# FORMER
# CONSOLIDATED FREIGHTWAYS TERMINAL
**11 WEST STREET, BROOKLYN, NEW YORK**
**Block 2570 Lot 1**

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# REMEDIAL INVESTIGATION WORK PLAN

November 2014

*Prepared for:*
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## CERTIFICATION

I, Charles B. Sosik, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Name

11/17/14
Date

# 1.0 INTRODUCTION

This Remedial Investigation Work Plan (RIWP) was prepared on behalf of M&H Realty LLC for the property located at 11 West Street, Brooklyn, New York. An application for acceptance into the New York State Brownfield Cleanup Program (BCP) is being submitted with this RIWP.

The Site has confirmed contamination in soil and groundwater which is related to historic on-site fueling operations, truck maintenance / repair and foundry / iron works. A Remedial Investigation performed at the Site under the New York City E-Designation Program, identified elevated levels of SVOCs in soil at concentrations above restricted residential soil cleanup objectives (SCOs), VOCs above unrestricted use SCOs, heavy metals above unrestricted or restricted residential SCOs and PCB 1260 above restricted residential SCOs.

The purpose of this Remedial Investigation Work Plan is to collect data of sufficient quality and quantity to characterize the nature and extent of contamination in on-site soil, groundwater and soil gas, to complete a qualitative exposure assessment for future occupants of the proposed building and the surrounding community and to evaluate alternatives to remediate the contamination.

The overall objectives of the project are to prepare the site for residential use and to remediate known and unknown environmental conditions at the site to the satisfaction of the DEC and the New York State Department of Health (NYSDOH).

## 1.1 Site Location and Description

The street address for the subject site is 11 West Street, Brooklyn, NY (**Figure 1**). The subject property is located in the City of New York and Borough of Brooklyn (Kings County). The subject site is listed as Block 2570, Lot 1 by the New York City Deptarment of Finance. The lot is located on the west side of West Street between Quay and Oak Streets. The lot consists of 480 feet of street frontage on West Street, 400 feet of frontage on the East River and is approximately 750 feet deep for a total area of 213,000 square feet (4.88 acres).The property is currently developed with three buildings: a 90 ft x 530 ft single story raised platform, two-sided loading dock and storage building, a 50 ft x 70 ft two story building formerly used for truck maintenance which includes a cellar utilized for the boiler and electrical rooms and a 25 ft x 50 ft building formerly used for truck repair/maintenance. The remainder of the property is an open lot. (**Figure 2**).

According to the deed and the Automated City Registration Information System (ACRIS) website, the current owner of the lot is M&H Realty LLC.

The area surrounding the property is highly urbanized and predominantly consists of commercial, industrial and residential buildings with mixed-use buildings (residential w/ first floor retail) along main corridors / thoroughfares.

The elevation of the Site is from 9 feet to 1 foot above the National Geodetic Vertical Datum (NGVD). The area topography gradually slopes to the east. Groundwater at the Site is present under water table conditions at a depth of approximately 5-15 feet below grade. Based on Site

specific references, the predominant groundwater flow direction is expected to be west toward the East River, though flow will likely reverse up to 400 feet inland during periods of high tide.

## 1.2 Redevelopment Plans

Redevelopment plans for the property include 4 new mixed-use tower-base buildings. The towers will range from 10 to 40-stories while the base structures will range from 4 to 6 stories. The project includes 50,000 square feet (sf) of commercial (retail) space, 330,000 sf of affordable housing and 1.28 million sf of market-rate apartments. The project will feature a water-front park with public access through walkways extending to West Street.

The buildings will cover approximately 50% of the lot, leaving the remainder of the space for the water-front park, recreation areas, walkways and building grounds. Excavation will be required for the building foundations and to remove contaminated soil. Soil will also need to be imported to the site to raise the grade approximately two-feet across the Site.

## 1.3 Site History

The environmental history of the Site was previously investigated by EBC in February 2014 as part of a Phase I Site Assessment Screening.

According to a review of NYC records, City Directory Listings and historic Sanborn maps, as well as personal interviews, the Site was developed prior to 1887 as a shipyard and iron works known as Samuel Sneden & Company and its successor Continental Iron Works. The company built iron water pipes, boilers, iron ferryboats / steamboats and ironclad warships for the US Navy during the Civil War. Following the decline of shipbuilding following the war, the company focused on building marine boilers and iron components for gas works.

The Site continued to be occupied by the Continental Iron Works through 1916. It appears that the property was vacated sometime between 1916 and 1922 and remained vacant till 1942 when the southeast corner was used by a lumber yard. Sometime between 1942 and 1951 the lumber yard was replaced by a machine shop and welding company which occupied a greater portion of the property. By 1965 the existing buildings were constructed and occupied by Associated Transport. Auto repair shops are identified in the east and west end of the building with a fueling station shown on the north side of the building. Associated Trucking was replaced by Consolidated Freightways in 1978 and continued until the company filed for bankruptcy in 2002.

## 1.4 Summary of Previous Investigations

Environmental investigations performed at the Site include the following:

- Phase I Environmental Site Assessment Screening- EBC (February 2014)
- NYCOER Remedial Investigation Preliminary Data Summary - EBC (March 2014)

A summary of the investigations performed is provided in the following sections.

### *1.4.1 February 2014 – Phase I Environmental Site Assessment Screening (EBC)*

According to NYSDEC petroleum bulk storage (PBS) records 21 tanks (17 underground storage tanks and 4 above-ground storage tanks) were registered to the property. With one exception, all of the tanks were closed - removed by 1992. The remaining tank, a 2,000 gallon underground fuel oil tank, was closed in place in 1999. The location of this tank is unknown but expected to be in close proximity to the building.

At the time of the Phase I inspection the northern half of the building and grounds was occupied by One Stop L.I.C. a property management company which leases parking space and indoor commercial storage space to multiple tenants. The southern half of the building and ground was occupied by a Tri-State Lumber and Building supply for storage and sale of building materials.

Based upon reconnaissance of the Site and surrounding properties, interviews and review of historical records and regulatory agency databases, EBC noted the following recognized environmental conditions for the Site.

- The use of the Site as a freight terminal and trucking facility for more than 37 years.
- The historic presence of 17 underground storage tanks for gasoline, diesel and fuel oil and the absence of documentation regarding the tank removals.
- The historic presence of a fueling station as shown in Sanborn maps from 1965 on.
- The use of the Site by a machine shop and welding facility.
- The historic use of the Site as an iron works.
- The historic presence of a foundry at the Site.

### *1.4.2 March 2014 - Preliminary RI Data Summary (EBC)*

The remedial investigation was performed from March 5-11, 2014 in accordance with the Remedial Investigation Work Plan approved by the NYCOER as part of the E-designation review process. The investigation included the installation of 20 soil borings and 8 temporary monitoring wells.

Soil samples were analyzed for one or more of the following:

- VOCs
- SVOCs
- Metals
- Pesticides
- PCBs

Groundwater samples were analyzed for VOCs and SVOCs only.

The results of the RI identified elevated levels of SVOCs in soil at concentrations above restricted residential soil cleanup objectives (SCOs). In many cases the detection limit for VOCs was above the SCO due to interference from the SVOCs and other unknown parameters.

Metals including arsenic, barium, cadmium, copper, chromium, lead, mercury, nickel and zinc were reported above unrestricted or restricted residential SCOs in many of the borings. PCB 1260 was reported above restricted residential SCOs in one boring at a depth of 5-7 feet. It was not reported in the shallow sample.

Groundwater was encountered at a depth of approximately 5-10 feet below grade. Petroleum VOCs including n-propylbenzene and isopropylbenzene were reported at concentrations slightly above groundwater standards in one sample.

The elevated levels of SVOCs found within the former fueling station area are related to a release of diesel fuel from the UST system. The extent of the contamination has not been determined. The distribution, type and concentration of metals contamination is inconsistent with historic fill and is likely related to shipbuilding and foundry operations in which foundry castings sand, shavings, ash and slag were likely deposited on the site. Metals including arsenic, cadmium, chromium, lead, mercury and zinc are known to be associated with iron works.

## 1.5 Site Geology / Hydrogeology

Subsurface soils at the Site consists of a mixture of a fill materials consisting of bricks and other rubble in a silty-soil matrix. The thickness of the fill ranges from 5 to more than 10 feet. Below the fill material is a silty-sand. Groundwater is present under water table conditions at a depth of approximately 5-8 feet below the surface and is expected to flow west (**Figure 3**) though flow will likely reverse up to 400 feet inland during periods of high tide. .

According to the USGS topographic map for the area (Brooklyn Quadrangle), the elevation of the Site varies from 9 feet to 1 foot above the National Geodetic Vertical Datum (NGVD). The area topography gradually slopes to the west toward the East River.

## 1.6 Site Conceptual Model

Known SVOC contamination at the Site is related to the former fuel dispensing area located in the north-central area of the Site. According to the PBS database 21 tanks are listed at the property under the name P. Chimento Trucking Inc. (PBS No. 2-032816). The database lists 17 underground storage tanks and 4 aboveground storage tanks including (10) 550 gallon underground diesel tanks, (4) 550 gallon underground gasoline tanks, (2) 2,000 gallon underground fuel oil tanks, (4) 275 gallon aboveground tanks (unspecified) and (1) 5,000 gallon underground fuel oil tank. All of the tanks, with the exception of one 2,000 gallon fuel oil tank, are listed as closed - removed. The remaining 2,000 gallon tank is listed as administratively closed. The majority of the tanks were closed in 1992. Installation dates are unknown.

It is not known where all of the tanks were located but it is likely that the majority were located in the fuel dispensing area. Leaks at the tanks and / or dispensers have occurred in this area and migrated to the shallow water table approximately 8 feet below the surface. Free phase fuel could then rise and fall with daily, monthly and seasonal water table fluctuations potentially resulting in a vertical "smear zone" of contaminated soil. Components would then dissolve into an aqueous phase and migrate with groundwater flow towards the River. Due to the proximity of the

tank area to the River, a flow reversal to some degree would be expected to occur during high tide, creating further spreading of residual contamination in the upgradient direction.

The metals contamination is likely related to shipbuilding and foundry operations in which foundry castings sand, shavings, ash and slag were likely deposited on the site. Metals including arsenic, cadmium, chromium lead, mercury and zinc are known to be associated with iron works. The release scenario in this case would include dumping and spreading of foundry materials / waste at the site. Whether this would have been done in specific areas or evenly across the entire site is unknown but it is likely it would have been deposited in low areas with poor drainage and to generally raise the elevation of the site. Based on previous sampling at the site, heavy metals are limited to shallow soils in some areas and in others to depths of 10 feet suggesting that both deposition scenarios occurred.

This conceptual model will be refined and updated based upon finding of the Remedial Investigation.

# 2.0 SAMPLING AND ANALYIS PLAN

The purpose of this work plan will be to determine the nature and extent of the on-site contamination and identify all sources of contamination (horizontal/vertical) that may be present at the Site. The investigation must produce data of sufficient quality and quantity to allow NYSDEC and NYSDOH to complete a Significant Threat Determination as per Part 375-2.7 and enable the performance of a qualitative human health exposure assessment as per DER-10, 3.3(c) 4.

The investigation will consist of the following elements:

- A geophysical survey to identify the location of the 2,000 gallon tank abandoned in place in 1992 and to identify the location of any additional tanks that may be present.

- Installation of 14 soil borings across the site to delineate the extent of soil impact and to obtain additional information on soil quality with respect to Soil Cleanup Objective (SCOs);

- Installation of 10 additional monitoring wells and collection of groundwater samples from the 10 new and 9 existing monitoring wells to delineate groundwater impacts and assess groundwater quality; and

- Installation of 10 soil gas implants and 4 subslab vapor sampling points to assess vapor phase VOCs.

## 2.1 Soil Sampling

### *2.1.1 Soil Borings*

Fourteen soil borings (B23 through B36) will be advanced across the Site. At all boring locations soil samples will be collected continuously in 5-foot intervals using a Geoprobe™ dual-tube sampling system. The Geoprobe™ uses a direct push hydraulic percussion system to drive and retrieve core samplers. A track-mounted Geoprobe™ model 6620DT will be utilized.

At each boring location sampling will continue to a minimum depth of 15 feet below grade. Collected soil samples will be characterized by an experienced environmental professional (EP) and field screened for the presence of volatile organic compounds (VOCs) using a photo-ionization detector (PID). The EP will record all observations in a bound project dedicated field book which will be used to prepare a boring log for each soil boring location. Recorded observations will include sample depth, sample recovery, soil type evidence of water (if encountered), PID reading and physical evidence of contamination (odor, staining, sheen, etc.).

Retained samples from the borings will be as follows:

B23-B27: FUELING AREA DELINEATION BORINGS
All borings (WT Interface, 13-15 ft) - VOCs / SVOCs
B23, B25 (0-2ft, 5-7 ft) pesticides / PCBs, metals

B28-B31: FOUNDRY AREA BORINGS
All borings (0-2 ft, 5-7 ft) - metals
B28, B30 (0-2 ft, 5-7 ft) - VOCs, SVOCs, pesticides/PCBs

B32-B34: LOADING DOCK BORINGS
All borings (5-7 ft, WT) - VOCs, SVOCs
All borings (5-7 ft), pesticides/PCBs, metals

B35-B36: SOUTH LOADING DOCK BORINGS
All borings (0-2 ft, WT) - VOCs, SVOCs, pesticides/PCBs, metals

If contaminated soils are encountered additional samples will be retained from the interval and section of the core with the highest PID reading, if it is not the same interval as one of the planned samples.

A sample matrix showing the number, type and analysis of samples collected during the Remedial Investigation is provided as **Table 1**. The proposed location of the soil borings is shown on **Figure 4**.

## 2.2 Monitoring Well Installation / Groundwater Sampling

Ten monitoring wells, MW10-MW19, will be installed to a depth of approximately 6 feet below the water table using a track-mounted Geoprobe™ model 6620DT. The monitoring wells will be constructed of 1-inch diameter pvc casing and 0.010 inch slotted pvc well screen. The wells will have 10 feet of screen from 5 to 15 feet below grade. A No. 00 Morie or equivalent filer sand will be placed in the borehole to within 2 feet above the top of the screen. A 1-foot hydrated bentonite seal will be placed on top of the filter sand and the remainder of the borehole will be backfilled to grade.

Groundwater samples will be collected from existing monitoring wells MW1 through MW6, which were previously installed in March 2014 and are of the same construction as the proposed for monitoring wells, as well as newly installed wells MW10 through MW19. Sample procurement will be achieved through the use of dedicated polyethylene tubing, a stainless steel check valve and a peristaltic pump. Proposed and existing monitoring well locations are shown on **Figure 5**.

All groundwater sampling activities will be recorded in the project dedicated field book. This will include a description of:

- Date and time of sample collection
- Sample location
- Purging time, duration and volume;
- Sample appearance
- Analytical methodology:

Groundwater samples will be collected using a check valve, peristaltic pump and dedicated polyethylene tubing in accordance with standard low-flow sampling procedures as follows:

- Record pump make & model on sampling form.
- Wear appropriate health and safety equipment as outlined in the Health and Safety Plan
- Inspect each well for any damage or evidence of tampering and note condition in field logbook.
- Remove the well cap.
- Lay out plastic sheeting and place the monitoring, purging and sampling equipment on the sheeting.
- To avoid cross-contamination, do not let any downhole equipment touch the ground.
- Measure well headspace with a PID or FID and record the reading in the field logbook.
- A synoptic water level measurement round should be performed (in the shortest possible time) before any purging and sampling activities begin. Measure and record the depth to water using a water level meter or interface probe to the nearest 0.01 ft. Record the measurement in the field logbook. Do not measure the depth to the bottom of the well at this time (to avoid disturbing any sediment that may have accumulated). Obtain depth to bottom information from installation information in the field logbook or soil boring logs.
- Collect samples in order from wells with lowest contaminant concentration to highest concentration.
- Connect the polyethylene tubing to the peristaltic pump and lower the tubing into the well to approximately the middle of the screen. Tubing should be a minimum of 2 feet above the bottom of the well as this may cause mobilization of any sediment present in the bottom of the well.
- Start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Check water level. Adjust pump speed until there is little or no water level drawdown (less than 0.3 feet). If the minimal drawdown that can be achieved exceeds 0.3 feet but remains stable, continue purging until indicator field parameters stabilize.
- There should be at least 1 foot of water over the end of the tubing so there is no risk of entrapment of air in the sample. Pumping rates should be reduced to the minimum capabilities of the pump, if needed, to avoid purging the well dry. However, if the recharge rate of the well is very low and the well is purged dry, then wait until the well has recharged to a sufficient level and collect the appropriate volume of sample.
- During well purging, monitor indicator field parameters (temperature, specific conductance and pH) every three to five minutes (or less frequently, if appropriate). Note: during the early phase of purging emphasis should be put on minimizing and stabilizing pumping stress, and recording those adjustments. Purging is considered complete and sampling may begin when all the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings, taken at three (3) to five (5) minute intervals, are within the following limits:
    - specific conductance (3%),
    - temperature (3%),
    - pH (± 0.1 unit)
- VOC samples should be collected directly into pre-preserved sample containers. Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. Fill each container with sample to just overflowing so that no air bubbles are entrapped inside. Cap each bottle as it is filled.
- Label the samples, and record them on the chain of custody form. Place immediately into a cooler for shipment and maintain at 4$^{o}$C.

- Remove the tubing from the well. The polyethylene tubing must either be dedicated to each well or discarded. If dedicated the tubing should be placed in a large plastic garbage bag, sealed, and labeled with the appropriate well identification number.
- Close and lock the well.
- Decontaminate pump either by changing the surgical pump tubing between wells or as follows:
    1. Flush the equipment/pump with potable water.
    2. Flush with non-phosphate detergent solution. If the solution is recycled, the solution must be changed periodically.
    3. Flush with potable or distilled/deionized water to remove all of the detergent solution. If the water is recycled, the water must be changed periodically.
    4. Flush with isopropyl alcohol (pesticide grade). If equipment blank data from the previous sampling event show that the level of contaminants is insignificant, then this step may be skipped.
    5. Flush with distilled/deionized water. The final water rinse must not be recycled.

Samples will be collected in pre-cleaned laboratory supplied glassware, stored in a cooler with ice and submitted to a New York State ELAP certified environmental laboratory. Samples will be collected in pre-cleaned laboratory supplied glassware, stored in a cooler with ice and submitted to a New York State ELAP certified environmental laboratory. Groundwater samples from monitoring well locations will be submitted for analysis of VOCs/SVOCs. In addition to the VOC/SVOC analysis groundwater samples from 10 of the wells (MW1, MW2, MW7, MW8, MW11, MW12, MW15, MW16, MW17 and MW19 will be analyzed for pesticides/PCBs and metals.

All monitoring wells will be surveyed to determine relative casing elevation to the nearest 0.01 ft and horizontal position to the nearest 0.1ft. Survey data will be used to determine the direction and gradient of groundwater flow at the Site.

## 2.3 Soil Vapor Sampling

Soil vapor samples will be collected in accordance with the Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 10/2006) to determine if the medium is contaminated with VOCs. If VOCs are present, the results will be used to evaluate current off-site human exposures and future human exposures within the planned building. The evaluation of current off-site exposure will be useful in determining if further off-site investigation of the exposure pathway is warranted. The evaluation of future on-site exposure will determine whether or not the use of control measures will be necessary to prevent exposure by residents of the new building.

In order to determine the vapor quality in the soil beneath the site, soil vapor samples will be taken from ten soil gas locations (SG1 through SG10) and four sub-slab soil gas locations (SS1 through SS4) as shown in **Figure 6**. Vapor sampling locations were selected to provide information on the interior of the property to assess potential vapor intrusion in the new buildings and at the perimeter of the Site to assess the potential for off-site vapor migration. Soil vapor implants will be set at approximately two feet above the water table surface.

### *2.3.1 Soil Vapor Sampling Procedure*

The vapor implants will be installed with Geoprobe™ equipment and constructed in the same manner at all locations to minimize possible discrepancies. The implants will be made from stainless steel and fitted with Teflon-lined polyethylene tubing. Coarse sand or glass beads will be added to create a sampling zone of one to two feet in length and sealed above with hydrated bentonite powder for a minimum distance of 3 feet.

