tumors.

Species: Mouse

Route of Application: Oral

Dose: 4160 MG/KG

Exposure Time: 26W

Frequency: I

Result: Lungs, Thorax, or Respiration: Tumors.

Tumorigenic: Carcinogenic by RTECS criteria.

Species: Mouse

Route of Application: Skin

Dose: 1200 MG/KG

Exposure Time: 50W

Frequency: I

Result: Tumorigenic: Tumors at site or application.

Tumorigenic: Carcinogenic by RTECS criteria. Skin and Appendages:

Other: Tumors.

Species: Mouse  
Route of Application: Subcutaneous  
Dose: 445 UG/KG  
Result: Skin and Appendages: Other: Tumors.  
Tumorigenic: Carcinogenic by RTECS criteria. Tumorigenic: Tumors  
at site or application.

Species: Mouse  
Route of Application: Intravenous  
Dose: 40 MG/KG  
Result: Tumorigenic: Neoplastic by RTECS criteria. Lungs, Thorax,  
or Respiration: Tumors. Liver: Tumors.

Species: Mouse  
Route of Application: Implant  
Dose: 80 MG/KG  
Result: Kidney, Ureter, Bladder: Tumors. Tumorigenic: Carcinogenic  
by RTECS criteria.

Species: Mouse  
Route of Application: Multiple  
Dose: 40 MG/KG  
Exposure Time: 12D  
Frequency: I  
Result: Tumorigenic: Tumors at site or application. Lungs,  
Thorax, or Respiration: Tumors. Tumorigenic: Equivocal tumorigenic  
agent by RTECS criteria.

Species: Guinea pig  
Route of Application: Subcutaneous  
Dose: 250 MG/KG  
Exposure Time: 24D  
Frequency: I  
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS  
criteria. Tumorigenic: Tumors at site or application. Lungs,  
Thorax, or Respiration: Tumors.

Species: Guinea pig  
Route of Application: Intravenous  
Dose: 30 MG/KG  
Result: Tumorigenic: Tumors at site or application. Lungs,  
Thorax, or Respiration: Tumors. Tumorigenic: Equivocal tumorigenic  
agent by RTECS criteria.

Species: Pigeon  
Route of Application: Intramuscular  
Dose: 6 MG/KG  
Result: Tumorigenic: Carcinogenic by RTECS criteria.  
Liver: Tumors. Tumorigenic: Tumors at site or application.

Species: Frog  
Route of Application: Intrarenal  
Dose: 12 MG/KG  
Result: Kidney, Ureter, Bladder: Kidney tumors. Lungs, Thorax, or  
Respiration: Tumors. Tumorigenic: Neoplastic by RTECS criteria.

Species: Mouse  
Route of Application: Implant  
Dose: 14 MG/KG

Result: Tumorigenic:Neoplastic by RTECS criteria.  
Tumorigenic:Tumors at site or application.

Species: Mouse  
Route of Application: Subcutaneous  
Dose: 78 UG/KG  
Result: Tumorigenic:Neoplastic by RTECS criteria.  
Tumorigenic:Tumors at site or application.

Species: Mouse  
Route of Application: Oral  
Dose: 4520 MG/KG  
Exposure Time: 36W  
Frequency: C  
Result: Tumorigenic:Carcinogenic by RTECS criteria. Lungs,  
Thorax, or Respiration:Tumors. Gastrointestinal:Tumors.

Species: Mouse  
Route of Application: Implant  
Dose: 200 MG/KG  
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax,  
or Respiration:Bronchiogenic carcinoma. Tumorigenic:Tumors at  
site or application.

Species: Mouse  
Route of Application: Skin  
Dose: 6 UG/KG  
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and  
Appendages: Other: Tumors.

Species: Mouse  
Route of Application: Subcutaneous  
Dose: 6 MG/KG  
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS  
criteria. Tumorigenic:Tumors at site or application.

Species: Mouse  
Route of Application: Skin  
Dose: 400 MG/KG  
Exposure Time: 40W  
Frequency: I  
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and  
Appendages: Other: Tumors.

Species: Mouse  
Route of Application: Implant  
Dose: 100 MG/KG  
Result: Tumorigenic:Carcinogenic by RTECS criteria. Kidney,  
Ureter, Bladder:Tumors. Tumorigenic:Tumors at site or  
application.

Species: Rat  
Route of Application: Subcutaneous  
Dose: 135 MG/KG  
Exposure Time: 9W  
Frequency: I  
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax,  
or Respiration:Tumors. Tumorigenic:Tumors at site or application.

Species: Mouse

Route of Application: Subcutaneous  
Dose: 400 MG/KG  
Exposure Time: 10W  
Frequency: I  
Result: Tumorigenic:Neoplastic by RTECS criteria.  
Tumorigenic:Tumors at site or application.

#### IARC CARCINOGEN LIST

Rating: Group 2A

#### NTP CARCINOGEN LIST

Rating: Anticipated to be a carcinogen.

#### CHRONIC EXPOSURE - MUTAGEN

Result: Laboratory experiments have shown mutagenic effects.

Species: Human  
Dose: 360 NMOL/L  
Cell Type: Embryo  
Mutation test: DNA

Species: Human  
Dose: 100 UMOL/L  
Cell Type: fibroblast  
Mutation test: Unscheduled DNA synthesis

Species: Human  
Dose: 10 MG/L  
Cell Type: Other cell types  
Mutation test: Unscheduled DNA synthesis

Species: Human  
Dose: 100 NMOL/L  
Cell Type: HeLa cell  
Mutation test: Unscheduled DNA synthesis

Species: Human  
Dose: 54 UG/L  
Cell Type: lymphocyte  
Mutation test: Mutation in mammalian somatic cells.

Species: Rat  
Route: Intratracheal  
Dose: 25500 UG/KG  
Exposure Time: 16H  
Mutation test: Micronucleus test

Species: Rat  
Route: Oral  
Dose: 200 MG/KG  
Mutation test: Morphological transformation.

Species: Rat  
Dose: 100 UG/L  
Cell Type: Embryo  
Mutation test: Morphological transformation.

Species: Rat

Route: Intratracheal  
Dose: 25560 UG/KG  
Mutation test: DNA

Species: Rat  
Route: Intratracheal  
Dose: 51150 UG/KG  
Mutation test: Sister chromatid exchange

Species: Mouse  
Route: Intraperitoneal  
Dose: 500 MG/KG  
Mutation test: Micronucleus test

Species: Mouse  
Dose: 4250 UG/L (+S9)  
Cell Type: lymphocyte  
Mutation test: Mutation in microorganisms

Species: Mouse  
Dose: 500 UG/L  
Cell Type: fibroblast  
Mutation test: Morphological transformation.

Species: Mouse  
Dose: 100 UG/L  
Cell Type: Embryo  
Mutation test: Morphological transformation.

Species: Mouse  
Dose: 6 UMOL/L  
Cell Type: liver  
Mutation test: DNA

Species: Mouse  
Route: Skin  
Dose: 40 UMOL/KG  
Mutation test: DNA

Species: Mouse  
Dose: 1 MG/L  
Cell Type: Other cell types  
Mutation test: DNA

Species: Mouse  
Dose: 1 MG/L  
Cell Type: Other cell types  
Mutation test: Other mutation test systems

Species: Mouse  
Dose: 510 NMOL/L  
Cell Type: Embryo  
Mutation test: DNA

Species: Mouse  
Dose: 510 NMOL/L  
Cell Type: Embryo  
Mutation test: Other mutation test systems

Species: Hamster

Dose: 56400 NMOL/L (+S9)  
Cell Type: lung  
Mutation test: Mutation in microorganisms

Species: Hamster  
Dose: 2500 UG/L  
Cell Type: Embryo  
Mutation test: Morphological transformation.

Species: Hamster  
Dose: 25 UG/L  
Cell Type: kidney  
Mutation test: Morphological transformation.

Species: Hamster  
Dose: 5 MG/L  
Exposure Time: 24H  
Cell Type: fibroblast  
Mutation test: DNA damage

Species: Hamster  
Dose: 360 NMOL/L  
Cell Type: Embryo  
Mutation test: DNA

Species: Hamster  
Dose: 5 MG/L  
Cell Type: kidney  
Mutation test: DNA damage

Species: Hamster  
Dose: 1 MG/L  
Cell Type: lung  
Mutation test: DNA

Species: Hamster  
Dose: 1 MG/L  
Cell Type: lung  
Mutation test: Other mutation test systems

Species: Hamster  
Dose: 1 MMOL/L  
Cell Type: fibroblast  
Mutation test: Cytogenetic analysis

Species: Hamster  
Route: Intraperitoneal  
Dose: 900 MG/KG  
Exposure Time: 24H  
Mutation test: Sister chromatid exchange

Species: Hamster  
Dose: 500 UG/L  
Cell Type: lung  
Mutation test: Mutation in mammalian somatic cells.

Species: Mammal  
Dose: 2 NMOL/L  
Cell Type: lymphocyte  
Mutation test: DNA damage

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Section 12 - Ecological Information

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No data available.

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Section 13 - Disposal Considerations

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APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations. (DN)Requires special label: "Contains a substance which is regulated by Danish work environmental law due to the risk of carcinogenic properties."

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Section 14 - Transport Information

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DOT

Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s.  
UN#: 3077  
Class: 9  
Packing Group: Packing Group III  
Hazard Label: Class 9  
PIH: Not PIH

IATA

Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s.  
IATA UN Number: 3077  
Hazard Class: 9  
Packing Group: III

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Section 15 - Regulatory Information

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EU DIRECTIVES CLASSIFICATION

Symbol of Danger: T-N  
Indication of Danger: Toxic. Dangerous for the environment.  
R: 45-50/53  
Risk Statements: May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.  
S: 53-45-60-61  
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT

Indication of Danger: Toxic. Dangerous for the environment.  
Risk Statements: May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.  
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Wear suitable protective clothing, gloves, and eye/face protection. This

material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US Statements: Target organ(s): Lungs. Liver. Calif. Prop. 65 carcinogen.