Sub-slab soil vapor probes will be installed by drilling a 1/2 inch hole through the concrete slab with a handheld drill and inserting 1/4 inch polyethylene tubing to no more than 2 inches below the base of the slab. All of the probes will be installed utilizing the same technique to minimize possible discrepancies. The tubing will be capped with a 1/4 inch plastic end to prevent the infiltration of foreign particles into the tube. The tubing will then be sealed at the surface with hydrated granular bentonite and a 12" x12" (approx.) plastic sheet.

After installation of the probes, one to three volumes (i.e., the volume of the sample probe and tube) will be purged prior to collecting the samples to ensure samples collected are representative. Flow rates for both purging and collecting will not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling. Samples will be collected in Summa® canisters which have been certified clean by the laboratory and analyzed by using USEPA Method TO-15. All samples will be collected over the same period of time and submitted to a NYSDOH certified laboratory.

A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of soil vapor extracted, vacuum of canisters before and after samples are collected, apparent moisture content of the sampling zone, and chain of custody protocols.

As part of the vapor intrusion evaluation, a tracer gas will be used in accordance with NYSDOH protocols to serve as a quality assurance/quality control (QA/QC) device to verify the integrity of the soil vapor probe seal. Helium will be used as the tracer gas and a box will serve to keep it in contact with the probe during the testing. A portable monitoring device will be used to analyze a sample of soil vapor for the tracer prior to sampling. If tracer sample results show a significant presence of the tracer, the probe seals will be adjusted to prevent infiltration.

After the collection of the analytical sample, a field reading will be recorded at each sampling points utilizing a photoionization detector capable of detecting organic compounds in the parts per billion range.

## 2.4 Laboratory Analysis

Samples will be submitted to the laboratory for a standard turnaround time, which is estimated to be one to two weeks. The proposed sampling program is summarized in **Table 1**.

### *2.4.1 Analysis of Soil and Groundwater Samples*

Collected soil and groundwater samples will be placed in pre-cleaned laboratory supplied glassware, and placed in a cooler packed with ice for transport to the laboratory. Sample analysis

will be provided by a New York State certified environmental laboratory; either York Analytical Laboratories of Stratford Connecticut (NYSDOH Lab I.D. No. 10854) or Phoenix Environmental Laboratories of Manchester Connecticut (NYSDOH Lab I.D. No. 11301). Soil and groundwater samples will be analyzed for one or more or the following parameters depending on location.

- Volatile organic Compounds (VOCs) by EPA Method 8260;
- Semi-volatile organic compounds (SVOCs) by EPA Method 8270;
- Target Analyte List (TAL) metals, and
- Pesticides/PCBs by Method 8081/8082.

### *2.4.2 Analysis of Soil Vapor Samples*

Analytical procedures and corresponding reporting limits will be identified when reporting the sampling results. Samples will be analyzed for volatile organic compounds (VOCs) by USEPA Method TO-15. All samples will be analyzed by a New York State certified environmental laboratory: either York or ALS.

## 2.5 Management of Investigation Derived Wastes

Investigation derived wastes include contaminated soil, groundwater and disposable sampling equipment generated during the remedial investigation.

Soil from borings will be returned to their original location. Excess soil will be placed in U.S. Department of Transportation (DOT) – approved drums. This material will either be disposed of at an appropriate off-site disposal facility or will be disposed of along with other soil during subsequent remedial activities to be implemented under the RAWP. Purge water generated during groundwater sampling will be containerized in drums and analyzed for VOCs. Final classification and disposal of purge water will be based on the results of this analysis and upon approval of the NYSDEC Project Manager.

Disposable sampling equipment (gloves, tubing, acetate liners, etc.) will be placed in heavy-duty plastic bags and disposed of properly.

# 3.0 QUALITY ASSURANCE PROJECT PLAN (QAPP)

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

Collected samples will be appropriately packaged, placed in coolers and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of ice or cold-pak(s) to maintain a temperature of 4$^{o}$C.

Dedicated disposable sampling materials will be used for both soil and groundwater samples (if collected), eliminating the need to prepare field equipment (rinsate) blanks. However, if non-disposable equipment is used, (stainless steel scoop, etc.) field rinsate blanks will be prepared at the rate of 1 for every eight samples collected. No field filtering will be conducted; any required filtration will be completed by the laboratory.

Decontamination of non-dedicated sampling equipment will consist of the following:

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

Prepare field blanks by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers. Trip blanks will accompany samples each time they are transported to the laboratory. Matrix spike and matrix spike duplicates (MS/MSD) will be collected at the rate of one per 20 samples submitted to the laboratory and duplicate samples will be collected at a rate of one per ten samples submitted to the laboratory. Laboratory reports will be upgradeable to ASP category B deliverables for use in the preparation of a data usability report (DUSR). The DUSR will be applicable to all confirmation samples and final round samples. Performance monitoring samples will be in a results-only format. The QAPP prepared for the Site is provided in **Attachment A**.

## 3.1 Soil Samples

Dedicated disposable acetate liners will be utilized for sampling, therefore, field equipment (rinsate) blanks will not be part of the QA/QC program. Trip blanks will accompany samples each time they are transported to the laboratory.

## 3.2 Soil Vapor Samples

Extreme care will be taken during all aspects of sample collection to ensure that sampling error is minimized and high quality data are obtained. The sampling team members will avoid actions (e.g., using permanent marker pens and wearing freshly dry-cleaned clothes or personal

fragrances) which can cause sample interference in the field. A tracer gas, helium, will be used in accordance with NYSDOH sampling protocols to serve as a QA/QC device to verify the integrity of the soil vapor probe seals. QA/QC protocols will be followed for sample collection and laboratory analysis, such as use of certified clean sample devices, meeting sample holding times and temperatures, sample accession, and chain of custody.

Samples will be delivered to the analytical laboratory as soon as possible after collection. The laboratory analyzes QC samples with each analytical batch, including a Method Blank (MB), Laboratory Control Sample (LCS), and a Laboratory Control Sample Duplicate (LCSD). Internal standards are added to all calibration standards, samples, and blanks to verify that the analytical system is in control.

### 3.3 Reporting of Results

Sample analysis will be provided by a New York State certified environmental laboratory. Laboratory reports will include ASP category B deliverables for use in the preparation of a data usability summary report (DUSR). All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format.

### 3.4 DUSR

The DUSR provides a thorough evaluation of analytical data with third party data validation. The primary objective of a DUSR is to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and data use. Verification and/or performance monitoring samples collected under this RIWP will be reviewed and evaluated in accordance with the Guidance for the Development of Data Usability Summary Reports as presented in Appendix 2B of DER-10. The completed DUSR for verification/performance samples collected during implementation of this RIWP will be included in the final Engineering Report.

## 4.0 HEALTH AND SAFETY PLAN

The Health and Safety Plan (HASP) takes into account the specific hazards inherent in conducting the RI, and presents the minimum requirements which are to be met by Environmental Business Consultants (EBC), its subcontractors, and other personnel in order to avoid and, if necessary, protect against health and/or safety hazards. A HASP has been prepared and is provided in **Attachment B** of this work plan.

Sub-contractors will have the option of adopting this HASP or developing their own site-specific document. If a subcontractor chooses to prepare their own HASP, it must meet the minimum requirements as detailed in the RI HASP prepared by EBC and must be made available to EBC and the NYSDEC.

Activities performed under the HASP will comply with applicable parts of OSHA Regulations, primarily 29 CFR Parts 1910 and 1926. Modifications to the HASP may be made with the approval of the EBC Site Safety Manager (SSM) and/or Project Manager (PM).

## 5.0 COMMUNITY AIR MONITORING PLAN

The Community Air Monitoring Plan (CAMP) provides measures for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site commercial workers) from potential airborne contaminant releases resulting from investigation activities.

The action levels specified require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that the investigation work did not spread contamination off-site through the air.

The primary concerns during the investigation are odors from VOCs, which will be mitigated / controlled through work stoppages and /or use of vapor suppressive foam or similar. The CAMP for this investigation is provided as **Attachment C**.

## 6.0 REMEDIAL INVESTIGATION REPORT

Following completion of the investigation and receipt of the analytical data, EBC will prepare a Remedial Investigation Report (RIR) in accordance with DER10. The RIR will which will include the following:

1. A description of the work which was performed under the RI.
2. Any modification from this work scope and the reason for the modifications
3. The nature and extent of the off-site groundwater plume
4. Soil, and groundwater conditions that were observed
5. Analytical data in tabular form comparing results to part 375-6 SCOs
6. Cross sections and data figures
7. Laboratory analytical data, sampling logs and well completion logs for all samples and areas covered by the investigation
8. Scaled drawings showing the locations of temporary sampling points, monitoring wells and surface water sampling locations
9. A Qualitative Human Health Exposure Assessment

## 7.0 SCHEDULE

Implementation of the RI will be performed prior to building demolition. Since the building is currently vacant, access to most of the proposed sampling locations will not pose any challenges. However, some preparation may be required such as creating overhead clearance to access some the locations.

Mobilization for the field work is anticipated to begin approximately 2 weeks following NYSDEC approval of the RI Work Plan and 44 days following the public notification of the BCP application. The estimated duration of the full RI activity is one weeks total field time.

The anticipated schedule of events is as follows:

| Schedule Task | Estimated Date |
|---|---|
| NYSDEC Approval of RIWP | Week of November 17, 2014 |
| Mobilize equipment to the Site (begin) | Week of November 17, 2014 |
| Complete Field Work | Week of December 1, 2014 |
| Receive all Laboratory Reports | Week of December 22, 2014 |
| Submit Remedial Investigation Report | Week of January 5, 2015 |
| Distribute Fact Sheet on RI Results and Comment period on RAWP (if submitted with RIR) | Within 4 weeks of completion of field work |

# ***TABLES***

**TABLE 1**
**SUMMARY OF**
**SAMPLING PROGRAM RATIONALE AND ANALYSIS**

| Matrix | Location | Approximate Number of Samples | Rationale for Sampling | Laboratory Analysis |
|---|---|---|---|---|
| Subsurface soil (0 to 15 feet bgs) | FUELING AREA: Five petroleum delineation borings B25-B27 within former fueling area. Samples from the WT interface and 13-14 ft interval. A third sample will be retained for highest PID reating if not the same as the planned intervals. | 10-15 | To supplement previous sampling and delineate petroleum affected soil at the Site. | VOCs EPA Method 8260C, SVOCS EPA Method 8270D |
| Subsurface soil (0 to 10 feet bgs) | FUELING AREA: Two borings (B23, B25) located within the former fueling area. Retain samples from 0-2 ft and 5-7 ft. | 4 | To establish existing and post remedial soil quality | Metals EPA Method 6010, Pesticides EPA Method 8081B, PCBs EPA Method 8082A |
| Subsurface soil (0 to 10 feet bgs) | FOUNDRY AREA: Four borings (B28-B31) located within the former foundry area. Retain samples from 0-2 ft and 5-7 ft. | 8 | To delineate metals associated with foundry area | Metals EPA Method 6010, |
| Subsurface soil (0 to 10 feet bgs) | FOUNDRY AREA: Two borings (B28, B30) located within the former foundry area. Retain samples from 0-2 ft and 5-7 ft. | 4 | To establish existing and post remedial soil quality | VOCs EPA Method 8260C, SVOCS EPA Method 8270D, Metals EPA Method 6010, Pesticides EPA Method 8081B, PCBs EPA Method 8082A |
| Subsurface soil (0 to 10 feet bgs) | LOADING DOCK AREA: Three borings (B32-B34) located within the loading dock. Retain samples from 5-7 ft and WT interface. | 6 | To establish existing and post remedial soil quality, and delineate potential petroleum at WT | VOCs EPA Method 8260C, SVOCS EPA Method 8270D |
| Subsurface soil (0 to 10 feet bgs) | LOADING DOCK AREA: Three borings (B32-B34) located within the loading dock. Retain samples from 5-7 ft | 3 | To establish existing and post remedial soil quality | Metals EPA Method 6010, Pesticides EPA Method 8081B, PCBs EPA Method 8082A |
| Subsurface soil (0 to 10 feet bgs) | SOUTH OF LOADINGDOCK AREA: Three borings (B35-B36) located along south side of loading dock. Retain samples from 0-2 ft and WT interface. | 8 | To establish existing and post remedial soil quality, and delineate potential petroleum at WT | VOCs EPA Method 8260C, SVOCS EPA Method 8270D, Metals EPA Method 6010, Pesticides EPA Method 8081B, PCBs EPA Method 8082A |
| **Total (Soils)** | | 43-48 | | |
| Groundwater (water table) | From eight existing monitoring wells (MW1-MW8)and ten new wells (MW10-MW19). | 18 | Assess overall groundwater quality | VOCs EPA Method 8260C, SVOCs EPA Method 8270D |
| Groundwater (water table) | From four existing monitoring wells (MW1, MW2, MW7, MW8) and six new wells (MW11, MW12, MW15, MW16, MW17 and MW19). | 10 | Assess overall groundwater quality | Pesticides EPA Method 8081B, PCBs EPA Method 8082A, TAL Metals (dissolved) EPA Method 6010 |
| **Total (Groundwater)** | | 28 | | |
| Soil Gas | From ten soil gas implants (SG1-SG10) to be installed on the Site. | 10 | Evaluate soil gas at the Site. | VOCs EPA Method TO15 |
| Sub-Slab Soil Gas | From four sub-slab points (SS1-SS4) located within exsting structures to be installed on the Site. | 4 | Evaluate soil gas at the Site. | VOCs EPA Method TO15 |
| **Total (Soil Gas)** | | 14 | | |
| MS/MSD | Matrix spike and Matrix spike duplicates at the rate 5% (1 per 20) | 4 | To meet requirements of QA / QC program | 3 MS/MSD (3 soil 1 GW) for VOCs, EPA Method 8260C, SVOCS EPA Method 8270D, for Pesticides EPA Method 8081B, PCBs EPA Method 8082A, TAL Metals (dissolved) EPA Method 6010 |
| Duplicate | Duplicates at the rate 10% per matrix. | 7 | To meet requirements of QA / QC program | 7 Duplicate Samples (5 soil 2 GW) for VOCs, EPA Method 8260C, SVOCS EPA Method 8270D, for Pesticides EPA Method 8081B, PCBs EPA Method 8082A, TAL Metals (dissolved) EPA Method 6010 |
| Trip Blanks | One laboratory prepared trip blank to accompany samples each time they are delivered to the laboratory. | 4 | To meet requirements of QA / QC program | VOCs EPA Method 8260C |
| **Total (QA / QC Samples)** | | 15 | | |

# ***FIGURES***


USGS Brooklyn Quadrangle 1995, Contour Interval = 10 feet

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FORMER CONSOLIDATED FREIGHTWAYS

11 WEST STREET, BROOKLYN, NY

**FIGURE 1** SITE LOCATION MAP

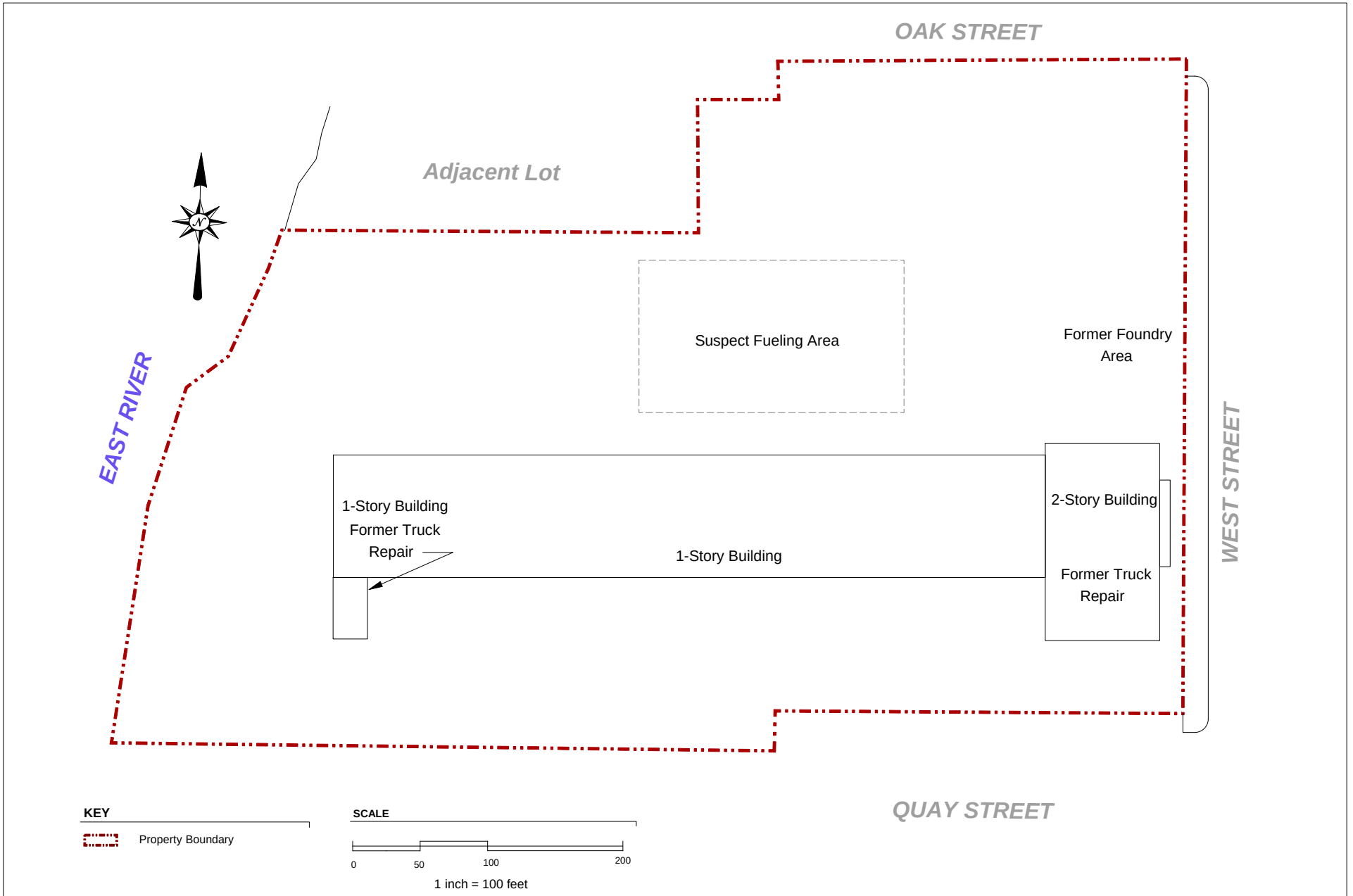


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Figure No. 2

Site Name: FORMER CONTINENTAL FREIGHTWAYS TERMINAL

Site Address: 11 WEST STREET, BROOKLYN, NY

Drawing Title: SITE PLAN

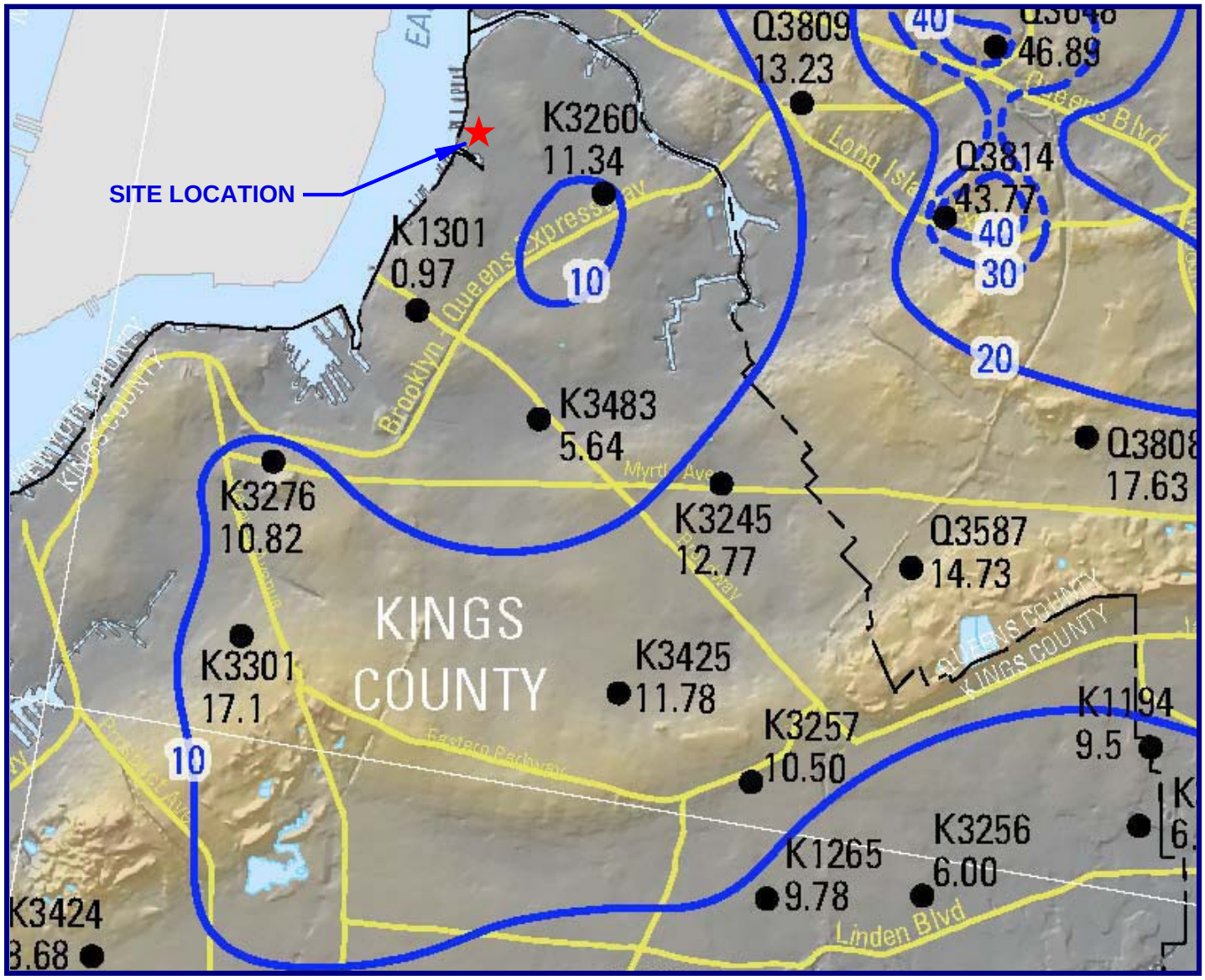


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**FIGURE 3** REGIONAL GROUNDWATER MAP

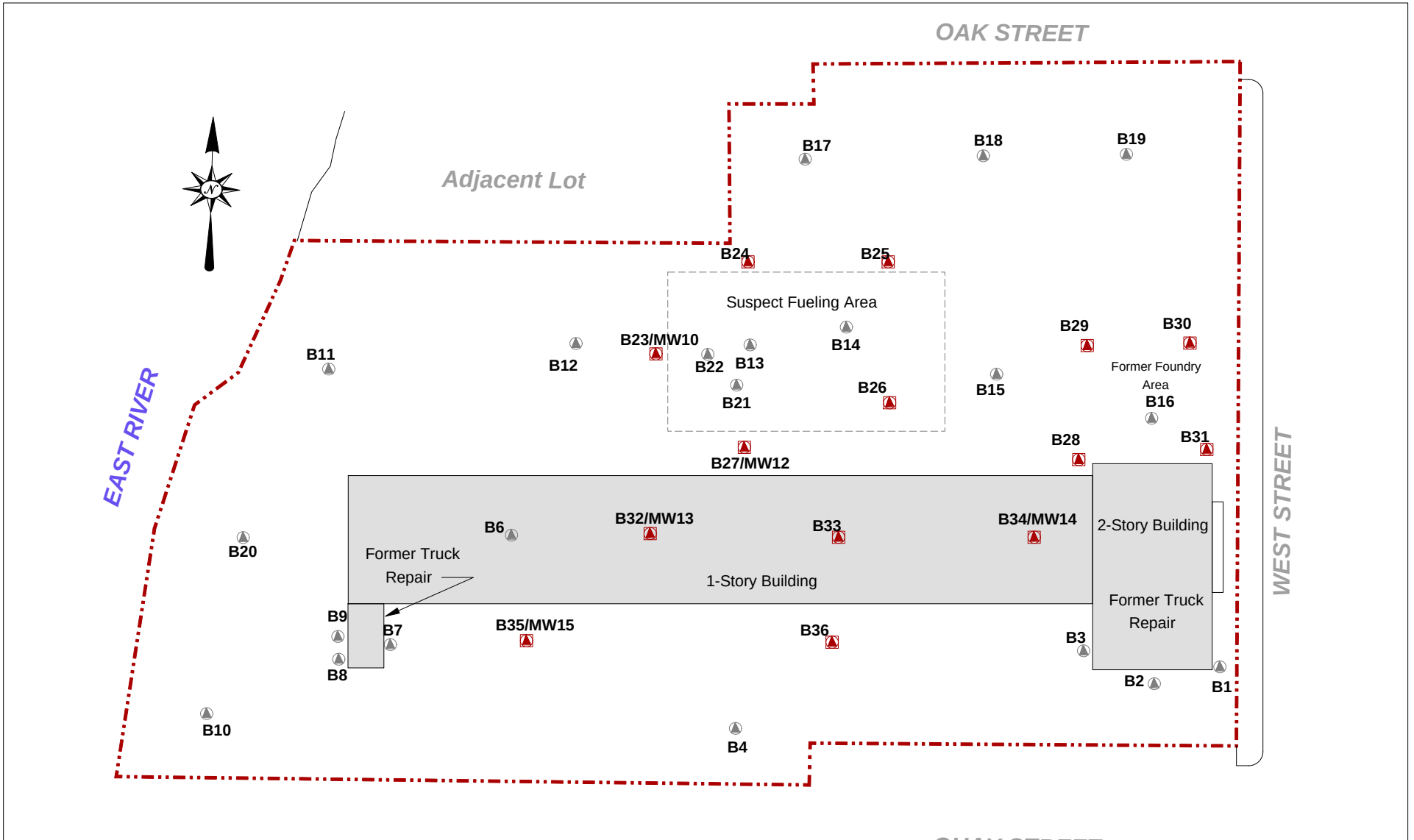


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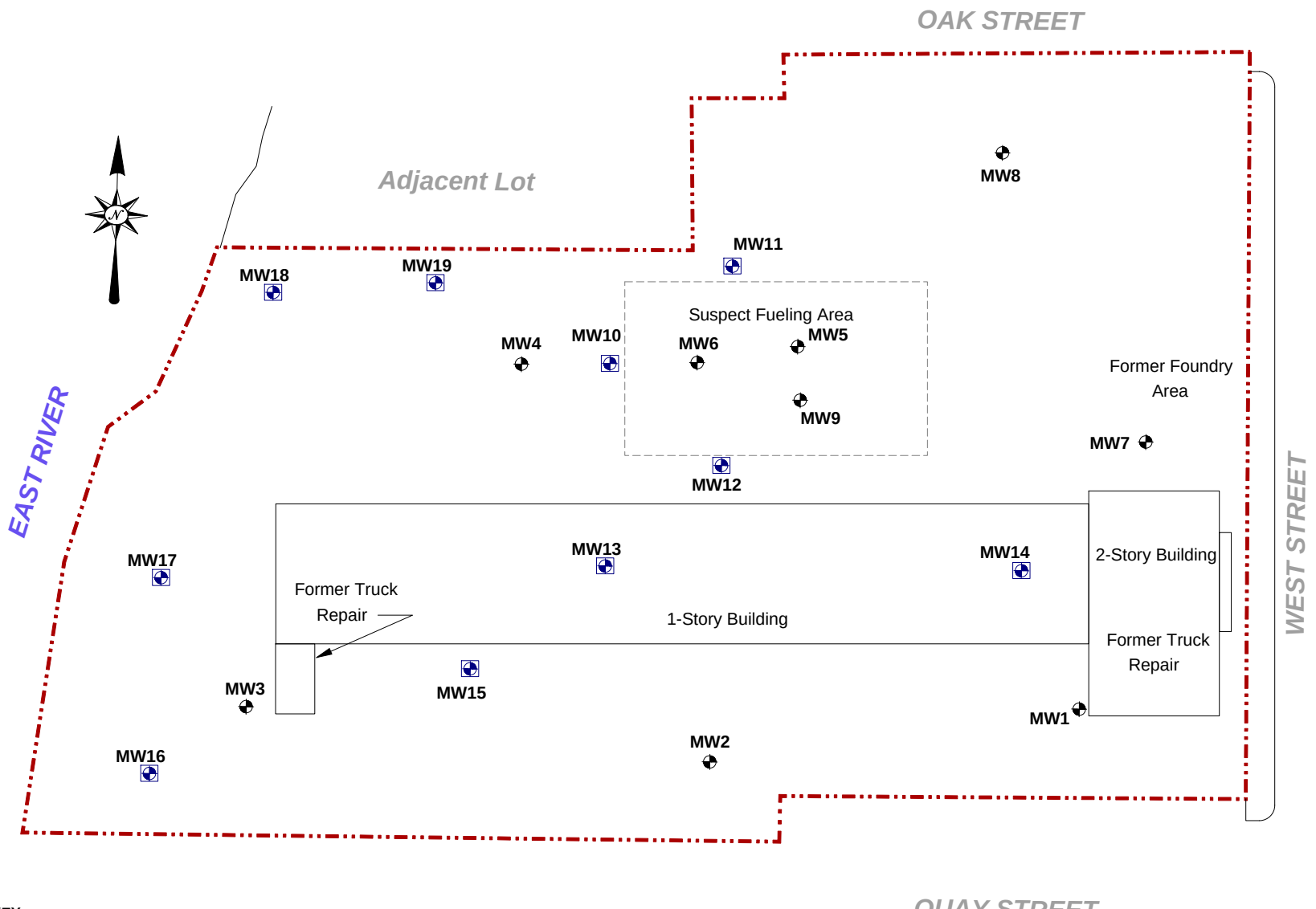
Figure No. 4

Site Name: FORMER CONTINENTAL FREIGHTWAYS TERMINAL

Site Address: 11 WEST STREET, BROOKLYN, NY

Drawing Title: PROPOSED SOIL BORING LOCATIONS




**KEY**

Property Boundary

MWx Existing Monitoring Well

MWx Monitoring Well Location

**SCALE**

0 50 100 200

1 inch = 100 feet

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Figure No. 5

Site Name: FORMER CONTINENTAL FREIGHTWAYS TERMINAL

Site Address: 11 WEST STREET, BROOKLYN, NY

Drawing Title: PROPOSED MONITORING WELL LOCATIONS

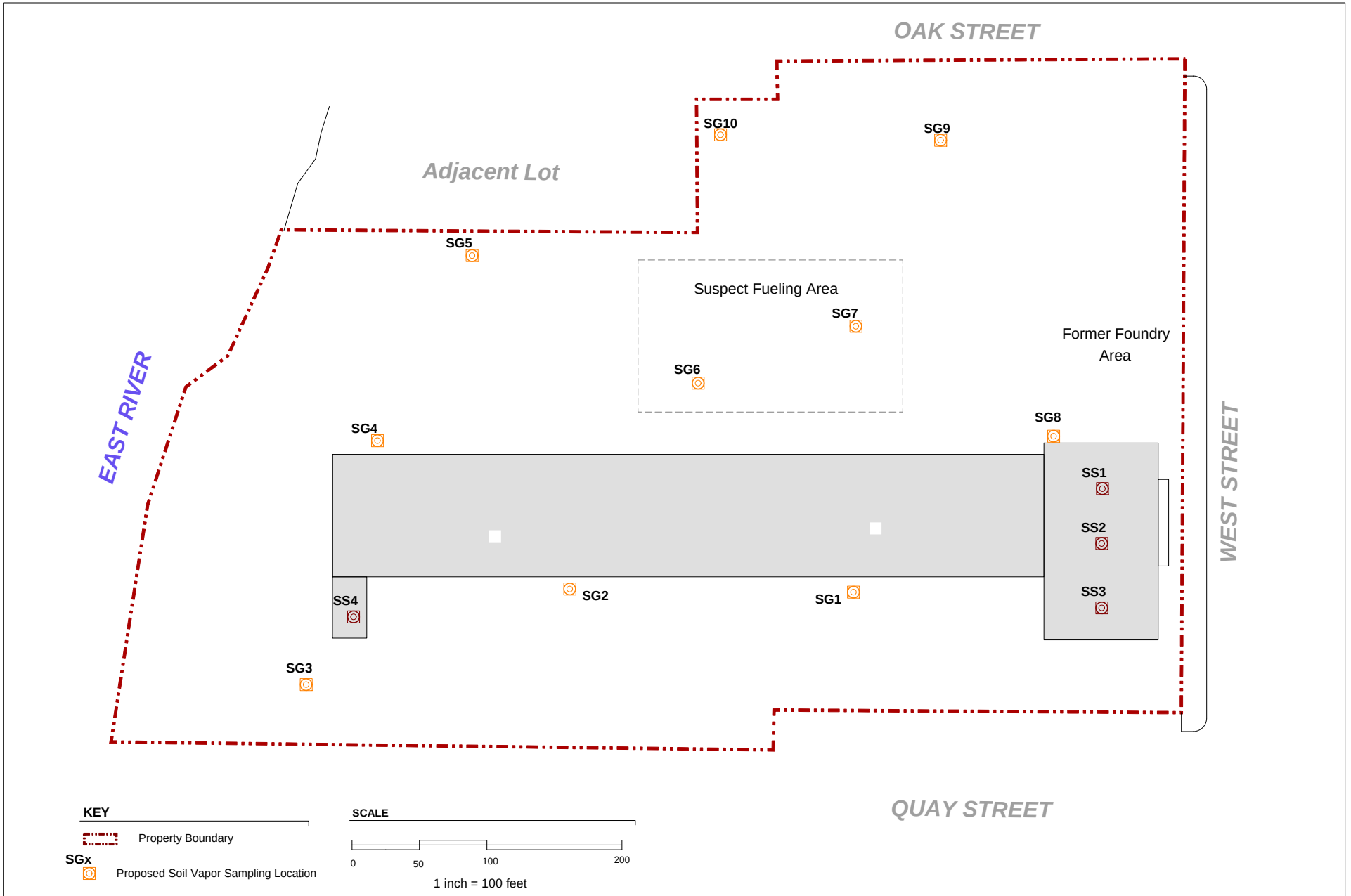


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Figure No. 6

Site Name: FORMER CONTINENTAL FREIGHTWAYS TERMINAL

Site Address: 11 WEST STREET, BROOKLYN, NY

Drawing Title: PROPOSED SOIL VAPOR SAMPLINGL LOCATIONS

# ***ATTACHMENT A***
# *Quality Assurance Project Plan*

# QUALITY ASSURANCE PROJECT PLAN
## Former Consolidated Freightways Terminal
## 11 West Street, Greenpoint, NY

---

**Prepared on behalf of:**

M & H Realty LLC
420 9th Avenue
New York, NY 10001

**Prepared by:**

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS
RIDGE, NY 11961

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11 West Street, Greenpoint, NY


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# 1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared in accordance with DER-10 to detail procedures to be followed during the course of the sampling and analytical portion of the project, as required by the approved work plan.

To ensure the successful completion of the project each individual responsible for a given component of the project must be aware of the quality assurance objectives of his / her particular work and of the overall project. The EBC Project Director, Charles Sosik will be directly responsible to the client for the overall project conduct and quality assurance/quality control (QA/QC) for the project. The Project Director will be responsible for overseeing all technical and administrative aspects of the project and for directing QA/QC activities. Mr. Kevin Brussee will serve as the Quality Assurance Officer (QAO) and in this role may conduct:

- conduct periodic field and sampling audits;
- interface with the analytical laboratory to resolve problems; and
- interface with the data validator and/or the preparer of the DUSR to resolve problems.

Chawinie Miller will serve as the Project Manager and will be responsible for implementation of the Remedial Investigation and coordination with field sampling crews and subcontractors. Reporting directly to the Project Manager will be the Field Operations Officer, Kevin Waters; who will serve as the on-Site qualified environmental professional who will record observations, direct the drilling crew and be responsible for the collection and handling of all samples.

## 1.1 Organization

Project QA will be maintained under the direction of the Project Manager, in accordance with this QAPP. QC for specific tasks will be the responsibility of the individuals and organizations listed below, under the direction and coordination of the Project Manager

.

| GENERAL RESPONSIBILITY | SCOPE OF WORK | RESPONSIBILITY OF QUALITY CONTROL |
|---|---|---|
| Quality Assurance Officer | Conduct sampling audits, resolution of laboratory problems, resolution of data validator/DUSR preparation problems | K. Brussee, EBC |
| Field Operations | Supervision of Field Crew, sample collection and handling | K. Waters, EBC |
| Project Manager | Implementation of the RI according to the RIWP. | Chawinie Miller, EBC |
| Laboratory Analysis | Analysis of soil samples by NYSDEC ASP methods Laboratory | NYSDOH-Certified Laboratory |
| Data review | Review for completeness and compliance | 3rd party validation |


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# 2.0 QUALITY ASSURANCE PROJECT PLAN OBJECTIVES

## 2.1 Overview

Overall project goals are defined through the development of Data Quality Objectives (DQOs), which are qualitative and quantitative Statements that specify the quality of the data required to support decisions; DQOs, as described in this section, are based on the end uses of the data as described in the work plan.

In this plan, Quality Assurance and Quality Control are defined as follows:

- Quality Assurance - The overall integrated program for assuring reliability of monitoring and measurement data.

- Quality Control - The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

## 2.2 QA / QC Requirements for Analytical Laboratory

Samples will be analyzed by a New York State Department of Health (NYSDOH) certified laboratory that is certified in the appropriate categories. Data generated from the laboratory will be used to evaluate contaminants such as chlorinated and other volatile organic compounds (VOCs) in soil, soil gas and groundwater. The QA requirements for all subcontracted analytical laboratory work performed on this project are described below. QA elements to be evaluated include accuracy, precision, sensitivity, representativeness, and completeness. The data generated by the analytical laboratory for this project are required to be sensitive enough to achieve required quantification limits as specified in NYSDEC Analytical Services Protocol (NYSDEC ASP, 07/2005) and useful for comparison with clean-up objectives. The analytical results meeting the required quantification limits will provide data sensitive enough to meet the data quality objectives of this remedial program as described in the work plan. Reporting of the data must be clear, concise, and comprehensive. The QC elements that are important to this project are completeness of field data, sample custody, sample holding times, sample preservation, sample storage, instrument calibration and blank contamination.

### *2.2.1 Instrument Calibration*

Calibration curves will be developed for each of the compounds to be analyzed. Standard concentrations and a blank will be used to produce the initial curves. The development of calibration curves and initial calibration response factors must be consistent with method requirements presented in the most recent version of NYSDEC ASP 07/2005).

### *2.2.2 Continuing Instrument Calibration*

The initial calibration curve will be verified every 12 hrs by analyzing one calibration standard. The standard concentration will be the midpoint concentration of the initial calibration curve. The calibration check compound must come within 25% relative percent difference (RPD) of the average response factor obtained during initial calibration. If the RPD is greater than 25%, then corrective action must be taken as provided in the specific methodology.

### *2.2.3 Method Blanks*

Method blank or preparation blank is prepared from an analyte·free matrix which includes the same reagents, internal standards and surrogate standards as me related samples. II is carried through the


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entire sample preparation and analytical procedure. A method blank analysis will be performed once for each 12 hr period during the analysis of samples for volatiles. An acceptable method blank will contain less than two (2) times the CRQL of methylene chloride, acetone and 2-butanone. For all other target compounds, the method blank must contain less than or equal to the CRQL of any single target compound. For non-target peaks in the method blank, the peak area must be less than 10 percent of the nearest internal standard. The method blank will be used to demonstrate the level of laboratory background and reagent contamination that might result from the analytical process itself.