#### UNITED STATES REGULATORY INFORMATION

SARA LISTED: Yes

NOTES: This product is subject to SARA section 313 reporting requirements.

TSCA INVENTORY ITEM: Yes

#### UNITED STATES - STATE REGULATORY INFORMATION

##### CALIFORNIA PROP - 65

California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer. This product is or contains chemical(s) known to the state of California to cause cancer.

#### CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: No

NDSL: Yes

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#### Section 16 - Other Information

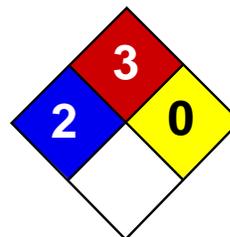
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#### DISCLAIMER

For R&D use only. Not for drug, household or other uses.

#### WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2010 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.



Health	2
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet Ethylbenzene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Ethylbenzene

**Catalog Codes:** SLE2044

**CAS#:** 100-41-4

**RTECS:** DA0700000

**TSCA:** TSCA 8(b) inventory: Ethylbenzene

**CI#:** Not available.

**Synonym:** Ethyl Benzene; Ethylbenzol; Phenylethane

**Chemical Name:** Ethylbenzene

**Chemical Formula:** C<sub>8</sub>H<sub>10</sub>

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Ethylbenzene	100-41-4	100

**Toxicological Data on Ingredients:** Ethylbenzene: ORAL (LD50): Acute: 3500 mg/kg [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

**Potential Chronic Health Effects:**

Slightly hazardous in case of skin contact (irritant, sensitizer). **CARCINOGENIC EFFECTS:** Classified 2B (Possible for human.) by IARC. **MUTAGENIC EFFECTS:** Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 432°C (809.6°F)

**Flash Points:**

CLOSED CUP: 15°C (59°F). (Tagliabue.) OPEN CUP: 26.667°C (80°F) (Cleveland) (CHRIS, 2001) CLOSED CUP: 12.8 C (55 F) (Bingham et al, 2001; NIOSH, 2001) CLOSED CUP: 21 C (70 F) (NFPA)

**Flammable Limits:** LOWER: 0.8% - 1.6%UPPER: 6.7% - 7%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Highly flammable in presence of open flames and sparks, of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

**Special Remarks on Fire Hazards:**

Vapor may travel considerable distance to source of ignition and flash back. Vapors may form explosive mixtures with air. When heated to decomposition it emits acrid smoke and irritating fumes.

**Special Remarks on Explosion Hazards:** Vapors may form explosive mixtures in air.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

### Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Sensitive to light. Store in light-resistant containers.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

### Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 100 STEL: 125 (ppm) from OSHA (PEL) [United States] TWA: 435 STEL: 545 from OSHA (PEL) [United States] TWA: 435 STEL: 545 (mg/m<sup>3</sup>) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from ACGIH (TLV) [United States] TWA: 100 STEL: 125 (ppm) [United Kingdom (UK)] TWA: 100 STEL: 125 (ppm) [Belgium] TWA: 100 STEL: 125 (ppm) [Finland] TWA: 50 (ppm) [Norway] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Sweetish. Gasoline-like. Aromatic.

**Taste:** Not available.

**Molecular Weight:** 106.16 g/mole

**Color:** Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 136°C (276.8°F)

**Melting Point:** -94.9 (-138.8°F)

**Critical Temperature:** 617.15°C (1142.9°F)

**Specific Gravity:** 0.867 (Water = 1)

**Vapor Pressure:** 0.9 kPa (@ 20°C)

**Vapor Density:** 3.66 (Air = 1)

**Volatility:** 100% (v/v).

**Odor Threshold:** 140 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil;  $\log(\text{oil/water}) = 3.1$

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether.

**Solubility:**

Easily soluble in diethyl ether. Very slightly soluble in cold water or practically insoluble in water. Soluble in all proportions in Ethyl alcohol. Soluble in Carbon tetrachloride, Benzene. Insoluble in Ammonia. Slightly soluble in Chloroform. Solubility in Water: 169 mg/l @ 25 deg. C.; 0.014 g/100 ml @ 15 deg. C.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources (flames, sparks, static), incompatible materials, light

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Not considered to be corrosive for metals and glass.

**Special Remarks on Reactivity:**

Can react vigorously with oxidizing materials. Sensitive to light.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Inhalation.

**Toxicity to Animals:** Acute oral toxicity (LD50): 3500 mg/kg [Rat].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: central nervous system (CNS).

**Other Toxic Effects on Humans:**

Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

**Special Remarks on Toxicity to Animals:**

Lethal Dose/Conc 50% Kill: LD50 [Rabbit] - Route: Skin; Dose: 17800 ul/kg Lowest Published Lethal Dose/Conc: LDL[Rat] - Route: Inhalation (vapor); Dose: 4000 ppm/4 H

**Special Remarks on Chronic Effects on Humans:**

May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data. May cause cancer based on animals data. IARC evidence for carcinogenicity in animals is sufficient. IARC evidence of carcinogenicity in humans inadequate. May affect genetic material (mutagenic).

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Can cause mild skin irritation. It can be absorbed through intact skin. Eyes: Contact with vapor or liquid can cause severe eye irritation depending on concentration. It may also cause conjunctivitis. At a vapor exposure level of 85 - 200 ppm, it is mildly and transiently irritating to the eyes; 1000 ppm causes further irritation and tearing; 2000 ppm results in immediate and severe irritation and tearing; 5,000 ppm is intolerable (ACGIH, 1991; Clayton and Clayton, 1994). Standard draize test for eye irritation using 500 mg resulted in severe irritation (RTECS) Inhalation: Exposure to high concentrations can cause nasal, mucous membrane and respiratory tract irritation and can also result in chest constriction and, trouble breathing, respiratory failure, and even death. It can also affect behavior/Central Nervous System. The effective dose for CNS depression in experimental animals was 10,000 ppm (ACGIH, 1991). Symptoms of CNS depression include

headache, nausea, weakness, dizziness, vertigo, irritability, fatigue, lightheadedness, sleepiness, tremor, loss of coordination, judgement and consciousness, coma, and death. It can also cause pulmonary edema. Inhalation of 85 ppm can produce fatigue, insomnia, headache, and mild irritation of the respiratory tract (Haley & Berndt, 1987). Ingestion: Do not drink, pipet or siphon by mouth. May cause gastrointestinal/digestive tract irritation with Abdominal pain, nausea, vomiting. Ethylbenzene is a pulmonary aspiration hazard. Pulmonary aspiration of even small amounts of the liquid may cause fatal pneumonitis. It may also affect behavior/central nervous system with

## Section 12: Ecological Information

### Ecotoxicity:

Ecotoxicity in water (LC50): 14 mg/l 96 hours [Fish (Trout)] (static). 12.1 mg/l 96 hours [Fish (Fathead Minnow)] (flow-through)]. 150 mg/l 96 hours [Fish (Blue Gill/Sunfish)] (static). 275 mg/l 96 hours [Fish (Sheepshead Minnow)]. 42.3 mg/l 96 hours [Fish (Fathead Minnow)](soft water). 87.6mg/l 96 hours [Shrimp].

**BOD5 and COD:** Not available.

### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Ethylbenzene UNNA: 1175 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

### Federal and State Regulations:

Connecticut hazardous material survey.: Ethylbenzene Illinois toxic substances disclosure to employee act: Ethylbenzene Illinois chemical safety act: Ethylbenzene New York release reporting list: Ethylbenzene Rhode Island RTK hazardous substances: Ethylbenzene Pennsylvania RTK: Ethylbenzene Minnesota: Ethylbenzene Massachusetts RTK: Ethylbenzene Massachusetts spill list: Ethylbenzene New Jersey: Ethylbenzene New Jersey spill list: Ethylbenzene Louisiana spill reporting: Ethylbenzene California Director's List of Hazardous Substances: Ethylbenzene TSCA 8(b) inventory: Ethylbenzene TSCA 4(a) proposed test rules: Ethylbenzene TSCA 8(d) H and S data reporting: Ethylbenzene: Effective Date: 6/19/87; Sunset Date: 6/19/97 SARA 313 toxic chemical notification and release reporting: Ethylbenzene

### Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

### Other Classifications:

### WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASSE D-2B: Material causing other toxic effects (TOXIC).

**DSCL (EEC):**

R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S24/25- Avoid contact with skin and eyes. S29- Do not empty into drains.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information****References:**

-Manufacturer's Material Safety Data Sheet. -Fire Protection Guide to Hazardous Materials, 13th ed., National Fire Protection Association (NFPA) -Registry of Toxic Effects of Chemical Substances (RTECS) -Chemical Hazard Response Information System (CHRIS) -Hazardous Substance Data Bank (HSDB) -New Jersey Hazardous Substance Fact Sheet -Ariel Global View -Reprotext System

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 05:28 PM

**Last Updated:** 05/21/2013 12:00 PM

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### 1. PRODUCT AND COMPANY IDENTIFICATION

#### 1.1 Product identifiers

Product name : Fluoranthene  
Product Number : 48535  
Brand : Supelco  
CAS-No. : 206-44-0

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

#### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA  
Telephone : +1 800-325-5832  
Fax : +1 800-325-5052

#### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

### 2. HAZARDS IDENTIFICATION

#### 2.1 Classification of the substance or mixture

##### GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 4), H302  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

#### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H302

Harmful if swallowed.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P273

Avoid release to the environment.

P301 + P312 + P330

IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth.

P391

Collect spillage.

P501

Dispose of contents/ container to an approved waste disposal plant.

#### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1 Substances

Synonyms : Benzo[j,k]fluorene

Formula : C<sub>16</sub>H<sub>10</sub>

Molecular weight : 202.25 g/mol

CAS-No. : 206-44-0

EC-No. : 205-912-4

#### Hazardous components

Component	Classification	Concentration
<b>Fluoranthene</b>		
	Acute Tox. 4; Aquatic Acute 1; Aquatic Chronic 1; H302, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

### 4. FIRST AID MEASURES

#### 4.1 Description of first aid measures

##### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

##### If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

##### In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

##### In case of eye contact

Flush eyes with water as a precaution.