*2.2.4 Trip Blanks.*

Trip blanks consist of a single set of sample containers filled at the laboratory with deionized. laboratory-grade water. The water used will be from the same source as that used for the laboratory method blank. The containers will be carried into the field and handled and transported in the same way as the samples collected that day. Analysis of the trip blank for VOCs is used to identify contamination from the air, shipping containers, or from other items coming in contact with the sample bottles. (The bottles holding the trip blanks will be not opened during this procedure.) A complete set of trip blanks will be provided with each shipment of samples to the certified laboratory.

*2.2.5 Surrogate Spike Analysis*

For organic analyses, all samples and blanks will be spiked with surrogate compounds before purging or extraction in order to monitor preparation and analyses of samples. Surrogate spike recoveries shall fall within the advisory limits in accordance with the NY5DEC ASP protocols for samples falling within the quantification limits without dilution.

*2.2.6 Matrix Spike / Matrix Spike Duplicate / Matrix Spike Blank (MS/MSDIMSB) Analysis*

MS, MSD and MSB analyses will be performed to evaluate the matrix effect of the sample upon the analytical methodology along with the precision of the instrument by measuring recoveries. The MS / MSD / MSB samples will be analyzed for each group of samples of a similar matrix at a rate of 5% (one for every 20 field samples). The RPD will be calculated from the difference between the MS and MSD. Matrix spike blank analysis will be performed to indicate the appropriateness of the spiking solution(s) used for the MS/MSD. 10% of the samples of each matrix should be sampled and anlayzed as Duplicates.

## 2.3 Accuracy

Accuracy is defined as the nearness of a real or the mean (x) of a set of results to the true value. Accuracy is assessed by means of reference samples and percent recoveries. Accuracy includes both precision and recovery and is expressed as percent recovery (% REC). The MS sample is used to determine the percent recovery. The matrix spike percent recovery (% REC) is calculated by the following equation:

$$\%REC = \frac{SSR - SR}{SA} \times 100$$

Where:
SSR = spike sample results
SR = sample results
SA = spike added from spiking mix


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## 2.4 Precision

Precision is defined as the measurement of agreement of a set of replicate results among themselves without a Precision is defined as the measurement of agreement of a set of replicate results among themselves without assumption of any prior information as to the true result. Precision is assessed by means of duplicate/replicate sample analyses.

Analytical precision is expressed in terms of RPD. The RPD is calculated using the following formula:

$$RPD = \frac{D^1 - D^2}{(D^1 + D^2)/2} \times 100$$

Where:
RPD = relative percent difference
$D^1$ = first sample value
$D^2$ = second sample value (duplicate)

## 2.5 Sensitivity

The sensitivity objectives for this plan require that data generated by the analytical laboratory achieve quantification levels low enough to meet the required detection limits specified by NYSDEC ASP and to meet all site-specific standards, criteria and guidance values (SGCs) established for this project.

## 2.6 Representativeness

Representativeness is a measure of the relationship of an individual sample taken from a particular site to the remainder of that site and the relationship of a small aliquot of the sample (i.e., the one used in the actual analysis) to the sample remaining on site. The representativeness of samples is assured by adherence to sampling procedures described in the Remedial Investigation Work Plan.

## 2.7 Completeness

Completeness is a measure of the quantity of data obtained from a measurement system as compared to the amount of data expected from the measurement system. Completeness is defined as the percentage of all results that are not affected by failing QC qualifiers, and should be between 70 and 100% of all analyses performed. The objective of completeness in laboratory reporting is to provide a thorough data support package. The laboratory data package provides documentation of sample analysis and results in the form of summaries, QC data, and raw analytical data. The laboratory will be required to submit data packages that follow NYSDEC ASP Category B reporting format which, at a minimum, will include the following components:

1. All sample chain-of-custody forms.
2. The case narrative(s) presenting a discussion of any problems and/or procedural changes required during analyses. Also presented in the case narrative are sample summary forms.
3. Documentation demonstrating the laboratory's ability to attain the contract specified detection limits for all target analytes in all required matrices.
4. Tabulated target compound results and tentatively identified compounds.
5. Surrogate spike analysis results (organics).
6. Matrix spike/matrix spike duplicate/matrix spike blank results.
7. QC check sample and standard recovery results
8. Blank results (field, trip, and method).
9. Internal standard area and RT summary.


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## 2.8 Laboratory Custody Procedures

The following elements are important for maintaining the field custody of samples:

- Sample identification
- Sample labels
- Custody records
- Shipping records
- Packaging procedures

Sample labels will be attached to all sampling bottles before field activities begin; each label will contain an identifying number. Each number will have a suffix that identifies the site and where the sample was taken. Approximate sampling locations will be marked on a map with a description of the sample location. The number, type of sample, and sample identification will be entered into the field logbook. A chain-of-custody form, initiated at the analytical laboratory will accompany the sample bottles from the laboratory into the field. Upon receipt of the bottles and cooler, the sampler will sign and date the first received blank space. After each sample is collected and appropriately identified, entries will be made on the chain-of-custody form that will include:

- Site name and address
- Samplers' names and signatures

## 2.9 Sample Handling and Decontamination Procedures

Collected samples will be appropriately packaged, placed in coolers and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of ice or cold-pak(s) to maintain a temperature of 4$^{o}$C.

Dedicated disposable sampling materials will be used for both soil and groundwater samples (if collected), eliminating the need to prepare field equipment (rinsate) blanks. However, if non-disposable equipment is used, (stainless steel scoop, etc.) field rinsate blanks will be prepared at the rate of 1 for every eight samples collected. No field filtering will be conducted; any required filtration will be completed by the laboratory.

Decontamination of non-dedicated sampling equipment will consist of the following:

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

Prepare field blanks by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers. Trip blanks will accompany samples each time they are transported to the laboratory. Matrix spike and matrix spike duplicates (MS/MSD) will be collected at the rate of one per 20 samples submitted to the laboratory and duplicate samples will be collected at a rate of one per ten samples submitted to the laboratory.


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# 3.0 ANALYTICAL PROCEDURES

## 3.1 Laboratory Analysis

Samples will be analyzed by the NYSDOH ELAP laboratory for one or more of the following parameters: VOCs + TICs in soil / groundwater by USEPA Method 8260C, SVOCs + TICs in soil / groundwater by USEPA Method 8270D, Target Analyte List (TAL) Metals 6010 in soil and groundwater, pesticides / PCBs by USEPA Method 8081B/8082A and VOCs in air by USEPA Method TO15 (Table 2). If any modifications or additions to the standard procedures are anticipated and if any nonstandard sample preparation or analytical protocol is to be used, the modifications and the nonstandard protocol will be explicitly defined and documented. Prior approval by EBC's PM will be necessary for any nonstandard analytical or sample preparation protocol used by the laboratory, i.e., dilution of samples or extracts by greater than a factor of five (5).



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# 4.0 DATA REDUCTION, REVIEW, AND REPORTING

## 4.1 Overview

The process of data reduction, review, and reporting ensures the assessments or a conclusion based on the final data accurately reflects actual site conditions. This plan presents the specific procedures, methods, and format that will be employed for data reduction, review and reporting of each measurement parameter determined in the laboratory and field. Also described in this section is the process by which all data, reports, and work plans are proofed and checked for technical and numerical errors prior to final submission.

## 4.2 Data Reduction

Standard methods and references will be used as guidelines for data handling, reduction, validation, and reporting. All data for the project will be compiled and summarized with an independent verification at each step in the process to prevent transcription/typographical errors. Any computerized entry of data will also undergo verification review.

Sample analysis will be provided by a New York State certified environmental laboratory. Laboratory reports will include ASP category B deliverables for use in the preparation of a data usability summary report (DUSR). All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format. Analytical results shall be presented on standard NYSDEC ASP-B forms or equivalents, and include the dates the samples were received and analyzed, and the actual methodology used. Note that if waste characterization samples are analyzed they will be in results only format and will not be evaluated in the DUSR.

Laboratory QA/QC information required by the method protocols will be compiled, including the application of data QA/QC qualifiers as appropriate. In addition, laboratory worksheets, laboratory notebooks, chains-of-custody, instrument logs, standards records, calibration records, and maintenance records, as applicable, will be provided in the laboratory data packages to determine the validity of data. Specifics on internal laboratory data reduction protocols are identified in the laboratory's SOPs.

Following receipt of the laboratory analytical results by EBC, the data results will be compiled and presented in an appropriate tabular form. Where appropriate, the impacts of QA/QC qualifiers resulting from laboratory or external validation reviews will be assessed in terms of data usability.

## 4.3 Laboratory Data Reporting

All sample data packages submitted by the analytical laboratory will be required to be reported in conformance to the NYSDEC ASP (7/2005), Category B data deliverable requirements as applicable to the method utilized. All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format. Note that waste characterization samples, if analyzed, will be in results only format and will not be evaluated in the DUSR.


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## 5.0 CORRECTIVE ACTION

Review and implementation of systems and procedures may result in recommendations for corrective action. Any deviations from the specified procedures within approved project plans due to unexpected site-specific conditions shall warrant corrective action. All errors, deficiencies, or other problems shall be brought to the immediate attention of the EBC PM, who in turn shall contact the Quality Assurance/Data Quality Manager or his designee (if applicable).

Procedures have been established to ensure that conditions adverse to data quality are promptly investigated, evaluated and corrected. These procedures for review and implementation of a change are as follows:

- Define the problem.
- Investigate the cause of the problem.
- Develop a corrective action to eliminate the problem, in consultation with the personnel who defined the problem and who will implement the change.
- Complete the required form describing the change and its rationale (see below for form requirements).
- Obtain all required written approvals.
- Implement the corrective action.
- Verify that the change has eliminated the problem.

During the field investigation, all changes to the sampling program will be documented in field logs/sheets and the EBC PM advised.

If any problems occur with the laboratory or analyses, the laboratory must immediately notify the PM, who will consult with other project staff. All approved corrective actions shall be controlled and documented.

All corrective action documentation shall include an explanation of the problem and a proposed solution which will be maintained in the project file or associated logs. Each report must be approved by the necessary personnel (e.g., the PM) before implementation of the change occurs. The PM shall be responsible for controlling, tracking, implementing and distributing identified changes.



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**TABLE 1**
**SUMMARY OF**
**SAMPLING PROGRAM RATIONALE AND ANALYSIS**

| Matrix | Location | Approximate Number of Samples | Rationale for Sampling | Laboratory Analysis |
|---|---|---|---|---|
| Subsurface soil (0 to 15 feet bgs) | FUELING AREA: Five petroleum delineation borings B25-B27 within former fueling area. Samples from the WT interface and 13-14 ft interval. A third sample will be retained for highest PID reating if not the same as the planned intervals. | 10-15 | To supplement previous sampling and delineate petroleum affected soil at the Site. | VOCs EPA Method 8260C, SVOCS EPA Method 8270D |
| Subsurface soil (0 to 10 feet bgs) | FUELING AREA: Two borings (B23, B25) located within the former fueling area. Retain samples from 0-2 ft and 5-7 ft. | 4 | To establish existing and post remedial soil quality | Metals EPA Method 6010, Pesticides EPA Method 8081B, PCBs EPA Method 8082A |
| Subsurface soil (0 to 10 feet bgs) | FOUNDRY AREA: Four borings (B28-B31) located within the former foundry area. Retain samples from 0-2 ft and 5-7 ft. | 8 | To delineate metals associated with foundry area | Metals EPA Method 6010, |
| Subsurface soil (0 to 10 feet bgs) | FOUNDRY AREA: Two borings (B28, B30) located within the former foundry area. Retain samples from 0-2 ft and 5-7 ft. | 4 | To establish existing and post remedial soil quality | VOCs EPA Method 8260C, SVOCS EPA Method 8270D, Metals EPA Method 6010, Pesticides EPA Method 8081B, PCBs EPA Method 8082A |
| Subsurface soil (0 to 10 feet bgs) | LOADING DOCK AREA: Three borings (B32-B34) located within the loading dock. Retain samples from 5-7 ft and WT interface. | 6 | To establish existing and post remedial soil quality, and delineate potential petroleum at WT | VOCs EPA Method 8260C, SVOCS EPA Method 8270D |
| Subsurface soil (0 to 10 feet bgs) | LOADING DOCK AREA: Three borings (B32-B34) located within the loading dock. Retain samples from 5-7 ft | 3 | To establish existing and post remedial soil quality | Metals EPA Method 6010, Pesticides EPA Method 8081B, PCBs EPA Method 8082A |
| Subsurface soil (0 to 10 feet bgs) | SOUTH OF LOADINGDOCK AREA: Three borings (B35-B36) located along south side of loading dock. Retain samples from 0-2 ft and WT interface. | 8 | To establish existing and post remedial soil quality, and delineate potential petroleum at WT | VOCs EPA Method 8260C, SVOCS EPA Method 8270D, Metals EPA Method 6010, Pesticides EPA Method 8081B, PCBs EPA Method 8082A |
| **Total (Soils)** | | 43-48 | | |
| Groundwater (water table) | From eight existing monitoring wells (MW1-MW8)and ten new wells (MW10-MW19). | 18 | Assess overall groundwater quality | VOCs EPA Method 8260C, SVOCs EPA Method 8270D |
| Groundwater (water table) | From four existing monitoring wells (MW1, MW2, MW7, MW8) and six new wells (MW11, MW12, MW15, MW16, MW17 and MW19). | 10 | Assess overall groundwater quality | Pesticides EPA Method 8081B, PCBs EPA Method 8082A, TAL Metals (dissolved) EPA Method 6010 |
| **Total (Groundwater)** | | 28 | | |
| Soil Gas | From ten soil gas implants (SG1-SG10) to be installed on the Site. | 10 | Evaluate soil gas at the Site. | VOCs EPA Method TO15 |
| Sub-Slab Soil Gas | From four sub-slab points (SS1-SS4) located within exsting structures to be installed on the Site. | 4 | Evaluate soil gas at the Site. | VOCs EPA Method TO15 |
| **Total (Soil Gas)** | | 14 | | |
| MS/MSD | Matrix spike and Matrix spike duplicates at the rate 5% (1 per 20) | 4 | To meet requirements of QA / QC program | 3 MS/MSD (3 soil 1 GW) for VOCs, EPA Method 8260C, SVOCS EPA Method 8270D, for Pesticides EPA Method 8081B, PCBs EPA Method 8082A, TAL Metals (dissolved) EPA Method 6010 |
| Duplicate | Duplicates at the rate 10% per matrix. | 7 | To meet requirements of QA / QC program | 7 Duplicate Samples (5 soil 2 GW) for VOCs, EPA Method 8260C, SVOCS EPA Method 8270D, for Pesticides EPA Method 8081B, PCBs EPA Method 8082A, TAL Metals (dissolved) EPA Method 6010 |
| Trip Blanks | One laboratory prepared trip blank to accompany samples each time they are delivered to the laboratory. | 4 | To meet requirements of QA / QC program | VOCs EPA Method 8260C |
| **Total (QA / QC Samples)** | | 15 | | |

## TABLE 2
## SAMPLE COLLECTION AND ANALYSIS PROTOCOLS

| Sample Type | Matrix | Sampling Device | Parameter | Sample Container | Sample Preservation | Analytical Method# | CRQL / MDL | Holding Time |
|---|---|---|---|---|---|---|---|---|
| Soil | Soil | Scoop Direct into Jar | VOCs + TICs | (1) 2 oz Jar | Cool to 4$^{o}$ C | EPA Method 8260C | Compound specific (1-5 ug/kg) | 14 days |
| Soil | Soil | Scoop Direct into Jar | SVOCs | (1) 8 oz jar | Cool to 4$^{o}$ C | EPA Method 8270D | Compound specific (1-5 ug/kg) | 14 day ext/40 days |
| Soil | Soil | Scoop Direct into Jar | Pest/PCBs | from 8oz jar above | Cool to 4$^{o}$ C | EPA Method 8081B/8082A | Compound specific (1-5 ug/kg) | 14 day ext/40 days |
| Soil | Soil | Scoop Direct into Jar | Metals | from 8oz jar above | Cool to 4$^{o}$ C | TAL Metals | Compound specific (01-1 mg/kg) | 6 months |
| Groundwater | Water | Pump tubing | VOCs+ TICs | (3) 40 ml vials | Cool to 4$^{o}$ C | EPA Method 8260C | Compound specific (1-5 ug/L) | 14 days |
| Groundwater | Water | Pump tubing | SVOCs | (1) 1 Liter Amber Bottle | Cool to 4$^{o}$ C | EPA Method 8270D | Compound specific (1-5 ug/L) | 14 days |
| Groundwater | Water | Pump tubing | Pesticides and PCBs | (2) 1 Liter Amber Bottle | Cool to 4$^{o}$ C | EPA Method 8081B / 8082A | Compound specific (1-5 ug/L) | 14 days |
| Groundwater | water | Pump tubing | Total Metals | (1) 100 ml | HNO3 | TAL Metals 6010 | Compound specific (1-5 mg/L) | 6 months |
| Groundwater | water | Pump tubing | Dissolved Metals | (1) 100 ml | None | TAL Metals 6010 | Compound specific (1-5 mg/L) | 6 months |

*Notes*:
All holding times listed are from time of sample collection.
The number in parentheses in the "Sample Container" column denotes the number of containers needed.
Triple volume required when collected MS/MSD samples
The number of trip blanks are estimated.
CRQL / MDL = Contract Required Quantitation Limit / Method Detection Limit.

# ***ATTACHMENT B***
# *Health and Safety Plan*

# 11 WEST STREET
**BROOKLYN, NEW YORK**
**Block 2570, Lot 1**

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# INVESTIGATION
# HEALTH AND SAFETY PLAN

SEPTEMBER 2012

*Prepared By:*

EBC
ENVIRONMENTAL BUSINESS
1808 Middle Country Road
Ridge, NY 11961

**HEALTH AND SAFETY PLAN**
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**HEALTH AND SAFETY PLAN**
**207 Harrison Avenue, Brooklyn, New York**
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## STATEMENT OF COMMITMENT

This Health and Safety Plan (HASP) has been prepared to ensure that workers are not exposed to risks from hazardous materials during the planned Subsurface Investigation at the Site.

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

## 1.0 INTRODUCTION AND SITE ENTRY REQUIREMENTS

This document describes the health and safety guidelines developed by Environmental Business Consultants (EBC) for the subsurface investigation to be performed at 11 West Street, Brooklyn, New York to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes during subsurface investigation activities. In accordance with the Occupational Safety and Health Administration (OSHA) 29 CFR Part 1910.120 Hazardous Waste Operations and Emergency Response Final rule, this HASP, including the attachments, addresses safety and health hazards related to subsurface sample collection activities and is based on the best information available. The HASP may be revised by EBC at the request of the client and/or a regulatory agency upon receipt of new information regarding site conditions. Changes will be documented by written amendments signed by EBC's project manager, site safety officer and/or the EBC health and safety consultant.

### 1.1 Training Requirements

Personnel entering the exclusion zone or decontamination zone are required to be certified in health and safety practices for hazardous waste site operations as specified in the Federal OSHA Regulations CFR 1910.120e (revised 3/6/90).

Paragraph (e - 3) of the above referenced regulations requires that all on-site management personnel directly responsible for or who supervise employees engaged in hazardous waste operations, must initially receive 8 hours of supervisor training related to managing hazardous waste work.

Paragraph (e - 8) of the above referenced regulations requires that workers and supervisors receive 8 hours of refresher training annually on the items specified in Paragraph (e-1) and/or (e-3).

Additionally all on-site personnel must receive adequate site-specific training in the form of an on-site Health and Safety briefing prior to participating in field work with emphasis on the following:

- Protection of the adjacent community from hazardous vapors and / or dust which may be released during intrusive activities.
- Identification of chemicals known or suspected to be present on-site and the health effects and hazards of those substances.
- The need for vigilance in personnel protection, and the importance of attention to proper use, fit and care of personnel protective equipment.
- Decontamination procedures.
- Site control including work zones, access and security.
- Hazards and protection against heat or cold.
- The proper observance of daily health and safety practices, such as entry and exit of work zones and site. Proper hygiene during lunch, break, etc.
- Emergency procedures to be followed in case of fire, explosion and sudden release of hazardous gases.

Health and Safety meetings will be conducted on a daily basis and will cover protective clothing and other equipment to be used that day, potential and chemical and physical hazards, emergency procedures, and conditions and activities from the previous day.

## 1.2 Site Safety Plan Acceptance, Acknowledgment and Amendments

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

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

## 1.3 Key Personnel - Roles and Responsibilities

Personnel responsible for implementing this Health and Safety Plan are:

| Name | Title | Address | Contact Numbers |
|---|---|---|---|
| Mr. Kevin Brussee | EBC – Project Manager | 1808 Middle Country Rd Ridge, NY 11961 | (631) 504-6000 (631) 338-1749 |
| Mr. Kevin Waters | Site Safety Officer | 1808 Middle Country Rd Ridge, NY 11961 | (631) 504-6000 (516) 287-9023 |
| Mr. Joshua Faulk | Eastern Environmental Solutions, Inc. Equipment Operator | 258 Line Road, Manorville, NY | (631) 727-2700 (631) 774-9802 |

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

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

1. Educating personnel about information in this HASP and other safety requirements to be observed during site operations, including, but not limited to, decontamination procedures, designation of work zones and levels of protection, air monitoring, fit testing, and emergency procedures dealing with fire and first aid.

2. Coordinating site safety decisions with the project manager.

3. Designating exclusion, decontamination and support zones on a daily basis.

4. Monitoring the condition and status of known on-site hazards and maintaining and implementing the air quality monitoring program specified in this HASP.

5. Maintaining the work zone entry/exit log and site entry/exit log.

6. Maintaining records of safety problems, corrective measures and documentation of chemical exposures or physical injuries (the site safety officer will document these conditions in a bound notebook and maintain a copy of the notebook on-site).

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

## 2.0 SITE BACKGROUND AND SCOPE OF WORK

The street address for the Site is 11 West Street, Brooklyn, New York. The Site is identified as Block 2570, Lot 1 on the Borough of Brooklyn Tax Map (Kings County). The irregular shaped Lot has approximately 480 feet of frontage on West Street and is approximately 750 feet deep for a total area of 213,000 $ft^2$ (4.4 acres). The lot is improved with a 77,000 $ft^2$ 1-2 story building which was formally used by a trucking company as a freight terminal. At the time of the inspection, an 8 foot high chain link fence was erected around the property and the property was vacant.

The elevation of the property ranges from 1 to 9 feet above the National Geodetic Vertical Datum (NGVD). The depth to groundwater at the site is estimated to range from 5 to 10 feet below grade

A Phase II Subsurface Investigation is being conducted at the site to identify and characterize potential contaminants within the surface/subsurface soils, groundwater and soil gas at the site.

Results from this investigation will help determine what actions may be required, if any, to prevent exposure to contaminants from the change in use of the site. The work will be conducted in accordance with the procedures as required by the Environmental Review Process as administered by the New York City Office of Environmental Remediation (OER).

### 2.1 Scope of Subsurface Investigation

The subsurface investigation will include the installation of soil borings, groundwater monitoring wells and /or soil vapor implants. The location of the soil borings and monitoring wells are shown on **Figures 2 and 3** of the Subsurface Investigation Work Plan.

Soil borings will be advanced with Geoprobe direct push equipment and sampled with a 4 or 5 foot macro core sampler using disposable acetate liners. Soil will be characterized by a hydrogeologist or environmental technician and field screened for the presence of volatile organic compounds (VOCs) using a photo-ionization detector (PID). Retained samples from each boring will be submitted to a New York State Department of Health ELAP-certified laboratory for analysis.

The groundwater samples will be collected by installing a temporary monitoring well approximately 5 feet below the water table.

## 3.0 SITE HAZARD EVALUATION

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

This HASP has been developed for work performed at the site in association with a Phase II subsurface investigation. The primary hazards to the field crew will be physical hazards related to sample collection procedures and equipment, and chemical exposures to the sampling crew from exposure to potential contaminants which may be present at the site.

### 3.1 Physical Hazards

#### *3.1.1 Tripping Hazards*

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

#### *3.1.2 Cuts and Lacerations*

Field activities that involve drilling and boring equipment may result in cuts or lacerations from machinery and tools used in collecting samples, cutting disposable tubing and opening acetate sleeves and liners. A first aid kit approved by the American Red Cross will be available during all subsurface investigative activities.

#### *3.1.3 Lifting Hazards*

Improper lifting by workers is one of the leading causes of industrial injuries. Field workers and drillers may be required to lift heavy objects such as drilling tools, buckets of decontamination water, cement, etc. Therefore, all members of the field crew should be trained in the proper methods of lifting heavy objects. All workers should be cautioned against lifting objects too heavy for one person.

#### *3.1.4 Utility Hazards*

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

#### *3.1.5 Traffic Hazards*

All traffic, vehicular and pedestrian, shall be maintained and protected at all times consistent with local, state and federal agency regulations regarding such traffic and in accordance with NYCDOT guidelines. The drilling contractor shall carry on his operations without undue interference or delays to traffic. The drilling contractor shall furnish all labor, materials, guards,

barricades, signs, lights, and anything else necessary to maintain traffic and to protect his work and the public, during operations.

## 3.2 Work in Extreme Temperatures

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

### *3.2.1 Heat Stress*

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

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

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

2. Recognition and Treatment
    a. Heat Rash (or prickly heat):
        Cause: Continuous exposure to hot and humid air, aggravated by chafing clothing.
        Symptoms: Eruption of red pimples around sweat ducts accompanied by intense itching and tingling.
        Treatment: Remove source or irritation and cool skin with water or wet cloths.

    b. Heat Cramps (or heat prostration)
        Cause: Profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.
        Symptoms: Muscular weakness, staggering gait, nausea, dizziness, shallow breathing, pale and clammy skin, approximately normal body temperature.

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

c. Heat Stroke

| | |
|---|---|
| Cause: | Same as heat exhaustion. This is also an extremely serious condition. |
| Symptoms: | Dry and hot skin, dry mouth, dizziness, nausea, headache and rapid pulse. |
| Treatment: | Cool worker immediately by immersing or spraying with cool water or sponge bare skin after removing protective clothing. Transport to hospital. |

### *3.2.2 Cold Exposure*

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

## 3.3 Chemical Hazards

Urban fill, present throughout the New York City area, typically contain elevated levels of semi-volatile organic compounds and metals. These "contaminants" are not related to a chemical release occurring on the site, but are inherent in the reworked fill material in the area which contains ash and bits of tar and asphalt.

Based on the findings of the Phase I and use of adjacent properties, and the inherent properties of urban fill, the following compounds are considered for the site as potential contaminants: volatile organic compounds VOCs related to spills of petroleum fuels or industrial solvents, semi-volatile organic compounds (SVOCs) related to petroleum fuel spills or inherent in historic fill, pesticides related to historic use of the site, polychlorinated biphenyl's (PCBs), and heavy metals such as arsenic, chromium, lead and mercury related to historic fill materials.

The primary routes of exposure to these contaminants are inhalation, ingestion and absorption. **Appendix C** includes information sheets for suspected chemicals that may be encountered at the site.

### *3.3.1 Respirable Dust and Direct Contact with Soil and Groundwater*

Dust may be generated from drilling activities. If visible observation detects elevated levels of dust, a program of wetting will be employed by the site safety officer. If elevated dust levels persist, the site safety office will employ dust monitoring using a particulate monitor (Miniram or equivalent). If monitoring detects concentrations greater than the OSHA action level of 5,000 $\mu g/m^3$ over daily background, the site safety officer will take corrective actions as defined herein, including the use of water for dust suppression and if this is not effective, requiring workers to wear APRs with efficiency particulate air (HEPA) cartridges.

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

### *3.3.2 Organic Vapors*

Considering the past and present use of the properties, VOCs may be encountered at the site in soil and/or groundwater. Therefore, soil boring activities may cause the release of organic vapors to the atmosphere. The site safety officer will periodically monitor organic vapors with a Photoionization Detector (PID) during drilling activities to determine whether organic vapor concentrations exceed action levels shown below.

| PID Response | Action |
|---|---|
| Sustained readings of 5 ppm or greater | Shut down equipment and allow area to vent. Resume when readings return to background |
| Sustained readings of 5 ppm or greater that do not subside after venting | Implement Vapor Release Plan (Section 6.8). Re-evaluate respiratory protection as upgrade may be required. |

## 4.0 PERSONAL PROTECTIVE EQUIPMENT

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

### 4.1 Level D

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

- standard work 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.

### 4.2 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. The specifications on the APR filters used must be appropriate for contaminants identified or expected to be encountered. Level C PPE shall be donned when the identified contaminants have adequate warning properties and criteria for using APR have been met. Level C PPE consists of:

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

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

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

## 4.3 Activity-Specific Levels of Personal Protection

The required level of PPE is activity-specific and is based on air monitoring results (Section 4.0) and properties of identified or expected contaminants. **It is expected that site work will be performed in Level D.** If air monitoring results indicate the necessity to upgrade (i.e dust above 5,000 $\mu g/m^3$ or sustained VOCs above 5 ppm in the breathing zone) the level of protection engineering controls (i.e. Facing equipment away from the wind and placing site personnel upwind of excavations, active venting, etc.) will be implemented before requiring the use of respiratory protection.

## 5.0 SITE CONTROL

### 5.1 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. **It is expected that for soil boring and sampling activities, identification of an exclusion zone, decontamination zone, and support zone will not be necessary.**

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 Health and 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. All personnel and equipment exit the exclusion zone through the decontamination zone. If a decontamination trailer is provided the first aid equipment, an eye wash unit, and drinking water are kept in the decontamination trailer.

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

## 6.0 CONTINGENCY PLAN/EMERGENCY RESPONSE PLAN

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

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

### 6.1 Emergency Equipment On-site

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

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

### 6.2 Emergency Telephone Numbers

| | |
|---|---|
| General Emergencies | 911 |
| New York City Police | 911 |
| Woodhull Medical Center | 1-718-963-8000 |
| NYSDEC Spills Division | 1-800-457-7362 |
| NYSDEC Hazardous Waste Division | 1-718-482-4994 |
| NYCDEP | 1-718-699-9811 |
| NYC Department of Health | 1-212-788-4711 |
| NYC Fire Department | 911 |
| National Response Center | 1-800-424-8802 |
| Poison Control | 1-212-340-4494 |
| Site Safety Officer | 1-631-504-6000 |
| Alternate Site Safety Officer | 1-631-504-6000 |

### 6.3 Personnel Responsibilities During an Emergency

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

- Take appropriate measures to protect personnel including: withdrawal from the exclusion zone, evacuate and secure the site, or upgrade/downgrade the level of protective clothing and respiratory protection;

- Ensure that appropriate federal, state, and local agencies are informed and emergency

response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. If toxic materials are released to the air, the local authorities should be informed in order to assess the need for evacuation;

- Ensure appropriate decontamination, treatment, or testing for exposed or injured personnel;

- Determine the cause of incidents and make recommendations to prevent recurrence; and,

- Ensure that all required reports have been prepared.

The following key personnel are planned for this project:

- Project Manager — Mr. Kevin Brussee (631) 504-6000
- Alternate — Mr. Charles Sosik (631) 504-6000
- Site Safety Officer — Mr. Kevin Waters (631) 504-6000
- Alternate — Mr. Dominic Mosca (631) 504-6000

## 6.4 Medical Emergencies

A person who becomes ill or injured in the exclusion zone will be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination will be completed and first aid administered prior to transport. First aid will be administered while waiting for an ambulance or paramedics. A Field Accident Report (**Appendix D**) must be filled out for any injury.

A person transporting an injured/exposed person to a clinic or hospital for treatment will take the directions to the hospital (**Appendix D**) and information on the chemical(s) to which they may have been exposed (**Appendix C**).

## 6.5 Fire or Explosion

In the event of a fire or explosion, the local fire department will be summoned immediately. The site safety officer or his designated alternate will advise the fire commander of the location, nature and identification of the hazardous materials on-site. If it is safe to do so, site personnel may:

- use fire fighting equipment available on site; or,
- remove or isolate flammable or other hazardous materials that may contribute to the fire.

## 6.6 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.

## 6.7 Spill Control Procedures

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

## 6.8 Vapor Release Plan

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

If 5 ppm of VOCs are recorded over background on a PID at the property line, then an off-site reading will be taken within 20 feet of the nearest residential or commercial property, whichever

is closer. If efforts to mitigate the emission source are unsuccessful for 30 minutes, then the designated site safety officer will:

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

# *APPENDIX A*

# *SITE SAFETY ACKNOWLEDGEMENT FORM*

## DAILY BREIFING SIGN-IN SHEET

Date:_____ Person Conducting Briefing:_____

Project Name and Location:_____

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

_____

_____

_____

_____

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

_____

_____

_____

3. ATTENDEES (Print Name):

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

# *APPENDIX B*

# *SITE SAFETY PLAN AMENDMENTS*

## SITE SAFETY PLAN AMENDMENT FORM

**Site Safety Plan Amendment #:** _____

**Site Name:** _____

**Reason for Amendment:** _____

_____

_____

_____

**Alternative Procedures:** _____

_____

_____

_____

**Required Changes in PPE:** _____

_____

_____

_____

_____ _____

**Project Superintendent (signature)** **Date**

_____ _____

**Health and Safety Consultant (signature)** **Date**

_____ _____

**Site Safety Officer (signature)** **Date**

# *APPENDIX C*

# *CHEMICAL HAZARDS*

## CHEMICAL HAZARDS

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

# International Chemical Safety Cards

## BENZENE

**ICSC: 0015**

Cyclohexatriene
Benzol
$C_6H_6$
Molecular mass: 78.1

ICSC # 0015
CAS # 71-43-2
RTECS # CY1400000
UN # 1114
EC # 601-020-00-8
May 06, 2003 Peer reviewed


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

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus. | Fireproof. Separated from food and feedstuffs oxidants halogens | Do not transport with food and feedstuffs.<br>Note: E<br>F symbol<br>T symbol<br>R: 45-46-11-36/38-48/23/24/25-65<br>S: 53-45<br>UN Hazard Class: 3<br>UN Packing Group: II |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0015**

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

# International Chemical Safety Cards

## BENZENE

**ICSC: 0015**

**I M P O R T A N T D A T A**

**PHYSICAL STATE; APPEARANCE:**
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

**PHYSICAL DANGERS:**
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

**CHEMICAL DANGERS:**
Reacts violently with oxidants, nitric acid, sulfuric acid and halogens causing fire and explosion hazard. Attacks plastic and rubber.

**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: 0.5 ppm as TWA 2.5 ppm as STEL (skin) A1 BEI (ACGIH 2004).
MAK: H
Carcinogen category: 1 Germ cell mutagen group: 3A (DFG 2004).
OSHA PEL: 1910.1028 TWA 1 ppm ST 5 ppm See Appendix F
NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A
NIOSH IDLH: Ca 500 ppm See: 71432

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation through the skin and by ingestion

**INHALATION RISK:**
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

**EFFECTS OF SHORT-TERM EXPOSURE:**
The substance is irritating to the eyes the skin and the respiratory tract Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system , resulting in lowering of consciousness Exposure far above the occupational exposure limit value may result in unconsciousness death

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
The liquid defats the skin. The substance may have effects on the bone marrow immune system , resulting in a decrease of blood cells. This substance is carcinogenic to humans.

**PHYSICAL PROPERTIES**

Boiling point: 80°C
Melting point: 6°C
Relative density (water = 1): 0.88
Solubility in water, g/100 ml at 25°C: 0.18
Vapour pressure, kPa at 20°C: 10
Relative vapour density (air = 1): 2.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2
Flash point:
-11°C c.c.
Auto-ignition temperature: 498°C
Explosive limits, vol% in air: 1.2-8.0
Octanol/water partition coefficient as log Pow: 2.13

**ENVIRONMENTAL DATA**

The substance is very toxic to aquatic organisms.

**N O T E S**

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-30S1114 / 30GF1-II
NFPA Code: H2; F3; R0

**ADDITIONAL INFORMATION**

**ICSC: 0015** **BENZENE**



**IMPORTANT LEGAL NOTICE:**

# International Chemical Safety Cards

## TOLUENE

**ICSC: 0078**

Methylbenzene
Toluol
Phenylmethane
$C_6H_5CH_3$ / $C_7H_8$
Molecular mass: 92.1

ICSC # 0078
CAS # 108-88-3
RTECS # XS5250000
UN # 1294
EC # 601-021-00-3
October 10, 2002 Peer reviewed


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

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Evacuate danger area in large spill! Consult an expert in large spill! Remove all ignition sources. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: self-contained breathing apparatus | Fireproof. Separated from strong oxidants. | F symbol<br>Xn symbol<br>R: 11-38-48/20-63-65-67<br>S: 2-36/37-46-62<br>UN Hazard Class: 3<br>UN Packing Group: II |

**ICSC: 0078**

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

# International Chemical Safety Cards

## TOLUENE

**ICSC: 0078**

**IMPORTANT DATA**

**PHYSICAL STATE; APPEARANCE:**
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

**PHYSICAL DANGERS:**
The vapour mixes well with air, explosive mixtures are formed easily. As a result of flow, agitation, etc., electrostatic charges can be generated.

**CHEMICAL DANGERS:**
Reacts violently with strong oxidants causing fire and explosion hazard.

**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: 50 ppm as TWA (skin) A4 BEI issued (ACGIH 2004).
MAK: 50 ppm 190 mg/m³ H
Peak limitation category: II(4) Pregnancy risk group: C (DFG 2004).
OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)
NIOSH REL: TWA 100 ppm (375 mg/m$^3$) ST 150 ppm (560 mg/m$^3$)
NIOSH IDLH: 500 ppm See: 108883

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

**INHALATION RISK:**
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

**EFFECTS OF SHORT-TERM EXPOSURE:**
The substance is irritating to the eyes and the respiratory tract The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels may result in cardiac dysrhythmiaandunconsciousness.

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
The liquid defats the skin. The substance may have effects on the central nervous system Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

**PHYSICAL PROPERTIES**

Boiling point: 111°C
Melting point: -95°C
Relative density (water = 1): 0.87
Solubility in water: none
Vapour pressure, kPa at 25°C: 3.8
Relative vapour density (air = 1): 3.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 4°C c.c.
Auto-ignition temperature: 480°C
Explosive limits, vol% in air: 1.1-7.1
Octanol/water partition coefficient as log Pow: 2.69

**ENVIRONMENTAL DATA**

The substance is toxic to aquatic organisms.

**N O T E S**

Depending on the degree of exposure, periodic medical examination is suggested. Use of alcoholic beverages enhances the harmful effect.

Transport Emergency Card: TEC (R)-30S1294
NFPA Code: H 2; F 3; R 0;

**ADDITIONAL INFORMATION**

# International Chemical Safety Cards

## m-XYLENE

**ICSC: 0085**

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

ICSC # 0085
CAS # 108-38-3
RTECS # ZE2275000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated


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

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.) | Fireproof. Separated from strong oxidants strong acids | Note: C<br>Xn symbol<br>R: 10-20/21-38<br>S: 2-25<br>UN Hazard Class: 3<br>UN Packing Group: III |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0085**

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

# International Chemical Safety Cards

## m-XYLENE

**ICSC: 0085**

**I M P O R T A N T D A T A**

**PHYSICAL STATE; APPEARANCE:**
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

**PHYSICAL DANGERS:**
As a result of flow, agitation, etc., electrostatic charges can be generated.

**CHEMICAL DANGERS:**
Reacts with strong acids strong oxidants

**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: 100 ppm as TWA 150 ppm as STEL A4 (ACGIH 2001). BEI (ACGIH 2001).
MAK: 100 ppm 440 mg/m³
Peak limitation category: II(2)
skin absorption (H);
Pregnancy risk group: D
(DFG 2005).
EU OEL: 50 ppm as TWA 100 ppm as STEL (skin) (EU 2000).
OSHA PEL†: TWA 100 ppm (435 mg/m$^3$)
NIOSH REL: TWA 100 ppm (435 mg/m$^3$) ST 150 ppm (655 mg/m$^3$)
NIOSH IDLH: 900 ppm See: 95476

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

**INHALATION RISK:**
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

**EFFECTS OF SHORT-TERM EXPOSURE:**
The substance is irritating to the eyes and the skin The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
The liquid defats the skin. The substance may have effects on the central nervous system Animal tests show that this substance possibly causes toxicity to human reproduction or development.