##### If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

#### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

#### 4.3 Indication of any immediate medical attention and special treatment needed

No data available

---

### 5. FIREFIGHTING MEASURES

#### 5.1 Extinguishing media

##### Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

#### 5.2 Special hazards arising from the substance or mixture

Carbon oxides

#### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

#### 5.4 Further information

No data available

---

### 6. ACCIDENTAL RELEASE MEASURES

#### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

For personal protection see section 8.

## 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

## 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

## 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): Non Combustible Solids

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

#### Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

#### Personal protective equipment

##### Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

##### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

##### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

##### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an

industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

### **Body Protection**

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

### **Respiratory protection**

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

### **Control of environmental exposure**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

---

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

- |   |   |
|---|---|
| a) Appearance                                   | Form: solid   |
| b) Odour  | No data available                                       |
| c) Odour Threshold                              | No data available                                       |
| d) pH   | No data available                                       |
| e) Melting point/freezing point                 | Melting point/range: 105 - 110 °C (221 - 230 °F) - lit. |
| f) Initial boiling point and boiling range      | 384 °C (723 °F) - lit.                                  |
| g) Flash point                                  | 198.0 °C (388.4 °F) - closed cup                        |
| h) Evaporation rate                             | No data available                                       |
| i) Flammability (solid, gas)                    | No data available                                       |
| j) Upper/lower flammability or explosive limits | No data available                                       |
| k) Vapour pressure                              | No data available                                       |
| l) Vapour density                               | No data available                                       |
| m) Relative density                             | No data available                                       |
| n) Water solubility                             | No data available                                       |
| o) Partition coefficient: n-octanol/water       | No data available                                       |
| p) Auto-ignition temperature                    | No data available                                       |
| q) Decomposition temperature                    | No data available                                       |
| r) Viscosity                                    | No data available                                       |
| s) Explosive properties                         | No data available                                       |
| t) Oxidizing properties                         | No data available                                       |

### **9.2 Other safety information**

No data available

---

## **10. STABILITY AND REACTIVITY**

### **10.1 Reactivity**

No data available

## 10.2 Chemical stability

Stable under recommended storage conditions.

## 10.3 Possibility of hazardous reactions

No data available

## 10.4 Conditions to avoid

No data available

## 10.5 Incompatible materials

Strong oxidizing agents

## 10.6 Hazardous decomposition products

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

No data available

LD50 Oral - Rat - 2,000 mg/kg

Inhalation: No data available

Inhalation: No data available

Dermal: No data available

LD50 Dermal - Rabbit - 3,180 mg/kg

No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

#### Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Fluoranthene)

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: Reasonably anticipated to be a human carcinogen (Fluoranthene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

#### Reproductive toxicity

No data available

No data available

#### Specific target organ toxicity - single exposure

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: LL4025000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

---

**12. ECOLOGICAL INFORMATION****12.1 Toxicity**

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.0077 mg/l - 96 h NOEC - Cyprinodon variegatus (sheepshead minnow) - 560 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - > 0.005 - < 0.01 mg/l - 3 d Immobilization EC50 - Daphnia magna (Water flea) - 0.78 mg/l - 20 h NOEC - Daphnia magna (Water flea) - 0.085 mg/l - 48 h

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

No data available

---

**13. DISPOSAL CONSIDERATIONS****13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

---

**14. TRANSPORT INFORMATION****DOT (US)**

UN number: 3077      Class: 9      Packing group: III  
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Fluoranthene)  
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

**IMDG**

UN number: 3077      Class: 9      Packing group: III      EMS-No: F-A, S-F

Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Fluoranthene)

Marine pollutant:yes

**IATA**

UN number: 3077      Class: 9      Packing group: III

Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Fluoranthene)

**Further information**

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

---

**15. REGULATORY INFORMATION**

**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
Fluoranthene	206-44-0	1993-04-24

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
Fluoranthene	206-44-0	1993-04-24

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
Fluoranthene	206-44-0	1993-04-24

**California Prop. 65 Components**

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

---

**16. OTHER INFORMATION**

**Full text of H-Statements referred to under sections 2 and 3.**

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H302	Harmful if swallowed.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

**HMIS Rating**

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	1
Physical Hazard	0

**NFPA Rating**

Health hazard:	1
Fire Hazard:	1
Reactivity Hazard:	0

**Further information**

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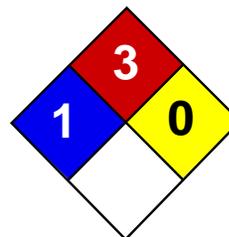
**Preparation Information**

Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 5.5

Revision Date: 01/02/2015

Print Date: 03/11/2015



Health	2
Fire	3
Reactivity	0
Personal Protection	G

## Material Safety Data Sheet

### Hexanes MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Hexanes

**Catalog Codes:** SLH2335, SLH2032

**CAS#:** 110-54-3

**RTECS:** MN9275000

**TSCA:** TSCA 8(b) inventory: Hexane

**CI#:** Not applicable.

**Synonym:**

**Chemical Name:** Hexane

**Chemical Formula:** C6-H14

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Hexanes	110-54-3	98.5-99.9

**Toxicological Data on Ingredients:** Hexane: ORAL (LD50): Acute: 25000 mg/kg [Rat].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of skin contact (permeator), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to peripheral nervous system, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 225°C (437°F)

**Flash Points:** CLOSED CUP: -22.5°C (-8.5°F). (TAG)

**Flammable Limits:** LOWER: 1.15% UPPER: 7.5%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:**

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

**Special Remarks on Fire Hazards:**

Extremely flammable liquid and vapor. Vapor may cause flash fire.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid, insoluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

**Storage:**

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves (impervious).

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 500 (ppm) from OSHA (PEL) [United States] Inhalation TWA: 1800 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] Inhalation TWA: 176 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] SKIN TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 500 STEL: 1000 (ppm) from ACGIH (TLV) [United States] Inhalation TWA: 1760 STEL: 3500 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] Inhalation Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Gasoline-like or petroleum-like (Slight.)

**Taste:** Not available.

**Molecular Weight:** 86.18g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 68°C (154.4°F)

**Melting Point:** -95°C (-139°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 0.66 (Water = 1)

**Vapor Pressure:** 17.3 kPa (@ 20°C)

**Vapor Density:** 2.97 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 130 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 3.9

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether, acetone.

**Solubility:**

Soluble in diethyl ether, acetone. Insoluble in cold water, hot water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources, incompatibles.

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Not available.

**Special Remarks on Reactivity:** Hexane can react vigorously with strong oxidizers (e.g. chlorine, bromine, fluorine)

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

### Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 25000 mg/kg [Rat]. Acute toxicity of the gas (LC50): 48000 ppm 4 hours [Rat].

**Chronic Effects on Humans:**

MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: peripheral nervous system, skin, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion, of inhalation. Hazardous in case of skin contact (permeator). Slightly hazardous in case of skin contact (irritant).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

May cause adverse reproductive effects based on animal data. May be tumorigenic based on animal data. May affect genetic material. Passes through the placental barrier in animal.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: May cause mild skin irritation. It can be absorbed through the skin in harmful amounts. Eyes: May cause mild eye irritation. Inhalation: May be harmful if inhaled. Inhalation of vapors may cause respiratory tract irritation. Overexposure may affect, brain, spinal cord, behavior/central and peripheral nervous systems (lightheadness, dizziness, hallucinations, paralysis, blurred vision, memory loss, headache, euphoria, general anesthetic, muscle weakness, numbness of the extremities, asphyxia, unconsciousness and possible death), metabolism, respiration, blood, cardiovascular system, gastrointestinal system (nausea) Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation with abdominal pain and nausea. May also affect the liver, blood, brain, peripheral and central nervous systems. Symptoms of over exposure by ingestion are similar to that of overexposure by inhalation.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

**Section 13: Disposal Considerations****Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

**Section 14: Transport Information**

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Hexane UNNA: 1208 PG: II

**Special Provisions for Transport:** Not available.

**Section 15: Other Regulatory Information****Federal and State Regulations:**

Connecticut hazardous material survey.: Hexanes Illinois toxic substances disclosure to employee act: Hexanes Illinois chemical safety act: Hexanes New York release reporting list: Hexanes Rhode Island RTK hazardous substances: Hexanes Pennsylvania RTK: Hexanes Florida: Hexanes Minnesota: Hexanes Massachusetts RTK: Hexanes Massachusetts spill list: Hexanes New Jersey: Hexanes New Jersey spill list: Hexanes Louisiana spill reporting: Hexanes TSCA 8(b) inventory: Hexanes SARA 313 toxic chemical notification and release reporting: Hexanes CERCLA: Hazardous substances.: Hexanes: 5000 lbs. (2268 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:****WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

**DSCL (EEC):**

R11- Highly flammable. R20- Harmful by inhalation. R38- Irritating to skin. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. R62- Possible risk of impaired fertility. R65- Harmful: may cause lung damage if swallowed. R67- Vapors may cause drowsiness or dizziness. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S29- Do not empty into drains. S33- Take precautionary measures against static discharges. S36/37- Wear suitable protective clothing and gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets. S62- If swallowed, do not induce vomiting: seek medical advice immediately and show this

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** g

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves (impervious). Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

### Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:19 PM

**Last Updated:** 05/21/2013 12:00 PM

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## SAFETY DATA SHEET

Version 5.3  
Revision Date 01/02/2015  
Print Date 03/11/2015

---

**1. PRODUCT AND COMPANY IDENTIFICATION****1.1 Product identifiers**

Product name : Indeno[1,2,3-cd]pyrene  
Product Number : 48499  
Brand : Supelco  
CAS-No. : 193-39-5

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses : Laboratory chemicals, Manufacture of substances

**1.3 Details of the supplier of the safety data sheet**

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA  
Telephone : +1 800-325-5832  
Fax : +1 800-325-5052

**1.4 Emergency telephone number**

Emergency Phone # : (314) 776-6555

---

**2. HAZARDS IDENTIFICATION****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Carcinogenicity (Category 2), H351

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal word

Warning

Hazard statement(s)

H351

Suspected of causing cancer.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P281

Use personal protective equipment as required.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P405

Store locked up.

P501

Dispose of contents/ container to an approved waste disposal plant.

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none**

---

**3. COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substances**

Supelco - 48499

Formula : C<sub>22</sub>H<sub>12</sub>  
Molecular weight : 276.33 g/mol  
CAS-No. : 193-39-5  
EC-No. : 205-893-2

#### Hazardous components

Component	Classification	Concentration
<b>Indeno[1,2,3-cd]pyrene</b>		
	Carc. 2; H351	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

#### If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

#### In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

#### In case of eye contact

Flush eyes with water as a precaution.

#### If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed

No data available

---

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

#### Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### 5.2 Special hazards arising from the substance or mixture

Carbon oxides

### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information

No data available

---

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

### 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): Non Combustible Solids

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

#### Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

#### Personal protective equipment

##### Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

##### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

##### Body Protection

impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

##### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

##### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

- |  |                     |
|--|---------------------|
| a) Appearance                              | Form: solid         |
| b) Odour                                   | No data available   |
| c) Odour Threshold                         | No data available   |
| d) pH                                      | No data available   |
| e) Melting point/freezing point            | 163.6 °C (326.5 °F) |
| f) Initial boiling point and boiling range | 536.0 °C (996.8 °F) |

- |   |                   |
|---|-------------------|
| g) Flash point                                  | No data available |
| h) Evaporation rate                             | No data available |
| i) Flammability (solid, gas)                    | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure                              | No data available |
| l) Vapour density                               | No data available |
| m) Relative density                             | No data available |
| n) Water solubility                             | No data available |
| o) Partition coefficient: n-octanol/water       | No data available |
| p) Auto-ignition temperature                    | No data available |
| q) Decomposition temperature                    | No data available |
| r) Viscosity                                    | No data available |
| s) Explosive properties                         | No data available |
| t) Oxidizing properties                         | No data available |

## 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

No data available

**Serious eye damage/eye irritation**

No data available

**Respiratory or skin sensitisation**

No data available

**Germ cell mutagenicity**

No data available

**Carcinogenicity**

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene)

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**

No data available

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

---

**12. ECOLOGICAL INFORMATION****12.1 Toxicity**

No data available

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

No data available

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

#### Contaminated packaging

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

#### DOT (US)

Not dangerous goods

#### IMDG

Not dangerous goods

#### IATA

Not dangerous goods

---

## 15. REGULATORY INFORMATION

#### SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

#### SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

#### SARA 311/312 Hazards

Chronic Health Hazard

#### Massachusetts Right To Know Components

Indeno[1,2,3-cd]pyrene

CAS-No.  
193-39-5

Revision Date  
1993-04-24

#### Pennsylvania Right To Know Components

Indeno[1,2,3-cd]pyrene

CAS-No.  
193-39-5

Revision Date  
1993-04-24

#### New Jersey Right To Know Components

Indeno[1,2,3-cd]pyrene

CAS-No.  
193-39-5

Revision Date  
1993-04-24

#### California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

Indeno[1,2,3-cd]pyrene

CAS-No.  
193-39-5

Revision Date  
2007-09-28

---

## 16. OTHER INFORMATION

#### Full text of H-Statements referred to under sections 2 and 3.

Carc. Carcinogenicity  
H351 Suspected of causing cancer.

#### HMIS Rating

Health hazard: 0  
Chronic Health Hazard: \*  
Flammability: 0

Physical Hazard 0

**NFPA Rating**

Health hazard: 1

Fire Hazard: 0

Reactivity Hazard: 0

**Further information**

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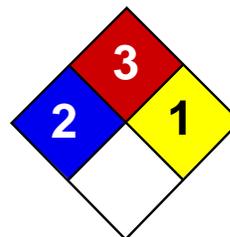
**Preparation Information**

Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 5.3

Revision Date: 01/02/2015

Print Date: 03/11/2015



Health	2
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet Cumene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Cumene

**Catalog Codes:** SLC3052

**CAS#:** 98-82-8

**RTECS:** GR8575000

**TSCA:** TSCA 8(b) inventory: Cumene

**CI#:** Not available.

**Synonym:** Isopropyl benzene; Cumol; 2-Phenyl propane; (1-Methylethyl)benzene

**Chemical Name:** Isopropylbenzene

**Chemical Formula:** C<sub>6</sub>H<sub>5</sub>CH(CH<sub>3</sub>)<sub>2</sub>

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Cumene	98-82-8	100

**Toxicological Data on Ingredients:** Cumene: ORAL (LD50): Acute: 1400 mg/kg [Rat]. 12750 mg/kg [Mouse]. DERMAL (LD50): Acute: 12300 mg/kg [Rabbit].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

Very hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 424°C (795.2°F)

**Flash Points:** CLOSED CUP: 36°C (96.8°F). OPEN CUP: 44°C (111.2°F).

**Flammable Limits:** LOWER: 0.9% UPPER: 6.5%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Flammable in presence of open flames and sparks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

### Storage:

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

### Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 50 CEIL: 75 (ppm) TWA: 245 CEIL: 365 (mg/m<sup>3</sup>) Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 120.2 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 152.4°C (306.3°F)

**Melting Point:** -96°C (-140.8°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 0.862 (Water = 1)

**Vapor Pressure:** 8 mm of Hg (@ 20°C)

**Vapor Density:** 4.14 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 1.2 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 3.7

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Very slightly soluble in cold water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

Acute oral toxicity (LD50): 1400 mg/kg [Rat]. Acute dermal toxicity (LD50): 12300 mg/kg [Rabbit].

**Chronic Effects on Humans:** The substance is toxic to lungs, the nervous system, mucous membranes.

**Other Toxic Effects on Humans:** Very hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** Class 3: Flammable liquid.

**Identification:** : Isopropylbenzene : UN1918 PG: III

## Section 15: Other Regulatory Information

### Federal and State Regulations:

Pennsylvania RTK: Cumene Massachusetts RTK: Cumene TSCA 8(b) inventory: Cumene SARA 313 toxic chemical notification and release reporting: Cumene CERCLA: Hazardous substances.: Cumene

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

### Other Classifications:

#### WHMIS (Canada):

CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).

#### DSCL (EEC):

R10- Flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes.

#### HMIS (U.S.A.):

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

#### National Fire Protection Association (U.S.A.):

**Health:** 2

**Flammability:** 3

**Reactivity:** 1

**Specific hazard:**

#### Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

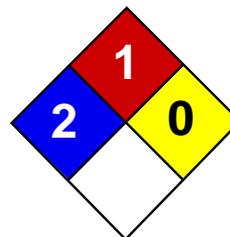
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/11/2005 11:43 AM

**Last Updated:** 05/21/2013 12:00 PM

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Health	2
Fire	1
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Copper MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Copper

**Catalog Codes:** SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

**CAS#:** 7440-50-8

**RTECS:** GL5325000

**TSCA:** TSCA 8(b) inventory: Copper

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Not available.

**Chemical Formula:** Cu

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Copper	7440-50-8	100

**Toxicological Data on Ingredients:** Copper LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:** Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:** Not available.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible.

**Storage:**

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:**

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 1 (mg/m<sup>3</sup>) from ACGIH [1990] Consult local authorities for acceptable exposure limits.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Solid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 63.54 g/mole

**Color:** Not available.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 2595°C (4703°F)

**Melting Point:** 1083°C (1981.4°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 8.94 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water.

**Section 10: Stability and Reactivity Data**

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:** The substance is toxic to lungs, mucous membranes.

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion. Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Human: passes through the placenta, excreted in maternal milk.

**Special Remarks on other Toxic Effects on Humans:** Not available.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Marine Pollutant

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

Pennsylvania RTK: Copper Massachusetts RTK: Copper TSCA 8(b) inventory: Copper CERCLA: Hazardous substances.: Copper

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):** CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):** R36- Irritating to eyes.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

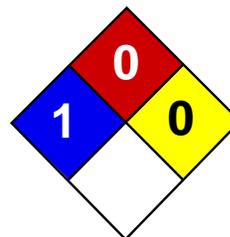
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 04:58 PM

**Last Updated:** 05/21/2013 12:00 PM

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Health	1
Fire	0
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Manganese MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Manganese

**Catalog Codes:** SLM2245

**CAS#:** 7439-96-5

**RTECS:** OO9275000

**TSCA:** TSCA 8(b) inventory: Manganese

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Manganese

**Chemical Formula:** Mn

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Manganese	7439-96-5	100

**Toxicological Data on Ingredients:** Manganese: ORAL (LD50): Acute: 9000 mg/kg [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, lungs, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:**

Moderate fire potential, in the form of dust or powder, when exposed to flame. When manganese is heated in the vapor of phosphorus at a very dull red heat, union occurs with incandescence. Concentrated nitric acid reacts with powdered manganese with incandescence and explosion. Powdered manganese ignites in chlorine.

**Special Remarks on Explosion Hazards:** Moderate explosion potential, in the form of dust or powder, when exposed to flame.

## Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, reducing agents.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 0.1 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] TWA: 5 (mg/m<sup>3</sup>) [Canada] TWA: 1 STEL: 3 (mg/m<sup>3</sup>) from NIOSH [United States] TWA: 5 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid.