**PHYSICAL PROPERTIES**

Boiling point: 139°C
Melting point: -48°C
Relative density (water = 1): 0.86
Solubility in water:
none
Vapour pressure, kPa at 20°C: 0.8

Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 27°C c.c.
Auto-ignition temperature: 527°C
Explosive limits, vol% in air: 1.1-7.0
Octanol/water partition coefficient as log Pow: 3.20

**ENVIRONMENTAL DATA**

The substance is toxic to aquatic organisms.

**N O T E S**

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

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

**ADDITIONAL INFORMATION**

**ICSC: 0085** **m-XYLENE**

# International Chemical Safety Cards

## o-XYLENE

**ICSC: 0084**

ortho-Xylene
1,2-Dimethylbenzene
o-Xylol
$C_6H_4(CH_3)_2$ / $C_8H_{10}$
Molecular mass: 106.2

ICSC # 0084
CAS # 95-47-6
RTECS # ZE2450000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated


| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Flammable. | NO open flames, NO sparks, and NO smoking. | Powder, water spray, foam, carbon dioxide. |
| **EXPLOSION** | Above 32°C explosive vapour/air mixtures may be formed. | Above 32°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding). | In case of fire: keep drums, etc., cool by spraying with water. |
| **EXPOSURE** | | STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! | |
| **•INHALATION** | Dizziness. Drowsiness. Headache. Nausea. | Ventilation, local exhaust, or breathing protection. | Fresh air, rest. Refer for medical attention. |
| **•SKIN** | Dry skin. Redness. | Protective gloves. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| **•EYES** | Redness. Pain. | Safety spectacles. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | Burning sensation. Abdominal pain. (Further see Inhalation). | Do not eat, drink, or smoke during work. | Rinse mouth. Do NOT induce vomiting. Refer for medical attention. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.) | Fireproof. Separated from strong oxidants strong acids | Note: C<br>Xn symbol<br>R: 10-20/21-38<br>S: 2-25<br>UN Hazard Class: 3<br>UN Packing Group: III |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0084**

# International Chemical Safety Cards

## o-XYLENE

**ICSC: 0084**

| | |
|---|---|
| **I M P O R T A N T D A T A** | **PHYSICAL STATE; APPEARANCE:**<br>COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.<br><br>**PHYSICAL DANGERS:**<br>As a result of flow, agitation, etc., electrostatic charges can be generated.<br><br>**CHEMICAL DANGERS:**<br>Reacts with strong acids strong oxidants<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV: 100 ppm as TWA 150 ppm as STEL A4 (ACGIH 2001). BEI (ACGIH 2001).<br>MAK: 100 ppm 440 mg/m³<br>Peak limitation category: II(2)<br>skin absorption (H);<br>Pregnancy risk group: D<br>(DFG 2005).<br>EU OEL: 50 ppm as TWA 100 ppm as STEL<br>(skin)<br>(EU 2000).<br>OSHA PEL†: TWA 100 ppm (435 mg/m$^3$)<br>NIOSH REL: TWA 100 ppm (435 mg/m$^3$) ST 150 ppm (655 mg/m$^3$)<br>NIOSH IDLH: 900 ppm See: 95476<br><br>**ROUTES OF EXPOSURE:**<br>The substance can be absorbed into the body by inhalation, through the skin and by ingestion.<br><br>**INHALATION RISK:**<br>A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br>The substance is irritating to the eyes and the skin The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development. |
| **PHYSICAL PROPERTIES** | Boiling point: 144°C<br>Melting point: -25°C<br>Relative density (water = 1): 0.88<br>Solubility in water:<br>none<br>Vapour pressure, kPa at 20°C: 0.7<br><br>Relative vapour density (air = 1): 3.7<br>Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02<br>Flash point: 32°C c.c.<br>Auto-ignition temperature: 463°C<br>Explosive limits, vol% in air: 0.9-6.7<br>Octanol/water partition coefficient as log Pow: 3.12 |
| **ENVIRONMENTAL DATA** | The substance is toxic to aquatic organisms.  |

**N O T E S**

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0086 p-Xylene and 0085 m-Xylene.

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

**ADDITIONAL INFORMATION**

**ICSC: 0084** **o-XYLENE**

# International Chemical Safety Cards

## p-XYLENE

**ICSC: 0086**

para-Xylene
1,4-Dimethylbenzene
p-Xylol
$C_6H_4(CH_3)_2$ / $C_8H_{10}$
Molecular mass: 106.2

ICSC # 0086
CAS # 106-42-3
RTECS # ZE2625000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated


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

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.) | Fireproof. Separated from strong oxidants, strong acids | Note: C<br>Xn symbol<br>R: 10-20/21-38<br>S: 2-25<br>UN Hazard Class: 3<br>UN Packing Group: III |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0086**

# International Chemical Safety Cards

## p-XYLENE

**ICSC: 0086**

| | |
|---|---|
| **I M P O R T A N T D A T A** | **PHYSICAL STATE; APPEARANCE:**<br>COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.<br><br>**PHYSICAL DANGERS:**<br>As a result of flow, agitation, etc., electrostatic charges can be generated.<br><br>**CHEMICAL DANGERS:**<br>Reacts with strong acids strong oxidants<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV: 100 ppm as TWA 150 ppm as STEL A4 (ACGIH 2001). BEI (ACGIH 2001).<br>MAK: 100 ppm 440 mg/m³<br>Peak limitation category: II(2)<br>skin absorption (H);<br>Pregnancy risk group: D<br>(DFG 2005).<br>EU OEL: 50 ppm as TWA 100 ppm as STEL (skin) (EU 2000).<br>OSHA PEL†: TWA 100 ppm (435 mg/m$^3$)<br>NIOSH REL: TWA 100 ppm (435 mg/m$^3$) ST 150 ppm (655 mg/m$^3$)<br>NIOSH IDLH: 900 ppm See: 95476<br><br>**ROUTES OF EXPOSURE:**<br>The substance can be absorbed into the body by inhalation, through the skin and by ingestion.<br><br>**INHALATION RISK:**<br>A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br>The substance is irritating to the eyes and the skin The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>The liquid defats the skin. The substance may have effects on the central nervous system. Animal tests show that this substance possibly causes toxicity to human reproduction or development. |
| **PHYSICAL PROPERTIES** | Boiling point: 138°C<br>Melting point: 13°C<br>Relative density (water = 1): 0.86<br>Solubility in water:<br>none<br>Vapour pressure, kPa at 20°C: 0.9<br><br>Relative vapour density (air = 1): 3.7<br>Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02<br>Flash point: 27°C c.c.<br>Auto-ignition temperature: 528°C<br>Explosive limits, vol% in air: 1.1-7.0<br>Octanol/water partition coefficient as log Pow: 3.15 |
| **ENVIRONMENTAL DATA** | The substance is toxic to aquatic organisms.  |

**N O T E S**

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0084 o-Xylene and 0085 m-Xylene.

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

**ADDITIONAL INFORMATION**

**ICSC: 0086** **p-XYLENE**

# International Chemical Safety Cards

## 1,2,4-TRIMETHYLBENZENE

**ICSC: 1433**

Pseudocumene

$C_9H_{12}$

Molecular mass: 120,2

ICSC # 1433
CAS # 95-63-6
RTECS # DC3325000
UN # 1993
EC # 601-043-00-3
March 06, 2002 Peer reviewed


| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Flammable. | NO open flames, NO sparks, and NO smoking. | Alcohol-resistant foam, dry powder, carbon dioxide. |
| **EXPLOSION** | Above 44°C explosive vapour/air mixtures may be formed. | Above 44°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding). | In case of fire: keep drums, etc., cool by spraying with water. |
| **EXPOSURE** | | PREVENT GENERATION OF MISTS! | |
| **•INHALATION** | Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting. | Ventilation, local exhaust, or breathing protection. | Fresh air, rest. Refer for medical attention. |
| **•SKIN** | Redness. Dry skin. | Protective gloves. | Rinse skin with plenty of water or shower. |
| **•EYES** | Redness. Pain. | Safety spectacles. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | (See Inhalation). | Do not eat, drink, or smoke during work. | Rinse mouth. Do NOT induce vomiting. Refer for medical attention. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: filter respirator for organic gases and vapours. | Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room. | Xn symbol<br>N symbol<br>R: 10-20-36/37/38-51/53<br>S: 2-26-61<br>UN Hazard Class: 3<br>UN Packing Group: III |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 1433**

# International Chemical Safety Cards

## 1,2,4-TRIMETHYLBENZENE

**ICSC: 1433**

| | | |
|---|---|---|
| **IMPORTANT DATA** | **PHYSICAL STATE; APPEARANCE:**<br>COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.<br><br>**PHYSICAL DANGERS:**<br><br>**CHEMICAL DANGERS:**<br>The substance decomposes on burning producing toxic and irritating fumes Reacts violently with strong oxidants causing fire and explosion hazard.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV: (as mixed isomers) 25 ppm as TWA (ACGIH 2004).<br>MAK: (as mixed isomers) 20 ppm 100 mg/m³<br>Peak limitation category: II(2) Pregnancy risk group: C (DFG 2004).<br>OSHA PEL†: none<br>NIOSH REL: TWA 25 ppm (125 mg/m$^3$)<br>NIOSH IDLH: N.D. See: IDLH INDEX | **ROUTES OF EXPOSURE:**<br>The substance can be absorbed into the body by inhalation.<br><br>**INHALATION RISK:**<br>A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br>The substance is irritating to the eyes the skin and the respiratory tract If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>The liquid defats the skin. Lungs may be affected by repeated or prolonged exposure , resulting in chronic bronchitis The substance may have effects on the central nervous system blood See Notes. |
| **PHYSICAL PROPERTIES** | Boiling point: 169°C<br>Melting point: -44°C<br>Relative density (water = 1): 0.88<br>Solubility in water:<br>very poor<br>Relative vapour density (air = 1): 4.1 | Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01<br>Flash point: 44°C c.c.<br>Auto-ignition temperature: 500°C<br>Explosive limits, vol% in air: 0.9-6.4<br>Octanol/water partition coefficient as log Pow: 3.8 |
| **ENVIRONMENTAL DATA** | The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.  | |

**N O T E S**

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is suggested. See also ICSC 1155 1,3,5-Trimethylbenzene (Mesitylene), ICSC 1362 1,2,3-Trimethylbenzene (Hemimellitene), ICSC 1389 Trimethyl benzene (mixed isomers). 1,3,5-Trimethylbenzene (Mesitylene) is classified as a marine pollutant.

Transport Emergency Card: TEC (R)-30GF1-III
NFPA Code: H0; F2; R0;

**ADDITIONAL INFORMATION**

# International Chemical Safety Cards

## ETHYLBENZENE

**ICSC: 0268**

Ethylbenzol
Phenylethane
EB
$C_8H_{10}$ / $C_6H_5C_2H_5$
Molecular mass: 106.2

ICSC # 0268
CAS # 100-41-4
RTECS # DA0700000
UN # 1175
EC # 601-023-00-4
March 13, 1995 Validated


| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Highly flammable. | NO open flames, NO sparks, and NO smoking. | Powder, AFFF, foam, carbon dioxide. |
| **EXPLOSION** | Vapour/air mixtures are explosive. | Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. | In case of fire: keep drums, etc., cool by spraying with water. |
| **EXPOSURE** | | PREVENT GENERATION OF MISTS! | |
| •**INHALATION** | Cough. Dizziness. Drowsiness. Headache. | Ventilation, local exhaust, or breathing protection. | Fresh air, rest. Refer for medical attention. |
| •**SKIN** | Dry skin. Redness. | Protective gloves. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| •**EYES** | Redness. Pain. Blurred vision. | Face shield or eye protection in combination with breathing protection. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| •**INGESTION** | (Further see Inhalation). | Do not eat, drink, or smoke during work. | Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Ventilation. Collect leaking liquid in covered containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Personal protection: A filter respirator for organic gases and vapours. | Fireproof. Separated from strong oxidants. | F symbol<br>Xn symbol<br>R: 11-20<br>S: 2-16-24/25-29<br>UN Hazard Class: 3<br>UN Packing Group: II |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0268**

# International Chemical Safety Cards

## ETHYLBENZENE

**ICSC: 0268**

| | | |
|---|---|---|
| **IMPORTANT DATA** | **PHYSICAL STATE; APPEARANCE:**<br>COLOURLESS LIQUID , WITH AROMATIC ODOUR.<br><br>**PHYSICAL DANGERS:**<br>The vapour mixes well with air, explosive mixtures are easily formed.<br><br>**CHEMICAL DANGERS:**<br>Reacts with strong oxidants. Attacks plastic and rubber.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV: 100 ppm as TWA 125 ppm as STEL A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued (ACGIH 2005).<br>MAK: skin absorption (H);<br>Carcinogen category: 3A;<br>(DFG 2004).<br>OSHA PEL†: TWA 100 ppm (435 mg/m$^3$)<br>NIOSH REL: TWA 100 ppm (435 mg/m$^3$) ST 125 ppm (545 mg/m$^3$)<br>NIOSH IDLH: 800 ppm 10%LEL See: 100414 | **ROUTES OF EXPOSURE:**<br>The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.<br><br>**INHALATION RISK:**<br>A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br>The substance is irritating to the eyes the skin and the respiratory tract Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system Exposure far above the OEL could cause lowering of consciousness.<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>Repeated or prolonged contact with skin may cause dermatitis. |
| **PHYSICAL PROPERTIES** | Boiling point: 136°C<br>Melting point: -95°C<br>Relative density (water = 1): 0.9<br>Solubility in water, g/100 ml at 20°C: 0.015<br>Vapour pressure, kPa at 20°C: 0.9<br>Relative vapour density (air = 1): 3.7 | Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02<br>Flash point: 18°C c.c.<br>Auto-ignition temperature: 432°C<br>Explosive limits, vol% in air: 1.0-6.7<br>Octanol/water partition coefficient as log Pow: 3.2 |
| **ENVIRONMENTAL DATA** | The substance is harmful to aquatic organisms.  | |

**N O T E S**

The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-30S1175 or 30GF1-I+II
NFPA Code: H2; F3; R0

**ADDITIONAL INFORMATION**





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

# International Chemical Safety Cards

## 1,3,5-TRIMETHYLBENZENE

**ICSC: 1155**

Mesitylene
$C_9H_{12}$
Molecular mass: 120.2

ICSC # 1155
CAS # 108-67-8
RTECS # OX6825000
UN # 2325
EC # 601-025-00-5
March 06, 2002 Peer reviewed

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Flammable. | NO open flames, NO sparks, and NO smoking. | Alcohol-resistant foam, dry powder, carbon dioxide. |
| **EXPLOSION** | Above 50°C explosive vapour/air mixtures may be formed. | Above 50°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding). | In case of fire: keep drums, etc., cool by spraying with water. |
| **EXPOSURE** | | PREVENT GENERATION OF MISTS! | |
| **•INHALATION** | Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting. | Ventilation, local exhaust, or breathing protection. | Fresh air, rest. Refer for medical attention. |
| **•SKIN** | Redness. Dry skin. | Protective gloves. | Remove contaminated clothes. Rinse skin with plenty of water or shower. |
| **•EYES** | Redness. Pain. | Safety spectacles. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | (See Inhalation). | Do not eat, drink, or smoke during work. | Rinse mouth. Do NOT induce vomiting. Refer for medical attention. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.) | Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room. | Marine pollutant.<br>Xi symbol<br>N symbol<br>R: 10-37-51/53<br>S: 2-61<br>UN Hazard Class: 3<br>UN Packing Group: III |

**SEE IMPORTANT INFORMATION ON BACK**

# International Chemical Safety Cards

## 1,3,5-TRIMETHYLBENZENE

**ICSC: 1155**

| | | |
|---|---|---|
| **IMPORTANT DATA** | **PHYSICAL STATE; APPEARANCE:**<br>COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.<br><br>**PHYSICAL DANGERS:**<br><br>**CHEMICAL DANGERS:**<br>The substance decomposes on burning producing toxic and irritating fumes. Reacts violently with strong oxidants causing fire and explosion hazard.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV (as mixed isomers): 25 ppm; (ACGIH 2001).<br>MAK (all isomers): 20 ppm; 100 mg/m$^3$; class II 1 © (2001)<br>OSHA PEL†: none<br>NIOSH REL: TWA 25 ppm (125 mg/m$^3$)<br>NIOSH IDLH: N.D. See: IDLH INDEX | **ROUTES OF EXPOSURE:**<br>The substance can be absorbed into the body by inhalation.<br><br>**INHALATION RISK:**<br>A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br>The substance is irritating to the eyes the skin and the respiratory tract If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system.<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>The liquid defats the skin. Lungs may be affected by repeated or prolonged exposure, resulting in chronic bronchitis. The substance may have effects on the central nervous system blood See Notes. |
| **PHYSICAL PROPERTIES** | Boiling point: 165°C<br>Melting point: -45°C<br>Relative density (water = 1): 0.86<br>Solubility in water:<br>very poor<br>Vapour pressure, kPa at 20°C: 0.25 | Relative vapour density (air = 1): 4.1<br>Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01<br>Flash point: 50°C (c.c.)<br>Auto-ignition temperature: 550°C<br>Octanol/water partition coefficient as log Pow: 3.42 |
| **ENVIRONMENTAL DATA** | The substance is harmful to aquatic organisms. Bioaccumulation of this chemical may occur in fish.  | |

**N O T E S**

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. See ICSC 1433 1,2,4-Trimethylbenzene (Pseudocumene), ICSC 1362 1,2,3-Trimethylbenzene (Hemimellitene), ICSC 1389 Trimethyl benzene (mixed isomers).

Transport Emergency Card: TEC (R)-30S2325
NFPA Code: H0; F2; R0

**ADDITIONAL INFORMATION**

# International Chemical Safety Cards

## PYRENE

**ICSC: 1474**

Benzo (d,e,f) phenanthrene
beta-Pyrene
$C_{16}H_{10}$
Molecular mass: 202.26

ICSC # 1474
CAS # 129-00-0
RTECS # UR2450000
November 27, 2003 Peer reviewed

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Gives off irritating or toxic fumes (or gases) in a fire. | NO open flames, NO sparks, and NO smoking. | Water spray, carbon dioxide, dry powder, alcohol-resistant foam, foam. |
| **EXPLOSION** | | | |
| **EXPOSURE** | | | |
| **•INHALATION** | | Avoid inhalation of dust | Fresh air, rest. |
| **•SKIN** | Redness. | Protective gloves. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| **•EYES** | Redness. | Safety spectacles. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | | Do not eat, drink, or smoke during work. | Do NOT induce vomiting. Give plenty of water to drink. Refer for medical attention. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder Do NOT let this chemical enter the environment. (Extra personal protection: P2 filter respirator for harmful particles.) | Separated from strong oxidants. Keep in a well-ventilated room. | Do not transport with food and feedstuffs.<br>R:<br>S: |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 1474**

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

# International Chemical Safety Cards

## PYRENE

**ICSC: 1474**

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|---|---|---|
| **I**<br><br>**M** | **PHYSICAL STATE; APPEARANCE:**<br>YELLOW COLOURLESS SOLID IN VARIOUS FORMS | **ROUTES OF EXPOSURE:**<br>The substance can be absorbed into the body by inhalation through the skin and by ingestion |

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|---|---|
| **P O R T A N T D A T A** | **PHYSICAL DANGERS:**<br><br>**CHEMICAL DANGERS:**<br>The substance decomposes on heating producing irritating fumes<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV not established.<br>MAK not established.<br><br>**INHALATION RISK:**<br>Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br>Exposure to sun may provoke an irritating effect of pyrene on skin and lead to chronic skin discoloration.<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** |

| | | |
|---|---|---|
| **PHYSICAL PROPERTIES** | Boiling point: 404°C<br>Melting point: 151°C<br>Density: 1.27<br>g/cm3 | Solubility in water: 0.135 mg/l<br>at 25°C<br>Vapour pressure, Pa at °C: 0.08<br>Octanol/water partition coefficient as log Pow: 4.88 |
| **ENVIRONMENTAL DATA** | Bioaccumulation of this chemical may occur in crustacea,in fish,in milk,in algae andin molluscs. It is strongly advised that this substance does not enter the environment.  | |

**N O T E S**

Pyrene is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, pyrene may be encountered as a laboratory chemical in its pure form. Health effects of exposure to the substance have not been investigated adequately. See ICSC 1415 Coal-tar pitch.

**ADDITIONAL INFORMATION**

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**ICSC: 1474** **PYRENE**



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

# International Chemical Safety Cards

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

**ICSC: 0730**

o-Phenylenepyrene
2,3-Phenylenepyrene
$C_{22}H_{12}$
Molecular mass: 276.3

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

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | | | In case of fire in the surroundings: use appropriate extinguishing media. |
| **EXPLOSION** | | | |
| **EXPOSURE** | | AVOID ALL CONTACT! | |
| **•INHALATION** | | Local exhaust or breathing protection. | Fresh air, rest. |
| **•SKIN** | | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| **•EYES** | | Safety spectacles or eye protection in combination with breathing protection. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | | Do not eat, drink, or smoke during work. | Rinse mouth. Refer for medical attention. |

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

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0730**

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

# International Chemical Safety Cards

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

**ICSC: 0730**

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

| | | |
|---|---|---|
| **O R T A N T D A T A** | **CHEMICAL DANGERS:**<br>Upon heating, toxic fumes are formed.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV not established.<br>MAK:<br>Carcinogen category: 2;<br>(DFG 2004). | Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>This substance is possibly carcinogenic to humans. |
| **PHYSICAL PROPERTIES** | Boiling point: 536°C<br>Melting point: 164°C<br>Solubility in water:<br>none | Octanol/water partition coefficient as log Pow: 6.58 |
| **ENVIRONMENTAL DATA** | This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in fish.  | |

**N O T E S**

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

**ADDITIONAL INFORMATION**

**ICSC: 0730** **INDENO(1,2,3-cd)PYRENE**

# International Chemical Safety Cards

## DIBENZO(a,h)ANTHRACENE

**ICSC: 0431**

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

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

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Combustible. | NO open flames. | Water spray, powder. |
| **EXPLOSION** | | | |
| **EXPOSURE** | | AVOID ALL CONTACT! | |
| **•INHALATION** | | Local exhaust or breathing protection. | Fresh air, rest. |
| **•SKIN** | Redness. Swelling. Itching. | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| **•EYES** | Redness. | Face shield or eye protection in combination with breathing protection. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | | Do not eat, drink, or smoke during work. Wash hands before eating. | Rinse mouth. |

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

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0431**

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

# International Chemical Safety Cards

## DIBENZO(a,h)ANTHRACENE

**ICSC: 0431**

**I**

**M**

**P**

**O**

**PHYSICAL STATE; APPEARANCE:**
COLOURLESS CRYSTALLINE POWDER.

**PHYSICAL DANGERS:**

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

**INHALATION RISK:**
Evaporation at 20°C is negligible; a harmful concentration

| | | |
|---|---|---|
| **R T A N T D A T A** | **CHEMICAL DANGERS:**<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV not established. | of airborne particles can, however, be reached quickly.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>The substance may have effects on the skin , resulting in photosensitization. This substance is probably carcinogenic to humans. |
| **PHYSICAL PROPERTIES** | Boiling point: 524°C<br>Melting point: 267°C<br>Relative density (water = 1): 1.28 | Solubility in water:<br>none<br>Octanol/water partition coefficient as log Pow: 6.5 |
| **ENVIRONMENTAL DATA** | Bioaccumulation of this chemical may occur in seafood.  | |

**N O T E S**

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

**ADDITIONAL INFORMATION**

**ICSC: 0431** **DIBENZO(a,h)ANTHRACENE**

# International Chemical Safety Cards

## CHRYSENE

**ICSC: 1672**

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

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


| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Combustible. | NO open flames. | Water spray. Dry powder. Foam. Carbon dioxide. |
| **EXPLOSION** | Finely dispersed particles form explosive mixtures in air. | Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting. | |
| **EXPOSURE** | See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. | AVOID ALL CONTACT! | |
| **•INHALATION** | | Local exhaust or breathing protection. | Fresh air, rest. |
| **•SKIN** | | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| **•EYES** | | Safety goggles | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | | Do not eat, drink, or smoke during work. | Rinse mouth. |

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

**SEE IMPORTANT INFORMATION ON BACK**

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

# International Chemical Safety Cards

## CHRYSENE

ICSC: 1672

**IMPORTANT DATA**

**PHYSICAL STATE; APPEARANCE:**
COLOURLESS TO BEIGE CRYSTALS OR POWDER

**PHYSICAL DANGERS:**
Dust explosion possible if in powder or granular form, mixed with air.

**CHEMICAL DANGERS:**
The substance decomposes on burning producing toxic fumes Reacts violently with strong oxidants

**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: A3 (confirmed animal carcinogen with unknown relevance to humans); (ACGIH 2006).
MAK not established.

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

**INHALATION RISK:**
A harmful concentration of airborne particles can be reached quickly when dispersed

**EFFECTS OF SHORT-TERM EXPOSURE:**

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

**PHYSICAL PROPERTIES**

Boiling point: 448°C
Melting point: 254 - 256°C
Density: 1.3 g/cm³

Solubility in water:
very poor
Octanol/water partition coefficient as log Pow: 5.9

**ENVIRONMENTAL DATA**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in seafood. It is strongly advised that this substance does not enter the environment.

**NOTES**

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

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

**ADDITIONAL INFORMATION**

# International Chemical Safety Cards

## BENZO(k)FLUORANTHENE

**ICSC: 0721**

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

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

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | | | In case of fire in the surroundings: use appropriate extinguishing media. |
| **EXPLOSION** | | | |
| **EXPOSURE** | | AVOID ALL CONTACT! | |
| **•INHALATION** | | Local exhaust or breathing protection. | Fresh air, rest. |
| **•SKIN** | | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| **•EYES** | | Safety spectacles or eye protection in combination with breathing protection if powder. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | | Do not eat, drink, or smoke during work. | Rinse mouth. Refer for medical attention. |

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

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0721**

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

# International Chemical Safety Cards

## BENZO(k)FLUORANTHENE

**ICSC: 0721**

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

| | |
|---|---|
| **P O R T A N T D A T A** | **PHYSICAL DANGERS:**<br><br>**CHEMICAL DANGERS:**<br>Upon heating, toxic fumes are formed.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV not established.<br>MAK:<br>Carcinogen category: 2;<br>(DFG 2004).<br><br>**INHALATION RISK:**<br>Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>This substance is possibly carcinogenic to humans. |
| **PHYSICAL PROPERTIES** | Boiling point: 480°C<br>Melting point: 217°C<br>Solubility in water:<br>none<br><br>Octanol/water partition coefficient as log Pow: 6.84 |
| **ENVIRONMENTAL DATA** | This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and in fish.  |

**N O T E S**

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

**ADDITIONAL INFORMATION**

**ICSC: 0721** **BENZO(k)FLUORANTHENE**

# International Chemical Safety Cards

## BENZO(g,h,i)FLUORANTHENE

**ICSC: 0527**

2,13-Benzofluoranthene
Benzo(mno)fluoranthene
$C_{18}H_{10}$
Molecular mass: 226.3

ICSC # 0527
CAS # 203-12-3
RTECS # DF6140000
March 25, 1998 Peer reviewed

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Combustible. | NO open flames. | Water spray, powder. |
| **EXPLOSION** | | | |
| **EXPOSURE** | | PREVENT DISPERSION OF DUST! | |
| **•INHALATION** | | Local exhaust or breathing protection. | |
| **•SKIN** | MAY BE ABSORBED! | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid. |
| **•EYES** | | Safety goggles, face shield, or eye protection in combination with breathing protection if powder. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | | Do not eat, drink, or smoke during work. | |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment. | Well closed. | R:<br>S: |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0527**

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

# International Chemical Safety Cards

## BENZO(g,h,i)FLUORANTHENE

**ICSC: 0527**

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

| | | |
|---|---|---|
| **O R T A N T D A T A** | **CHEMICAL DANGERS:**<br>The substance decomposes on heating producing toxic fumes.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV not established. | **INHALATION RISK:**<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>See Notes. |
| **PHYSICAL PROPERTIES** | Melting point: 149°C<br>Solubility in water: none<br>Vapour pressure, Pa at 20°C: <10 | Relative vapour density (air = 1): 7.8<br>Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0<br>Octanol/water partition coefficient as log Pow: 7.23 |
| **ENVIRONMENTAL DATA** | This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.  | |

**N O T E S**

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Also consult ICSC #0720 and 0721.

**ADDITIONAL INFORMATION**

**ICSC: 0527** **BENZO(g,h,i)FLUORANTHENE**

# International Chemical Safety Cards

## BENZO(b)FLUORANTHENE

**ICSC: 0720**

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

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

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | | | In case of fire in the surroundings: use appropriate extinguishing media. |
| **EXPLOSION** | | | |
| **EXPOSURE** | | AVOID ALL CONTACT! | |
| **•INHALATION** | | Local exhaust or breathing protection. | Fresh air, rest. |
| **•SKIN** | | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| **•EYES** | | Safety spectacles or eye protection in combination with breathing protection. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | | Do not eat, drink, or smoke during work. | Rinse mouth. Refer for medical attention. |

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

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0720**

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

# International Chemical Safety Cards

## BENZO(b)FLUORANTHENE

**ICSC: 0720**

| | | |
|---|---|---|
| **I** | **PHYSICAL STATE; APPEARANCE:**<br>COLOURLESS CRYSTALS | **ROUTES OF EXPOSURE:**<br>The substance can be absorbed into the body by inhalation |

| | |
|---|---|
| **IMPORTANT DATA** | **PHYSICAL DANGERS:**<br><br>**CHEMICAL DANGERS:**<br>Upon heating, toxic fumes are formed.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV: A2 (suspected human carcinogen); (ACGIH 2004).<br>MAK:<br>Carcinogen category: 2;<br>(DFG 2004).<br><br>of its aerosol and through the skin.<br><br>**INHALATION RISK:**<br>Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>This substance is possibly carcinogenic to humans. May cause genetic damage in humans. |
| **PHYSICAL PROPERTIES** | Boiling point: 481°C<br>Melting point: 168°C<br>Solubility in water:<br>none<br><br>Octanol/water partition coefficient as log Pow: 6.12 |
| **ENVIRONMENTAL DATA** | This substance may be hazardous to the environment; special attention should be given to air quality and water quality.  |

**N O T E S**

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

**ADDITIONAL INFORMATION**

**ICSC: 0720** **BENZO(b)FLUORANTHENE**

# International Chemical Safety Cards

## BENZO(a)PYRENE

**ICSC: 0104**

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

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

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Combustible. | NO open flames. | Water spray, foam, powder, carbon dioxide. |
| **EXPLOSION** | | | |
| **EXPOSURE** | See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. | AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN! | |
| **•INHALATION** | | Local exhaust or breathing protection. | Fresh air, rest. |
| **•SKIN** | MAY BE ABSORBED! | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| **•EYES** | | Safety goggles or eye protection in combination with breathing protection. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | | Do not eat, drink, or smoke during work. | Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention. |

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

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0104**

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

# International Chemical Safety Cards

# BENZO(a)PYRENE

**ICSC: 0104**

**IMPORTANT DATA**

**PHYSICAL STATE; APPEARANCE:**
PALE-YELLOW CRYSTALS

**PHYSICAL DANGERS:**

**CHEMICAL DANGERS:**
Reacts with strong oxidants causing fire and explosion hazard.

**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: Exposure by all routes should be carefully controlled to levels as low as possible A2 (suspected human carcinogen); (ACGIH 2005).
MAK:
Carcinogen category: 2; Germ cell mutagen group: 2; (DFG 2005).

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

**INHALATION RISK:**
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

**EFFECTS OF SHORT-TERM EXPOSURE:**

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

**PHYSICAL PROPERTIES**

Boiling point: 496°C
Melting point: 178.1°C
Density: 1.4
g/cm³

Solubility in water: none (<0.1 g/100 ml)
Vapour pressure :
negligible
Octanol/water partition coefficient as log Pow: 6.04

**ENVIRONMENTAL DATA**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish, in plants and in molluscs. The substance may cause long-term effects in the aquatic environment.

**NOTES**

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

**ADDITIONAL INFORMATION**

# International Chemical Safety Cards

## BENZ(a)ANTHRACENE

**ICSC: 0385**

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

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

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Combustible. | | Water spray, powder. In case of fire in the surroundings: use appropriate extinguishing media. |
| **EXPLOSION** | Finely dispersed particles form explosive mixtures in air. | Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting. | |
| **EXPOSURE** | | AVOID ALL CONTACT! | |
| **•INHALATION** | | Local exhaust or breathing protection. | Fresh air, rest. |
| **•SKIN** | | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| **•EYES** | | Safety goggles face shield or eye protection in combination with breathing protection. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | | Do not eat, drink, or smoke during work. Wash hands before eating. | Rinse mouth. |

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

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0385**

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

# International Chemical Safety Cards

**ICSC: 0385**

# BENZ(a)ANTHRACENE

**I M P O R T A N T D A T A**

**PHYSICAL STATE; APPEARANCE:**
COLOURLESS TO YELLOW BROWN FLUORESCENT FLAKES OR POWDER.

**PHYSICAL DANGERS:**
Dust explosion possible if in powder or granular form, mixed with air.

**CHEMICAL DANGERS:**

**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: A2 (suspected human carcinogen); (ACGIH 2004).
MAK:
Carcinogen category: 2 (as pyrolysis product of organic materials)
(DFG 2005).

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

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

**EFFECTS OF SHORT-TERM EXPOSURE:**

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

**PHYSICAL PROPERTIES**

Sublimation point: 435°C
Melting point: 162°C
Relative density (water = 1): 1.274
Solubility in water:
none

Vapour pressure, Pa at 20°C: 292
Octanol/water partition coefficient as log Pow: 5.61

**ENVIRONMENTAL DATA**

Bioaccumulation of this chemical may occur in seafood.

**N O T E S**

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

**ADDITIONAL INFORMATION**

**ICSC: 0385** **BENZ(a)ANTHRACENE**

# International Chemical Safety Cards

## ANTHRACENE

**ICSC: 0825**

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

ICSC # 0825
CAS # 120-12-7
RTECS # CA9350000
March 24, 1999 Peer reviewed

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

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

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0825**

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

# International Chemical Safety Cards

## ANTHRACENE

**ICSC: 0825**

| | | |
|---|---|---|
| **I**<br><br>**M** | **PHYSICAL STATE; APPEARANCE:**<br>WHITE CRYSTALS OR FLAKES. | **ROUTES OF EXPOSURE:**<br>The substance can be absorbed into the body by |

| | |
|---|---|
| **P O R T A N T D A T A** | **PHYSICAL DANGERS:**<br>Dust explosion possible if in powder or granular form, mixed with air.<br><br>**CHEMICAL DANGERS:**<br>The substance decomposes on heating, under influence of strong oxidants producing acrid, toxic fume , causing fire and explosion hazard.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV not established.<br><br>inhalation.<br><br>**INHALATION RISK:**<br>Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br>The substance slightly irritates the skin and the respiratory tract.<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>Repeated or prolonged contact with skin may cause dermatitis under the influence of UV light. |
| **PHYSICAL PROPERTIES** | Boiling point: 342°C<br>Melting point: 218°C<br>Density: 1.25-1.28 g/cm3<br>Solubility in water, g/100 ml at 20 °C: 0.00013<br>Vapour pressure, Pa at 25°C: 0.08<br><br>Relative vapour density (air = 1): 6.15<br>Flash point: 121°C<br>Auto-ignition temperature: 538°C<br>Explosive limits, vol% in air: 0.6-?<br>Octanol/water partition coefficient as log Pow: 4.5 (calculated) |
| **ENVIRONMENTAL DATA** | The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.  |

**N O T E S**

Green oil, Tetra-olive N2G are trade names.

NFPA Code: H0; F1; R;

**ADDITIONAL INFORMATION**

**ICSC: 0825** **ANTHRACENE**

# International Chemical Safety Cards

## NAPHTHALENE

**ICSC: 0667**

Naphthene
$C_{10}H_8$
Molecular mass: 128.18

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


| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Combustible. | NO open flames. | Powder, water spray, foam, carbon dioxide. |
| **EXPLOSION** | Above 80°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air. | Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting. | |
| **EXPOSURE** | | PREVENT DISPERSION OF DUST! | |
| **•INHALATION** | Headache. Weakness. Nausea. Vomiting. Sweating. Confusion. Jaundice. Dark urine. | Ventilation (not if powder), local exhaust, or breathing protection. | Fresh air, rest. Refer for medical attention. |
| **•SKIN** | MAY BE ABSORBED! (Further see Inhalation). | Protective gloves. | Rinse skin with plenty of water or shower. |
| **•EYES** | | Safety spectacles. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | Abdominal pain. Diarrhoea. Convulsions. Unconsciousness. (Further see Inhalation). | Do not eat, drink, or smoke during work. Wash hands before eating. | Rest. Refer for medical attention. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Personal protection: filter respirator for organic gases and vapours. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. | Separated from strong oxidants, food and feedstuffs Store in an area without drain or sewer access. | Do not transport with food and feedstuffs. Marine pollutant. Xn symbol N symbol R: 22-40-50/53 S: 2-36/37-46-60-61 UN Hazard Class: 4.1 UN Packing Group: III |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0667**

# International Chemical Safety Cards

## NAPHTHALENE

**ICSC: 0667**

**I M P O R T A N T D A T A**

**PHYSICAL STATE; APPEARANCE:**
WHITE SOLID IN VARIOUS FORMS , WITH CHARACTERISTIC ODOUR.

**PHYSICAL DANGERS:**
Dust explosion possible if in powder or granular form, mixed with air.

**CHEMICAL DANGERS:**
On combustion, forms irritating and toxic gases. Reacts with strong oxidants

**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: 10 ppm as TWA 15 ppm as STEL (skin) A4 (not classifiable as a human carcinogen); (ACGIH 2005).
MAK: skin absorption (H);
Carcinogen category: 2; Germ cell mutagen group: 3B; (DFG 2004).
OSHA PEL†: TWA 10 ppm (50 mg/m$^3$)
NIOSH REL: TWA 10 ppm (50 mg/m$^3$) ST 15 ppm (75 mg/m$^3$)
NIOSH IDLH: 250 ppm See: 91203

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

**INHALATION RISK:**
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. See Notes.

**EFFECTS OF SHORT-TERM EXPOSURE:**
The substance may cause effects on the blood , resulting in lesions of blood cells (haemolysis) See Notes. The effects may be delayed. Exposure by ingestion may result in death. Medical observation is indicated.

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
The substance may have effects on the blood , resulting in chronic haemolytic anaemia. The substance may have effects on the eyes , resulting in the development of cataract. This substance is possibly carcinogenic to humans.

**PHYSICAL PROPERTIES**

Boiling point: 218°C
Sublimation slowly at room temperature
Melting point: 80°C
Density: 1.16
g/cm3
Solubility in water, g/100 ml at 25°C:
none

Vapour pressure, Pa at 25°C: 11
Relative vapour density (air = 1): 4.42
Flash point:
80°C c.c.
Auto-ignition temperature: 540°C
Explosive limits, vol% in air: 0.9-5.9
Octanol/water partition coefficient as log Pow: 3.3

**ENVIRONMENTAL DATA**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

**N O T E S**

Some individuals may be more sensitive to the effect of naphthalene on blood cells.