**Odor:** Odorless.

**Taste:** Not available.

**Molecular Weight:** 54.94 g/mole

**Color:** Grayish white.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 2095°C (3803°F)

**Melting Point:** 1244°C (2271.2°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 7.44 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents, reducing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Superficially oxidized on exposure to air. Reacts with aqueous solutions of sodium or potassium bicarbonate. Reacts with dilute mineral acids with evolution of hydrogen and formation of divalent manganous salts. Reacts with fluorine and chlorine to produce di or tri fluoride, and di and tri chloride, respectively. In the form of powder, it reduces most metallic oxides on heating. On heating, it reacts directly with carbon, phosphorus, antimony, or arsenic. Also incompatible with hydroxides, cyanides, carbonates.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 9000 mg/kg [Rat].

**Chronic Effects on Humans:** May cause damage to the following organs: blood, lungs, brain, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of ingestion.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

Manganese can cross the placenta. May cause cancer (tumorigenic) based on animal data.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: May cause skin irritation Eyes: Dust may cause mechanical irritation. Inhalation: Dust may cause respiratory tract irritation. May cause "Metal Fume Fever" which may include flu-like symptoms (fever, chills, upset stomach, vomiting, weakness, headache, body aches, muscle pains, dry mouth and throat, coughing, tightness of the chest). May affect behavior/Central Nervous system (change in motor activity, torpor, nervousness, tremor, yawning, mood swings, irritability, restlessness, fatigue, headache, apathy, languor, insomnia than somnolence, hallucinations, delusions, uncontrollable laughter followed by crying, compulsions, aggressiveness, weakness in legs, memory loss, decreased libido, impotence, salivation, hearing loss, slow gait, ) and respiration (dyspnea, shallow respiration, cyanosis, alveolar inflammation). Ingestion: Repeated or prolonged exposure from ingestion may affect brain (degenerative changes), blood and metabolism. Ingestion: May cause digestive tract irritation. There is a low gastrointestinal absorption of manganese. Chronic Potential Health Effects: Inhalation: Repeated or prolonged exposure from inhalation may affect brain (degenerative changes), behavior/Central Nervous system with symptoms to acute exposure. May also affect liver (chronic liver disease, jaundice) Ingestion: Repeated or prolonged exposure from ingestion may affect brain, blood and metabolism

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

Illinois toxic substances disclosure to employee act: Manganese Rhode Island RTK hazardous substances: Manganese Pennsylvania RTK: Manganese Minnesota: Manganese Massachusetts RTK: Manganese New Jersey: Manganese New Jersey spill list: Manganese Louisiana spill reporting: Manganese California Director's List of Hazardous Substances: Manganese TSCA 8(b) inventory: Manganese SARA 313 toxic chemical notification and release reporting: Manganese

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** Not controlled under WHMIS (Canada).

**DSCL (EEC):** Not applicable.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

### Section 16: Other Information

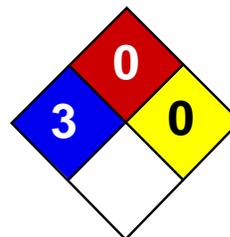
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 06:03 PM

**Last Updated:** 05/21/2013 12:00 PM

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Health	3
Fire	0
Reactivity	0
Personal Protection	

## Material Safety Data Sheet Mercury MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Mercury

**Catalog Codes:** SLM3505, SLM1363

**CAS#:** 7439-97-6

**RTECS:** OV4550000

**TSCA:** TSCA 8(b) inventory: Mercury

**CI#:** Not applicable.

**Synonym:** Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragryum

**Chemical Name:** Mercury

**Chemical Formula:** Hg

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Mercury	7439-97-6	100

**Toxicological Data on Ingredients:** Mercury LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

Hazardous in case of skin contact (permeator). **CARCINOGENIC EFFECTS:** Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

## Section 4: First Aid Measures

### **Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

### **Skin Contact:**

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

### **Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

### **Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

### **Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

### **Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

### **Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:** Not applicable.

### **Special Remarks on Fire Hazards:**

When thrown into mercury vapor, boron phosphodiiodide ignites at once. Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C. Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

### **Special Remarks on Explosion Hazards:**

A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY. Mercury and Ammonia can produce an

explosive compound. A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury. Methyl azide in the presence of mercury was shown to be potentially explosive.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 0.025 from ACGIH (TLV) [United States] SKIN TWA: 0.05 CEIL: 0.1 (mg/m<sup>3</sup>) from OSHA (PEL) [United States]  
Inhalation TWA: 0.025 (mg/m<sup>3</sup>) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid. (Heavy liquid)

**Odor:** Odorless.

**Taste:** Not available.

**Molecular Weight:** 200.59 g/mole

**Color:** Silver-white

**pH (1% soln/water):** Not available.

**Boiling Point:** 356.73°C (674.1°F)

**Melting Point:** -38.87°C (-38°F)

**Critical Temperature:** 1462°C (2663.6°F)

**Specific Gravity:** 13.55 (Water = 1)

**Vapor Pressure:** Not available.

**Vapor Density:** 6.93 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Very slightly soluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents, metals.

**Corrosivity:** Non-corrosive in presence of glass.

### Special Remarks on Reactivity:

Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously. A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonylnickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsilane, calcium,

### Special Remarks on Corrosivity:

The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalgam) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories. Special precautions: Mercury can attack copper and copper alloy materials.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

### Toxicity to Animals:

LD50: Not available. LC50: Not available.

### Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

### Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

May affect genetic material. May cause cancer based on animal data. Passes through the placental barrier in animal. May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

**Special Remarks on other Toxic Effects on Humans:**

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** Class 8: Corrosive material

**Identification:** : Mercury UNNA: 2809 PG: III

**Special Provisions for Transport:** Not available.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury Connecticut hazardous material survey.: Mercury Illinois toxic substances disclosure to employee act: Mercury Illinois chemical safety act: Mercury New York acutely hazardous substances: Mercury Rhode Island RTK hazardous substances: Mercury Pennsylvania RTK: Mercury Minnesota: Mercury Massachusetts RTK: Mercury New Jersey: Mercury New Jersey spill list: Mercury Louisiana spill reporting: Mercury California Director's List of Hazardous Substances.: Mercury TSCA 8(b) inventory: Mercury SARA 313 toxic chemical notification and release reporting: Mercury CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

**DSCL (EEC):**

R23- Toxic by inhalation. R33- Danger of cumulative effects. R38- Irritating to skin. R41- Risk of serious damage to eyes. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S2- Keep out of the

reach of children. S7- Keep container tightly closed. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

**HMIS (U.S.A.):**

**Health Hazard:** 3

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:**

**National Fire Protection Association (U.S.A.):**

**Health:** 3

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

## Section 16: Other Information

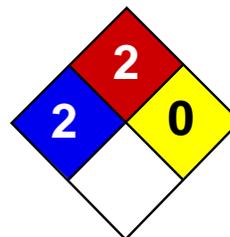
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:22 PM

**Last Updated:** 05/21/2013 12:00 PM

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Health	2
Fire	2
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Naphthalene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Naphthalene

**Catalog Codes:** SLN1789, SLN2401

**CAS#:** 91-20-3

**RTECS:** QJ0525000

**TSCA:** TSCA 8(b) inventory: Naphthalene

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Not available.

**Chemical Formula:** C<sub>10</sub>H<sub>8</sub>

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Naphthalene	91-20-3	100

**Toxicological Data on Ingredients:** Naphthalene: ORAL (LD50): Acute: 490 mg/kg [Rat]. 533 mg/kg [Mouse]. 1200 mg/kg [Guinea pig]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 170 ppm 4 hour(s) [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant, permeator). Severe over-exposure can result in death.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:** Not available.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

**Ingestion:**

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 567°C (1052.6°F)

**Flash Points:** CLOSED CUP: 88°C (190.4°F). OPEN CUP: 79°C (174.2°F).

**Flammable Limits:** LOWER: 0.9% UPPER: 5.9%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable solid. **SMALL FIRE:** Use DRY chemical powder. **LARGE FIRE:** Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

### Storage:

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

### Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

Israel: TWA: 10 (ppm) STEL: 15 (ppm) from ACGIH (TLV) [1995] TWA: 52 STEL: 79 (mg/m3) from ACGIH [1995]  
Australia: STEL: 15 (ppm) Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Crystalline solid.)

**Odor:** Aromatic.

**Taste:** Not available.

**Molecular Weight:** 128.19 g/mole

**Color:** White.

**pH (1% soln/water):** Not available.

**Boiling Point:** 218°C (424.4°F)

**Melting Point:** 80.2°C (176.4°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.162 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** 4.4 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 0.038 ppm

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:**

Partially dispersed in hot water, methanol, n-octanol. Very slightly dispersed in cold water. See solubility in methanol, n-octanol.

**Solubility:**

Partially soluble in methanol, n-octanol. Very slightly soluble in cold water, hot water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Highly reactive with oxidizing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** May attack some forms of rubber and plastic

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 490 mg/kg [Rat]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 170 ppm 4 hour(s) [Rat].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion. Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

### Section 12: Ecological Information

**Ecotoxicity:** Ecotoxicity in water (LC50): 305.2 ppm 96 hour(s) [Trout].

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** CLASS 4.1: Flammable solid.

**Identification:** : Naphthalene, refined : UN1334 PG: III

**Special Provisions for Transport:** Marine Pollutant

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

Rhode Island RTK hazardous substances: Naphthalene Pennsylvania RTK: Naphthalene Florida: Naphthalene Minnesota: Naphthalene Massachusetts RTK: Naphthalene TSCA 8(b) inventory: Naphthalene TSCA 8(a) PAIR: Naphthalene TSCA 8(d) H and S data reporting: Naphthalene: 06/01/87 SARA 313 toxic chemical notification and release reporting: Naphthalene: 1% CERCLA: Hazardous substances.: Naphthalene: 100 lbs. (45.36 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-4: Flammable solid. CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

**DSCL (EEC):**

R36- Irritating to eyes. R40- Possible risks of irreversible effects. R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed. R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation. R63- Possible risk of harm to the unborn child.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 2

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 2

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

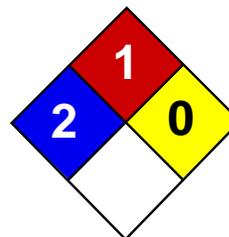
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/11/2005 01:30 PM

**Last Updated:** 05/21/2013 12:00 PM

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Health	2
Fire	1
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Phenanthrene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Phenanthrene

**Catalog Codes:** SLP1318

**CAS#:** 85-01-8

**RTECS:** SF7175000

**TSCA:** TSCA 8(b) inventory: Phenanthrene

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Not available.

**Chemical Formula:** C<sub>14</sub>H<sub>10</sub>

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Phenanthrene	85-01-8	100

**Toxicological Data on Ingredients:** Phenanthrene: ORAL (LD50): Acute: 700 mg/kg [Mouse].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** OPEN CUP: 171°C (339.8°F).

**Flammable Limits:** Not available.

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

### Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In

case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

**Storage:**

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:**

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:** Not available.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 178.22 g/mole

**Color:** Not available.

**pH (1% soln/water):** Not available.

**Boiling Point:** 340°C (644°F)

**Melting Point:** 101°C (213.8°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.179 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** 6.14 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Very slightly soluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

## Section 11: Toxicological Information

**Routes of Entry:** Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 700 mg/kg [Mouse].

**Chronic Effects on Humans:** Not available.

**Other Toxic Effects on Humans:**

Hazardous in case of skin contact (irritant, sensitizer), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

## Section 15: Other Regulatory Information

**Federal and State Regulations:** TSCA 8(b) inventory: Phenanthrene

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):** Not controlled under WHMIS (Canada).

**DSCL (EEC):**

R36/38- Irritating to eyes and skin. R43- May cause sensitization by skin contact.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 11:16 AM

**Last Updated:** 05/21/2013 12:00 PM

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## SAFETY DATA SHEET

Version 4.8  
Revision Date 02/28/2015  
Print Date 03/11/2015

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**1. PRODUCT AND COMPANY IDENTIFICATION****1.1 Product identifiers**

Product name : Pyrene

Product Number : 185515  
Brand : Aldrich

CAS-No. : 129-00-0

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses : Laboratory chemicals, Manufacture of substances

**1.3 Details of the supplier of the safety data sheet**

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052

**1.4 Emergency telephone number**

Emergency Phone # : (314) 776-6555

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**2. HAZARDS IDENTIFICATION****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal word : Warning

Hazard statement(s)  
H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P273

Avoid release to the environment.

P391

Collect spillage.

P501

Dispose of contents/ container to an approved waste disposal plant.

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS**

Rapidly absorbed through skin.

---

**3. COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substances**

Synonyms : Benzo[def]phenanthrene

Formula : C<sub>16</sub>H<sub>10</sub>  
Molecular weight : 202.25 g/mol  
CAS-No. : 129-00-0  
EC-No. : 204-927-3

#### Hazardous components

Component	Classification	Concentration
<b>Pyrene</b>	Aquatic Acute 1; Aquatic Chronic 1; H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

#### If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

#### In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

#### In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

#### If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed

No data available

---

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

#### Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### 5.2 Special hazards arising from the substance or mixture

Carbon oxides

### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information

No data available

---

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

## 6.4 Reference to other sections

For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): Non Combustible Solids

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Pyrene	129-00-0	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C See Appendix A		

#### Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Pyrene	129-00-0	1-Hydroxypyrene (1-HP)		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

### 8.2 Exposure controls

#### Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

## Personal protective equipment

### Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 480 min

Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 30 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

### Body Protection

impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

### Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

- |  |   |
|--|---|
| a) Appearance                              | Form: crystalline<br>Colour: yellow                     |
| b) Odour                                   | No data available                                       |
| c) Odour Threshold                         | No data available                                       |
| d) pH                                      | No data available                                       |
| e) Melting point/freezing point            | Melting point/range: 145 - 148 °C (293 - 298 °F) - lit. |
| f) Initial boiling point and boiling range | 390.0 - 395.0 °C (734.0 - 743.0 °F)                     |
| g) Flash point                             | > 200.0 °C (> 392.0 °F)                                 |
| h) Evaporation rate                        | No data available                                       |
| i) Flammability (solid, gas)               | No data available                                       |
| j) Upper/lower flammability or             | No data available                                       |

explosive limits

- |   |                        |
|---|------------------------|
| k) Vapour pressure                        | No data available      |
| l) Vapour density                         | No data available      |
| m) Relative density                       | 1.21 g/cm <sup>3</sup> |
| n) Water solubility                       | No data available      |
| o) Partition coefficient: n-octanol/water | log Pow: 4.88          |
| p) Auto-ignition temperature              | No data available      |
| q) Decomposition temperature              | No data available      |
| r) Viscosity                              | No data available      |
| s) Explosive properties                   | No data available      |
| t) Oxidizing properties                   | No data available      |

## 9.2 Other safety information

Bulk density	650 kg/m <sup>3</sup>
--------------	-----------------------

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## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

Other decomposition products - No data available  
In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD<sub>50</sub> Oral - Rat - 2,700 mg/kg

Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Conjunctive irritation.  
Behavioral:Excitement. Behavioral:Muscle contraction or spasticity.

LC<sub>50</sub> Inhalation - Rat - 170.0 mg/m<sup>3</sup>

Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Conjunctive irritation.  
Behavioral:Excitement. Behavioral:Muscle contraction or spasticity.

Dermal: No data available

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: Mild skin irritation - 24 h

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Mild eye irritation

**Respiratory or skin sensitisation**

No data available

**Germ cell mutagenicity**

Laboratory experiments have shown mutagenic effects.

**Carcinogenicity**

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Pyrene)

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: OSHA specifically regulated carcinogen (Pyrene)

**Reproductive toxicity**

No data available

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: UR2450000

Inhalation studies in animals have caused: Liver toxicity, pulmonary pathologies, intragastric pathologies, neutropenia, leukopenia, anemia, Contact with skin can cause: hyperemia, weight loss, hematopoietic changes, Dermatitis, Chronic effects, leukocytosis

Kidney -

---

**12. ECOLOGICAL INFORMATION****12.1 Toxicity**

Toxicity to fish LC50 - Oncorhynchus mykiss (rainbow trout) - > 2 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 0.002 - 0.003 mg/l - 48 h

**12.2 Persistence and degradability****12.3 Bioaccumulative potential**

Bioaccumulation other fish - 48 h  
- 0.056 mg/l

Bioconcentration factor (BCF): 4,810

**12.4 Mobility in soil**

No data available

## 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## 12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.  
Very toxic to aquatic life with long lasting effects.

Avoid release to the environment.

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

#### Contaminated packaging

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

UN number: 3077      Class: 9      Packing group: III  
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Pyrene)  
Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

### IMDG

UN number: 3077      Class: 9      Packing group: III      EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Pyrene)  
Marine pollutant:yes

### IATA

UN number: 3077      Class: 9      Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Pyrene)

### Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

### SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

### New Jersey Right To Know Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

### California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.  
Pyrene

CAS-No.  
129-00-0

Revision Date  
2007-09-28

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## 16. OTHER INFORMATION

### Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

### HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

### NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

### Further information

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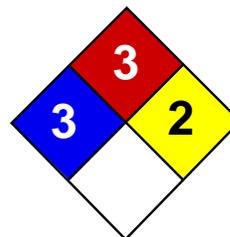
### Preparation Information

Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 4.8

Revision Date: 02/28/2015

Print Date: 03/11/2015



Health	3
Fire	3
Reactivity	2
Personal Protection	E

## Material Safety Data Sheet Sodium MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Sodium

**Catalog Codes:** SLS3505

**CAS#:** 7440-23-5

**RTECS:** VY0686000

**TSCA:** TSCA 8(b) inventory: Sodium

**CI#:** Not applicable.

**Synonym:** Natrium

**Chemical Name:** Sodium

**Chemical Formula:** Na

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Sodium	7440-23-5	100

**Toxicological Data on Ingredients:** Sodium LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (irritant), of eye contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

### Section 4: First Aid Measures

**Eye Contact:** Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 115°C (239°F)

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:**

Extremely flammable in presence of moisture. Highly flammable in presence of open flames and sparks, of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable solid. Moisture reactive material. SMALL FIRE: Obtain advice on use of water. Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Do not use water jet.

**Special Remarks on Fire Hazards:** When heated to decomposition it emits toxic fumes.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

### Section 7: Handling and Storage

**Precautions:**

Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, moisture.

**Storage:**

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:**

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:** Not available.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Solid. (Metal solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 22.99 g/mole

**Color:** Silvery.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 881.4°C (1618.5°F)

**Melting Point:** 97.8°C (208°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 0.97 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water.

**Section 10: Stability and Reactivity Data**

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:**

Highly reactive with oxidizing agents, acids, moisture. The product reacts violently with water to emit flammable but non toxic gases.

**Corrosivity:** Not available.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:** Not available.

**Other Toxic Effects on Humans:**

Very hazardous in case of skin contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Material is destructive to tissue of the mucous membranes and upper respiratory tract.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** CLASS 4.3: Material that emits flammable gases on contact with water.

**Identification:** : Sodium : UN1428 PG: I

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

### Federal and State Regulations:

Pennsylvania RTK: Sodium Massachusetts RTK: Sodium TSCA 8(b) inventory: Sodium CERCLA: Hazardous substances.: Sodium

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

### Other Classifications:

**WHMIS (Canada):** CLASS D-2B: Material causing other toxic effects (TOXIC).

### DSCL (EEC):

R17- Spontaneously flammable in air. R38- Irritating to skin. R41- Risk of serious damage to eyes.

### HMIS (U.S.A.):

**Health Hazard:** 3

**Fire Hazard:** 3

**Reactivity:** 2

**Personal Protection:** E

### National Fire Protection Association (U.S.A.):

**Health:** 3

**Flammability:** 3

**Reactivity:** 2

**Specific hazard:**

### Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

### References:

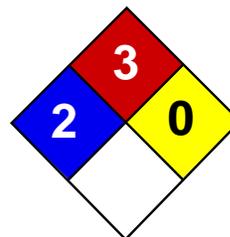
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 06:28 PM

**Last Updated:** 05/21/2013 12:00 PM

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet Toluene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Toluene

**Catalog Codes:** SLT2857, SLT3277

**CAS#:** 108-88-3

**RTECS:** XS5250000

**TSCA:** TSCA 8(b) inventory: Toluene

**CI#:** Not available.

**Synonym:** Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

**Chemical Name:** Toluene

**Chemical Formula:** C6-H5-CH3 or C7-H8

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Toluene	108-88-3	100

**Toxicological Data on Ingredients:** Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, the nervous system, liver, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 480°C (896°F)

**Flash Points:** CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

**Flammable Limits:** LOWER: 1.1% UPPER: 7.1%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:**

Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:**

Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide; concentrated nitric acid, sulfuric acid + nitric acid; N<sub>2</sub>O<sub>4</sub>; AgClO<sub>4</sub>; BrF<sub>3</sub>; Uranium hexafluoride; sulfur dichloride. Also forms an explosive mixture with tetranitromethane.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

**Section 7: Handling and Storage****Precautions:**

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

**Storage:**

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States] TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 100 STEL: 150 from NIOSH [United States] TWA: 375 STEL: 560 (mg/m<sup>3</sup>) from NIOSH [United States] Consult local authorities for acceptable exposure limits.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Liquid.

**Odor:** Sweet, pungent, Benzene-like.

**Taste:** Not available.

**Molecular Weight:** 92.14 g/mole

**Color:** Colorless.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 110.6°C (231.1°F)

**Melting Point:** -95°C (-139°F)

**Critical Temperature:** 318.6°C (605.5°F)

**Specific Gravity:** 0.8636 (Water = 1)

**Vapor Pressure:** 3.8 kPa (@ 25°C)

**Vapor Density:** 3.1 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 1.6 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil;  $\log(\text{oil/water}) = 2.7$

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether, acetone.

**Solubility:**

Soluble in diethyl ether, acetone. Practically insoluble in cold water. Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide. Solubility in water: 0.561 g/l @ 25 deg. C.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources (flames, sparks, static), incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride. Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C. Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 636 mg/kg [Rat]. Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

**Special Remarks on Chronic Effects on Humans:**

Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin. Eyes: Causes mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abrasions. This usually resolves in 2 days. Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia, ), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite. Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation. Chronic Potential Health Effects: Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophosphatemia), severe, muscle weakness and Rhabdomyolysis. Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

## Section 12: Ecological Information

### Ecotoxicity:

Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

**BOD5 and COD:** Not available.

### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Toluene UNNA: 1294 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Toluene California prop. 65 (no significant risk level): Toluene: 7 mg/day (value) California prop. 65 (acceptable daily intake level): Toluene: 7 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Toluene Connecticut hazardous material survey.: Toluene Illinois

toxic substances disclosure to employee act: Toluene Illinois chemical safety act: Toluene New York release reporting list: Toluene Rhode Island RTK hazardous substances: Toluene Pennsylvania RTK: Toluene Florida: Toluene Minnesota: Toluene Michigan critical material: Toluene Massachusetts RTK: Toluene Massachusetts spill list: Toluene New Jersey: Toluene New Jersey spill list: Toluene Louisiana spill reporting: Toluene California Director's List of Hazardous Substances.: Toluene TSCA 8(b) inventory: Toluene TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92 SARA 313 toxic chemical notification and release reporting: Toluene CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S29- Do not empty into drains. S33- Take precautionary measures against static discharges.

**HMS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

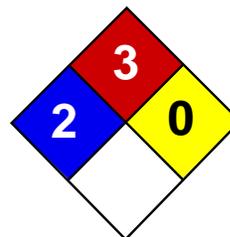
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:30 PM

**Last Updated:** 05/21/2013 12:00 PM

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet Xylenes MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Xylenes

**Catalog Codes:** SLX1075, SLX1129, SLX1042, SLX1096

**CAS#:** 1330-20-7

**RTECS:** ZE2100000

**TSCA:** TSCA 8(b) inventory: Xylenes

**CI#:** Not available.

**Synonym:** Xylenes; Dimethylbenzene; xylol; methyltoluene

**Chemical Name:** Xylenes (o-, m-, p- isomers)

**Chemical Formula:** C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Xylenes	1330-20-7	100

**Toxicological Data on Ingredients:** Xylenes: ORAL (LD50): Acute: 4300 mg/kg [Rat]. 2119 mg/kg [Mouse]. DERMAL (LD50): Acute: >1700 mg/kg [Rabbit].

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 464°C (867.2°F)

**Flash Points:** CLOSED CUP: 24°C (75.2°F). (Tagliabue.) OPEN CUP: 37.8°C (100°F).

**Flammable Limits:** LOWER: 1% UPPER: 7%

**Products of Combustion:** These products are carbon oxides (CO, CO2).

**Fire Hazards in Presence of Various Substances:**

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of heat.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:** Vapors may travel to source of ignition and flash back.

**Special Remarks on Explosion Hazards:**

Vapors may form explosive mixtures with air. Containers may explode when heated. May polymerize explosively when heated. An attempt to chlorinate xylene with 1,3-Dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin) caused a violent explosion

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined

areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

### Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

### Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 100 (ppm) [Canada] TWA: 435 (mg/m<sup>3</sup>) [Canada] TWA: 434 STEL: 651 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States]  
TWA: 100 STEL: 150 (ppm) from ACGIH (TLV) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Sweetish.

**Taste:** Not available.

**Molecular Weight:** 106.17 g/mole

**Color:** Colorless. Clear

**pH (1% soln/water):** Not available.

**Boiling Point:** 138.5°C (281.3°F)

**Melting Point:** -47.4°C (-53.3°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 0.864 (Water = 1)

**Vapor Pressure:** 0.9 kPa (@ 20°C)

**Vapor Density:** 3.7 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 1 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil;  $\log(\text{oil/water}) = 3.1$

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:**

Insoluble in cold water, hot water. Miscible with absolute alcohol, ether, and many other organic liquids.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources, incompatibles

**Incompatibility with various substances:** Reactive with oxidizing agents, acids.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Store away from acetic acid, nitric acid, chlorine, bromine, and fluorine.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2119 mg/kg [Mouse]. Acute dermal toxicity (LD50): >1700 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5000 4 hours [Rat].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS).

**Other Toxic Effects on Humans:** Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:**

Lowest Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Man] - Route: Oral; Dose: 10000 ppm/6H

**Special Remarks on Chronic Effects on Humans:**

Detected in maternal milk in human. Passes through the placental barrier in animal. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects (male and female fertility (spontaneous abortion and fetotoxicity)) and birth defects based animal data.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes skin irritation. Can be absorbed through skin. Eyes: Causes eye irritation. Inhalation: Vapor causes respiratory tract and mucous membrane irritation. May affect central nervous system and behavior (General anesthetic/CNS depressant with effects including headache, weakness, memory loss, irritability, dizziness, giddiness, loss of coordination and judgement, respiratory depression/arrest or difficulty breathing, loss of appetite, nausea, vomiting, shivering, and possible coma and death). May also affect blood, sense organs, liver, and peripheral nerves. Ingestion: May cause gastrointestinal irritation including abdominal pain, vomiting, and nausea. May also affect liver and urinary system/kidneys. May cause effects similar to those of acute inhalation. Chronic Potential Health Effects: Chronic inhalation may affect the urinary system (kidneys) blood (anemia), bone marrow (hyperplasia of bone marrow) brain/behavior/Central Nervous system. Chronic inhalation may also cause mucosal bleeding. Chronic ingestion may affect the liver and metabolism (loss of appetite) and may affect urinary system (kidney damage)

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification :** Xylenes UNNA: 1307 PG: III

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

Connecticut hazardous material survey.: Xylenes Illinois chemical safety act: Xylenes New York acutely hazardous substances: Xylenes Rhode Island RTK hazardous substances: Xylenes Pennsylvania RTK: Xylenes Minnesota: Xylenes Michigan critical material: Xylenes Massachusetts RTK: Xylenes Massachusetts spill list: Xylenes New Jersey: Xylenes New Jersey spill list: Xylenes Louisiana spill reporting: Xylenes California Director's List of Hazardous Substances: Xylenes TSCA 8(b) inventory: Xylenes SARA 302/304/311/312 hazardous chemicals: Xylenes SARA 313 toxic chemical notification and release reporting: Xylenes CERCLA: Hazardous substances.: Xylenes: 100 lbs. (45.36 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R10- Flammable. R21- Harmful in contact with skin. R36/38- Irritating to eyes and skin. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves. S46- If swallowed, seek medical advice immediately and show this container or label.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

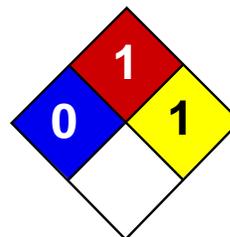
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/11/2005 12:54 PM

**Last Updated:** 05/21/2013 12:00 PM

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Health	1
Fire	1
Reactivity	1
Personal Protection	E

## Material Safety Data Sheet Zinc Metal MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Zinc Metal

**Catalog Codes:** SLZ1054, SLZ1159, SLZ1267, SLZ1099, SLZ1204

**CAS#:** 7440-66-6

**RTECS:** ZG8600000

**TSCA:** TSCA 8(b) inventory: Zinc Metal

**CI#:** Not applicable.

**Synonym:** Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips

**Chemical Name:** Zinc Metal

**Chemical Formula:** Zn

**Contact Information:**

**Sciencelab.com, Inc.**  
14025 Smith Rd.  
Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Zinc Metal	7440-66-6	100

**Toxicological Data on Ingredients:** Zinc Metal LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 480°C (896°F)

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:**

Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials, of acids, of alkalis, of moisture. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:**

Zinc + NaOH causes ignition. Oxidation of zinc by potassium proceeds with incandescence. Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper. Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined. When hydrazine mononitrate is heated in contact with zinc, a flaming decomposition occurs at temperatures a little above its melting point. Contact with acids and alkali hydroxides (sodium hydroxide, potassium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas. Zinc foil ignites if traces of moisture are present. It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or moist air.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

## Section 7: Handling and Storage

### Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

### Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:** Not available.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Lustrous solid. Metal solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 65.39 g/mole

**Color:** Bluish-grey

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 907°C (1664.6°F)

**Melting Point:** 419°C (786.2°F)

**Critical Temperature:** Not available.

**Specific Gravity:** Not available.

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Excess heat, incompatible materials, moisture

**Incompatibility with various substances:**

Reactive with oxidizing agents, acids, alkalis. Slightly reactive to reactive with moisture. The product may react violently with water to emit flammable but non toxic gases.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Incompatible with acids, halogenated hydrocarbons,  $\text{NH}_4\text{NO}_3$ , barium oxide,  $\text{Ba}(\text{NO}_3)_2$ , Cadmium,  $\text{CS}_2$ , chlorates,  $\text{Cl}_2$ ,  $\text{CrO}_3$ ,  $\text{F}_2$ , Hydroxylamine,  $\text{Pb}(\text{N}_3)_2$ ,  $\text{MnCl}_2$ ,  $\text{HNO}_3$ , performic acid,  $\text{KClO}_3$ ,  $\text{KNO}_3$ ,  $\text{N}_2\text{O}_2$ , Selenium,  $\text{NaClO}_3$ ,  $\text{Na}_2\text{O}_2$ , Sulfur, Te, water,  $(\text{NH}_4)_2\text{S}$ ,  $\text{As}_2\text{O}_3$ ,  $\text{CS}_2$ ,  $\text{CaCl}_2$ , chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide,  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ ,  $(\text{Mg} + \text{Ba}(\text{NO}_3)_2 + \text{BaO}_2)$ , (ethyl acetoacetate +tribromoneopentyl alcohol. Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen. Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide. May react with water.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:** Not available.

**Other Toxic Effects on Humans:** Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: May cause skin irritation. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss. Eyes: May cause eye irritation. Ingestion: May be harmful if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills. May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizziness, irritability, muscular stiffness, and pain. May also affect blood. Inhalation: Inhalation of zinc dust or fumes may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis. The toxicological properties of this substance have not been fully investisgated.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** Not available.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

New York release reporting list: Zinc Metal Rhode Island RTK hazardous substances: Zinc Metal Pennsylvania RTK: Zinc Metal Florida: Zinc Metal Michigan critical material: Zinc Metal Massachusetts RTK: Zinc Metal New Jersey: Zinc Metal California Director's List of Hazardous Substances: Zinc Metal TSCA 8(b) inventory: Zinc Metal TSCA 12(b) one time export: Zinc Metal SARA 313 toxic chemical notification and release reporting: Zinc Metal CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)

**Other Regulations:** EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** Not Available

**DSCL (EEC):**

R15- Contact with water liberates extremely flammable gases. R17- Spontaneously flammable in air. S7/8- Keep container tightly closed and dry.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 1

**Reactivity:** 1

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 0

**Flammability:** 1

**Reactivity:** 1

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

### Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 12:18 AM

**Last Updated:** 05/21/2013 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*



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**Attachment F**  
**Confined Space Entry Checklist/ Permit**

**NON-PERMIT REQUIRED CONFINED SPACE  
PRE-ENTRY/ENTRY CHECK LIST**

Date and Time:  
 Issued By:  
 Job Site:  
 Work to Be Performed:

Date and Time Expire:  
 Excavation Number:  
 Job Supervisor:  
 Work to Be Performed:

Pre-Entry (See Safety Procedures)

1. Atmospheric Checks: Time:  
 Oxygen: %  
 Explosive: % LEL

1. Entry, standby, and backup persons  
 Successfully completed required training? Yes No  
 Is it current? ( ) ( )  
 ( ) ( )

2. Source Isolation (No Entry): N/A Yes No

Pumps or lines blinded,  
 disconnected or blocked ( ) ( )

3. Equipment: N/A Yes No

Direct reading gas monitor-tested ( ) ( ) ( )

Safety harnesses and life-lines for entry  
 and standby persons? ( ) ( ) ( )

3. Ventilation Modification N/A Yes No

Mechanical ( ) ( ) ( )

Hoisting Equipment? ( ) ( ) ( )

Natural Ventilation Only ( ) ( ) ( )

Powered Communications? ( ) ( ) ( )

SCBAs for Entry and Standby Persons? ( ) ( ) ( )

Protective Clothing? ( ) ( ) ( )

4. Atmospheric check after isolation and ventilation

Oxygen \_\_\_\_\_ % > 19.5%  
 Explosive \_\_\_\_\_ % LEL < 10%  
 Toxic \_\_\_\_\_ PPM < 10 PPM H<sub>2</sub>S  
 Time \_\_\_\_\_

5. Rescue Procedure: \_\_\_\_\_

If conditions are in compliance with the above requirements and there is no reason to believe conditions may change adversely, then proceed to the Permit Space Pre-entry Check List. Complete and post with this permit. If conditions are not in compliance with the above requirements or there is reason to believe that conditions may change adversely, proceed to the Entry Check List portion of this permit.

We have reviewed the work authorized by this permit and the information contained here-in. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the "No" column. This permit is not valid unless all appropriate items are completed.

Permit and Check List Prepared By: \_\_\_\_\_

Approved By: \_\_\_\_\_

Reviewed By: \_\_\_\_\_  
(Signature)

A copy of this Pre-Entry Check List must be retained in a bound notebook for each excavation.

If during the work hazardous atmospherics develop in the space, the work must be immediately terminated.

## CONFINED SPACE ENTRY PERMIT

\_\_\_\_\_ Confined Space      \_\_\_\_\_ Hazardous Area      \_\_\_\_\_ Non Permit Required

Note: No work will be performed unless the space meets non permit requirements  
 Permit valid for 8 hours only. All copies of permit will remain at this job site until job is completed.

Site location and description \_\_\_\_\_

Purpose of Entry \_\_\_\_\_

Supervisor(s) in charge of crews \_\_\_\_\_

Type of Crew \_\_\_\_\_ Phone # \_\_\_\_\_

\*Bold denotes minimum requirements to be completed and reviewed prior to entry\*

Requirements Completed	Date	Time	Requirements Completed	Date	Time
<b>Lock Out/De-energize/try-out</b>	_____	_____	<b>Full Body Harness w/"D" Ring</b>	_____	_____
<b>Line(s) Broken-capped-blanked</b>	_____	_____	<b>Emergency Escape Retrieval</b>	_____	_____
<b>Purge-Flush and Vent</b>	_____	_____	<b>Lifelines</b>	_____	_____
<b>Ventilation</b>	_____	_____	Fire Extinguishers	_____	_____
<b>Secure Area (Post and Flag)</b>	_____	_____	Lighting (Explosive Proof)	_____	_____
<b>Breathing Apparatus</b>	_____	_____	Protective Clothing	_____	_____
<b>Resuscitator-Inhalator</b>	_____	_____	Respirator(s) (Air Purifying)	_____	_____
<b>Standby Safety Personnel</b>	_____	_____	Burning and Welding Permit	_____	_____

Note: Items that do not apply enter N/A in the blank.

\*\* Record Continuous Monitoring Results Every 2 Hours.

Continuous	Permissible	Monitoring Results
Percent of Oxygen	19.5% to 23.5%	
Lower Flammable Limit	Under 10%	
Hydrogen Sulfide	+ 10 PPM * 15	

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- \* Short-term exposure time: Employee can work in the area up to 15 minutes.
- + 8 hour time - Weighted average: Employee can work in area 8 hours (longer with appropriate respiratory protection).
- \*\* Record continuous monitoring results every 30 minutes starting ½ hour prior to beginning work.

REMARKS:

Gas Tester Name & Check #	Instrument(s) Used	Model &/or Type	Serial &/or Unit #
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Safety standby person is required for all confined space work

Safety standby person(s)	Check #	Name of Safety Standby Person(s)	Check #
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Supervisor Authorizing Entry \_\_\_\_\_

All Above Conditions Satisfied \_\_\_\_\_

Emergency number posted in job trailer \_\_\_\_\_

Note: A single entry permit can be filled out prior to start of daily work.



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**Attachment G**  
**Emergency Telephone Numbers**  
**Hospital Information**  
**Field Accident Report**

## EMERGENCY INFORMATION

Emergency telephone numbers and routes to the nearest hospital with an emergency capacity are as follows:

General Emergencies:	911
NYPD	911
FDNY:	911
First Responder Medical Care:	911
National Response Center	1-800-424-8802
NYC Regional Poison Control Center	1-800-222-1222
Project Manager	1-631-787-3400 or 1-631-316-4892
Site Safety Officer	1-631-787-3400 or 1-631-697-4754
Alternate Health and Safety Officer	1-631-787-3400

For Non-Emergency Care – (Emergencies must call 911)

Nearest Hospital: The Brooklyn Hospital Center  
121 Dekalb Avenue  
Brooklyn, New York 11201  
1-718-250-8000

**Directions to The Brooklyn Hospital Center (Approximately 4 miles from the site):**

**Head southeast of McGuinness Boulevard toward Calyer Street. In 0.7 mile, merge onto I-278W / Brooklyn Queens Expressway W. In 1.4 miles, take exit 31 toward Wythe Avenue / Kent Avenue. After 0.2 mile, merge onto Williamsburg Street W and proceed for 0.3 mile, then turn right onto Flushing Avenue. In 0.3 mile, turn left onto Washington Avenue. In 0.6 mile, turn right onto Dekalb avenue, and the hospital will be on the right in approximately 0.6 mile.**

**A map showing the route to the nearest hospital is provided in Attachment A, Figure 2.**

VHB Engineering Surveying and Landscape Architecture, P.C.

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