Transport Emergency Card: TEC (R)-41S1334 (solid); 41GF1-II+III (solid); 41S2304 (molten)
NFPA Code: H2; F2; R0;

**ADDITIONAL INFORMATION**





**IMPORTANT LEGAL NOTICE:**

# Material Safety Data Sheet

Version 4.2
Revision Date 07/07/2011
Print Date 12/09/2011

## 1. PRODUCT AND COMPANY IDENTIFICATION

| | | |
|---|---|---|
| Product name | : | Aroclor 1262 |
| Product Number | : | 442463 |
| Brand | : | Supelco |
| Supplier | : | Sigma-Aldrich<br>3050 Spruce Street<br>SAINT LOUIS MO 63103<br>USA |
| Telephone | : | +1 800-325-5832 |
| Fax | : | +1 800-325-5052 |
| Emergency Phone # (For both supplier and manufacturer) | : | (314) 776-6555 |
| Preparation Information | : | Sigma-Aldrich Corporation<br>Product Safety - Americas Region<br>1-800-521-8956 |

## 2. HAZARDS IDENTIFICATION

### Emergency Overview

**OSHA Hazards**
Carcinogen

**GHS Classification**
Carcinogenicity (Category 1B)
Specific target organ toxicity - repeated exposure (Category 2)
Acute aquatic toxicity (Category 3)
Chronic aquatic toxicity (Category 3)

**GHS Label elements, including precautionary statements**

Pictogram

Signal word: Danger

Hazard statement(s)

| | |
|---|---|
| H350 | May cause cancer. |
| H373 | May cause damage to organs through prolonged or repeated exposure. |
| H412 | Harmful to aquatic life with long lasting effects. |

Precautionary statement(s)

| | |
|---|---|
| P201 | Obtain special instructions before use. |
| P273 | Avoid release to the environment. |
| P308 + P313 | IF exposed or concerned: Get medical advice/ attention. |

**HMIS Classification**

| | |
|---|---|
| **Health hazard**: | 0 |
| **Chronic Health Hazard**: | * |
| **Flammability**: | 0 |
| **Physical hazards**: | 0 |

**NFPA Rating**

| | |
|---|---|
| **Health hazard**: | 0 |
| **Fire**: | 0 |

**Reactivity Hazard**: 0

**Potential Health Effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |
| **Ingestion** | May be harmful if swallowed. |

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

| CAS-No. | EC-No. | Index-No. | Concentration |
|---|---|---|---|
| **PCB - Aroclor 1262** | | | |
| 37324-23-5 | - | 602-039-00-4 | - |

## 4. 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.

## 5. FIRE-FIGHTING MEASURES

**Conditions of flammability**
Not flammable or combustible.

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**Special protective equipment for fire-fighters**
Wear self contained breathing apparatus for fire fighting if necessary.

**Hazardous combustion products**
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

## 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions**
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

**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.

**Methods and materials for containment and cleaning up**
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

## 7. HANDLING AND STORAGE

**Precautions for safe handling**
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

**Conditions for safe storage**
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

**Personal protective equipment**

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) 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).

**Hand 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.

**Eye protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin and 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.

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

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance**

| | |
|---|---|
| Form | liquid |
| Colour | no data available |

**Safety data**

| | |
|---|---|
| pH | no data available |
| Melting point/freezing point | no data available |
| Boiling point | no data available |
| Flash point | no data available |
| Ignition temperature | no data available |
| Autoignition temperature | no data available |
| Lower explosion limit | no data available |
| Upper explosion limit | no data available |
| Vapour pressure | no data available |
| Density | no data available |
| Water solubility | no data available |
| Partition coefficient: n-octanol/water | no data available |
| Relative vapour density | no data available |

| | |
|---|---|
| Odour | no data available |
| Odour Threshold | no data available |
| Evaporation rate | no data available |

## 10. STABILITY AND REACTIVITY

**Chemical stability**
Stable under recommended storage conditions.

**Possibility of hazardous reactions**
no data available

**Conditions to avoid**
no data available

**Materials to avoid**
Strong oxidizing agents

**Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.
Other decomposition products - no data available

## 11. TOXICOLOGICAL INFORMATION

**Acute toxicity**

**Oral LD50**
LD50 Oral - rat - 11,300 mg/kg

**Inhalation LC50**
no data available

**Dermal LD50**
**Other information on acute toxicity**
no data available

**Skin corrosion/irritation**
no data available

**Serious eye damage/eye irritation**
no data available

**Respiratory or skin sensitization**
no data available

**Germ cell mutagenicity**

no data available

**Carcinogenicity**

Carcinogen

Possible human carcinogen

| | |
|---|---|
| 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

**Teratogenicity**

no data available

**Specific target organ toxicity - single exposure (Globally Harmonized System)**
no data available

**Specific target organ toxicity - repeated exposure (Globally Harmonized System)**
May cause damage to organs through prolonged or repeated exposure.
no data available

**Aspiration hazard**
no data available

**Potential health effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Ingestion** | May be harmful if swallowed. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |

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

**Synergistic effects**
no data available

**Additional Information**
RTECS: TQ1364000

## 12. ECOLOGICAL INFORMATION

**Toxicity**

| | |
|---|---|
| Toxicity to fish | LC50 - Oncorhynchus clarki - 50 mg/l - 96 h |

**Persistence and degradability**

| | |
|---|---|
| Biodegradability | Result: - According to the results of tests of biodegradability this product is not readily biodegradable.<br>Remarks: no data available |

**Bioaccumulative potential**
no data available

**Mobility in soil**
no data available

**PBT and vPvB assessment**
no data available

**Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Harmful to aquatic life with long lasting effects.

## 13. DISPOSAL CONSIDERATIONS

**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: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid
Reportable Quantity (RQ):
Marine pollutant: No
Poison Inhalation Hazard: No

**IMDG**
UN number: 2315 Class: 9 Packing group: II EMS-No: F-A, S-A
Proper shipping name: POLYCHLORINATED BIPHENYLS, LIQUID
Marine pollutant: No

**IATA**
UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid

## 15. REGULATORY INFORMATION

**OSHA Hazards**
Carcinogen

**SARA 302 Components**
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
SARA 313: 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**
No components are subject to the Massachusetts Right to Know Act.

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| PCB - Aroclor 1262 | 37324-23-5 | 1989-08-11 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| PCB - Aroclor 1262 | 37324-23-5 | 1989-08-11 |

**California Prop. 65 Components**

| | CAS-No. | Revision Date |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause cancer.<br>PCB - Aroclor 1262 | 37324-23-5 | 2008-08-01 |

**California Prop. 65 Components**

| | CAS-No. | Revision Date |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.<br>PCB - Aroclor 1262 | 37324-23-5 | 2008-08-01 |

## 16. OTHER INFORMATION

### Further information


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 Co., 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.

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# Material Safety Data Sheet

Version 4.1
Revision Date 01/13/2011
Print Date 12/09/2011

## 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Aroclor 1248

Product Number : 48589
Brand : Supelco
Product Use : For laboratory research purposes.

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

Manufacturer : Sigma-Aldrich Corporation
3050 Spruce St.
St. Louis, Missouri 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555
Preparation Information : Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

## 2. HAZARDS IDENTIFICATION

### Emergency Overview

**OSHA Hazards**
Target Organ Effect

**Target Organs**

LiverLiver

**GHS Classification**
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

**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.
P501 Dispose of contents/ container to an approved waste disposal plant.

**HMIS Classification**
**Health hazard**: 0
**Flammability**: 0
**Physical hazards**: 0

**NFPA Rating**
**Health hazard**: 0
**Fire**: 0
**Reactivity Hazard**: 0

**Potential Health Effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |
| **Ingestion** | May be harmful if swallowed. |

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

| CAS-No. | EC-No. | Index-No. | Concentration |
|---|---|---|---|
| **Aroclor 1248** | | | |
| 12672-29-6 | - | - | - |

## 4. 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.

## 5. FIRE-FIGHTING MEASURES

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**Special protective equipment for fire-fighters**
Wear self contained breathing apparatus for fire fighting if necessary.

**Hazardous combustion products**
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

## 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions**
Avoid breathing vapors, mist or gas. Ensure adequate ventilation.

**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.

**Methods and materials for containment and cleaning up**
Keep in suitable, closed containers for disposal.

## 7. HANDLING AND STORAGE

**Precautions for safe handling**
Normal measures for preventive fire protection.

**Conditions for safe storage**
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

**Personal protective equipment**

**Respiratory protection**
Respiratory protection not required. For nuisance exposures use type OV/AG (US) or type ABEK (EU EN 14387) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Hand 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.

**Eye protection**
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin and 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.

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

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance**

| | |
|---|---|
| Form | liquid |
| Colour | no data available |

**Safety data**

| | |
|---|---|
| pH | no data available |
| Melting/freezing point | no data available |
| Boiling point | no data available |
| Flash point | no data available |
| Ignition temperature | no data available |
| Autoignition temperature | no data available |
| Lower explosion limit | no data available |
| Upper explosion limit | no data available |
| Vapour pressure | no data available |
| Density | no data available |
| Water solubility | no data available |
| Partition coefficient: n-octanol/water | no data available |
| Relative vapour density | no data available |
| Odour | no data available |
| Odour Threshold | no data available |
| Evaporation rate | no data available |

## 10. STABILITY AND REACTIVITY

**Chemical stability**
Stable under recommended storage conditions.

**Possibility of hazardous reactions**
no data available

**Conditions to avoid**
no data available

**Materials to avoid**
Strong oxidizing agents

**Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.
Other decomposition products - no data available

## 11. TOXICOLOGICAL INFORMATION

**Acute toxicity**

**Oral LD50**
LD50 Oral - rat - 11,000 mg/kg

**Inhalation LC50**
no data available

**Dermal LD50**
no data available

**Other information on acute toxicity**
no data available

**Skin corrosion/irritation**
no data available

**Serious eye damage/eye irritation**
no data available

**Respiratory or skin sensitization**
no data available

**Germ cell mutagenicity**
no data available

**Carcinogenicity**

| | |
|---|---|
| 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**
Reproductive toxicity - Monkey - Oral
Maternal Effects: Menstrual cycle changes or disorders.
Reproductive toxicity - Monkey - Oral
Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).
Reproductive toxicity - Monkey - Oral
Effects on Fertility: Abortion.
Reproductive toxicity - Monkey - Oral

Effects on Newborn: Growth statistics (e.g., reduced weight gain). Effects on Newborn: Behavioral. Effects on Newborn: Other postnatal measures or effects.

no data available

**Teratogenicity**

Developmental Toxicity - rabbit - Oral
Specific Developmental Abnormalities: Immune and reticuloendothelial system.

no data available

**Specific target organ toxicity - single exposure (Globally Harmonized System)**
no data available

**Specific target organ toxicity - repeated exposure (Globally Harmonized System)**
no data available

**Aspiration hazard**
no data available

**Potential health effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Ingestion** | May be harmful if swallowed. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |

**Signs and Symptoms of Exposure**
Nausea, Dizziness, Headache, muscle pain, muscle weakness, neck stiffness, trunk stiffness, stiffness of extremities, thick feeling in the tongue, Thirst

**Synergistic effects**
no data available

**Additional Information**
RTECS: Not available

## 12. ECOLOGICAL INFORMATION

**Toxicity**

| | |
|---|---|
| Toxicity to fish | LC50 - Lepomis macrochirus - 0.278 mg/l - 96.0 h |
| Toxicity to algae | Growth inhibition EC50 - Thalassiosira rotula - 0.02 mg/l - 44 h |

**Persistence and degradability**
no data available

**Bioaccumulative potential**

| | |
|---|---|
| Bioaccumulation | Pimephales promelas (fathead minnow) - 250 d<br>Bioconcentration factor (BCF): 120,000 |

**Mobility in soil**
no data available

**PBT and vPvB assessment**
no data available

**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

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN-Number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid (Aroclor 1248)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

**IMDG**
UN-Number: 2315 Class: 9 Packing group: II EMS-No: F-A, S-A
Proper shipping name: POLYCHLORINATED BIPHENYLS, LIQUID (Aroclor 1248)
Marine pollutant: Marine pollutant

**IATA**
UN-Number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid (Aroclor 1248)

## 15. REGULATORY INFORMATION

**OSHA Hazards**
Target Organ Effect

**DSL Status**
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

| | CAS-No. |
|---|---|
| Aroclor 1248 | 12672-29-6 |

**SARA 302 Components**
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
SARA 313: 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**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1248 | 12672-29-6 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1248 | 12672-29-6 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1248 | 12672-29-6 | 1993-04-24 |

**California Prop. 65 Components**

| | CAS-No. | Revision Date |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause cancer.<br>Aroclor 1248 | 12672-29-6 | 2008-08-01 |

**California Prop. 65 Components**

| | CAS-No. | Revision Date |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.<br>Aroclor 1248 | 12672-29-6 | 2008-08-01 |

## 16. OTHER INFORMATION

**Further information**


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 Co., 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.

# Material Safety Data Sheet

Version 4.1
Revision Date 07/06/2011
Print Date 12/09/2011

## 1. PRODUCT AND COMPANY IDENTIFICATION

| | | |
|---|---|---|
| Product name | : | Aroclor 1242 |
| Product Number | : | 48585 |
| Brand | : | Supelco |
| Supplier | : | Sigma-Aldrich<br>3050 Spruce Street<br>SAINT LOUIS MO 63103<br>USA |
| Telephone | : | +1 800-325-5832 |
| Fax | : | +1 800-325-5052 |
| Emergency Phone # (For both supplier and manufacturer) | : | (314) 776-6555 |
| Preparation Information | : | Sigma-Aldrich Corporation<br>Product Safety - Americas Region<br>1-800-521-8956 |

## 2. HAZARDS IDENTIFICATION

### Emergency Overview

**OSHA Hazards**
No known OSHA hazards

**GHS Classification**
Acute toxicity, Oral (Category 5)
Specific target organ toxicity - repeated exposure (Category 1)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

**GHS Label elements, including precautionary statements**

Pictogram

Signal word Danger

Hazard statement(s)

| | |
|---|---|
| H303 | May be harmful if swallowed. |
| H372 | Causes damage to organs through prolonged or repeated exposure. |
| H410 | Very toxic to aquatic life with long lasting effects. |

Precautionary statement(s)

| | |
|---|---|
| P273 | Avoid release to the environment. |
| P314 | Get medical advice/ attention if you feel unwell. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**HMIS Classification**

| | |
|---|---|
| **Health hazard**: | 1 |
| **Flammability**: | 0 |
| **Physical hazards**: | 0 |

**NFPA Rating**

| | |
|---|---|
| **Health hazard**: | 0 |
| **Fire**: | 0 |
| **Reactivity Hazard**: | 0 |

**Potential Health Effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |
| **Ingestion** | May be harmful if swallowed. |

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

| CAS-No. | EC-No. | Index-No. | Concentration |
|---|---|---|---|
| **Aroclor 1242** | | | |
| 53469-21-9 | - | 602-039-00-4 | - |

## 4. FIRST AID MEASURES

**General advice**
Consult a physician. Show this safety data sheet to the doctor in attendance.

**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. Take victim immediately to hospital. 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.

## 5. FIRE-FIGHTING MEASURES

**Conditions of flammability**
Not flammable or combustible.

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**Special protective equipment for fire-fighters**
Wear self contained breathing apparatus for fire fighting if necessary.

**Hazardous combustion products**
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

## 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions**
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

**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.

**Methods and materials for containment and cleaning up**
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

## 7. HANDLING AND STORAGE

**Precautions for safe handling**
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

**Conditions for safe storage**
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Components with workplace control parameters**

| Components | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| Aroclor 1242 | 53469-21-9 | TWA | 1 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| Remarks | Eye irritation Liver damage Chloracne Danger of cutaneous absorption | | | |
| | | TWA | 1 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | Skin designation | | | |
| | | TWA | 1 mg/m3 | USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000 |
| | Skin notation | | | |
| | | TWA | 0.001 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | Potential Occupational Carcinogen See Appendix A | | | |

**Personal protective equipment**

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) 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).

**Hand 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.

**Eye protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin and 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.

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

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance**

| | |
|---|---|
| Form | liquid |
| Colour | no data available |

**Safety data**

| | |
|---|---|
| pH | no data available |
| Melting point/freezing point | no data available |
| Boiling point | no data available |

| | |
|---|---|
| Flash point | no data available |
| Ignition temperature | no data available |
| Autoignition temperature | no data available |
| Lower explosion limit | no data available |
| Upper explosion limit | no data available |
| Vapour pressure | no data available |
| Density | no data available |
| Water solubility | no data available |
| Partition coefficient: n-octanol/water | no data available |
| Relative vapour density | no data available |
| Odour | no data available |
| Odour Threshold | no data available |
| Evaporation rate | no data available |

## 10. STABILITY AND REACTIVITY

**Chemical stability**
Stable under recommended storage conditions.

**Possibility of hazardous reactions**
no data available

**Conditions to avoid**
no data available

**Materials to avoid**
Strong oxidizing agents

**Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - no data available

## 11. TOXICOLOGICAL INFORMATION

**Acute toxicity**

**Oral LD50**
LD50 Oral - rat - 4,250 mg/kg
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Chromodacryorrhea. Diarrhoea
Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

**Inhalation LC50**
no data available

**Dermal LD50**
no data available

**Other information on acute toxicity**
no data available

**Skin corrosion/irritation**
no data available

**Serious eye damage/eye irritation**
no data available

**Respiratory or skin sensitization**

**Germ cell mutagenicity**

no data available

**Carcinogenicity**

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

**Teratogenicity**

no data available

**Specific target organ toxicity - single exposure (Globally Harmonized System)**
no data available

**Specific target organ toxicity - repeated exposure (Globally Harmonized System)**
Causes damage to organs through prolonged or repeated exposure.
no data available

**Aspiration hazard**
no data available

**Potential health effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Ingestion** | May be harmful if swallowed. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |

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

**Synergistic effects**
no data available

**Additional Information**
RTECS: Not available

## 12. ECOLOGICAL INFORMATION

**Toxicity**

| | |
|---|---|
| Toxicity to fish | LC50 - Pimephales promelas (fathead minnow) - 0.015 mg/l - 96 h |
| Toxicity to daphnia and other aquatic invertebrates. | LC50 - Daphnia magna (Water flea) - 0.23 mg/l - 48 h |
| Toxicity to algae | LC50 - Algae - 0.006 mg/l - 28 h |

**Persistence and degradability**

| | |
|---|---|
| Biodegradability | Result: - According to the results of tests of biodegradability this product is not readily biodegradable.<br>Remarks: no data available |

**Bioaccumulative potential**

| | |
|---|---|
| Bioaccumulation | Pimephales promelas (fathead minnow) - 8.5 Months<br>Bioconcentration factor (BCF): 274,000 |

**Mobility in soil**
no data available

**PBT and vPvB assessment**
no data available

**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.

## 13. DISPOSAL CONSIDERATIONS

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid (Aroclor 1242)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

**IMDG**
UN number: 2315 Class: 9 Packing group: II EMS-No: F-A, S-A
Proper shipping name: POLYCHLORINATED BIPHENYLS, LIQUID (Aroclor 1242)
Marine pollutant: No

**IATA**
UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid (Aroclor 1242)

## 15. REGULATORY INFORMATION

**OSHA Hazards**
No known OSHA hazards

**SARA 302 Components**
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
SARA 313: 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**
No SARA Hazards

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1242 | 53469-21-9 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1242 | 53469-21-9 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1242 | 53469-21-9 | 1993-04-24 |

**California Prop. 65 Components**

| | | |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause cancer.<br>Aroclor 1242 | CAS-No.<br>53469-21-9 | Revision Date<br>2008-08-01 |

**California Prop. 65 Components**

| | | |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.<br>Aroclor 1242 | CAS-No.<br>53469-21-9 | Revision Date<br>2008-08-01 |

## 16. OTHER INFORMATION

**Further information**


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 Co., 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.

# Material Safety Data Sheet

Version 4.1
Revision Date 08/03/2011
Print Date 12/09/2011

## 1. PRODUCT AND COMPANY IDENTIFICATION

| | | |
|---|---|---|
| Product name | : | Aroclor 1232 |
| Product Number | : | 48588 |
| Brand | : | Supelco |
| Supplier | : | Sigma-Aldrich<br>3050 Spruce Street<br>SAINT LOUIS MO 63103<br>USA |
| Telephone | : | +1 800-325-5832 |
| Fax | : | +1 800-325-5052 |
| Emergency Phone # (For both supplier and manufacturer) | : | (314) 776-6555 |
| Preparation Information | : | Sigma-Aldrich Corporation<br>Product Safety - Americas Region<br>1-800-521-8956 |

## 2. HAZARDS IDENTIFICATION

### Emergency Overview

**OSHA Hazards**
No known OSHA hazards

**GHS Classification**
Acute toxicity, Oral (Category 5)
Acute aquatic toxicity (Category 1)

**GHS Label elements, including precautionary statements**

Pictogram

Signal word Warning

Hazard statement(s)

| | |
|---|---|
| H303 | May be harmful if swallowed. |
| H400 | Very toxic to aquatic life. |

Precautionary statement(s)

| | |
|---|---|
| P273 | Avoid release to the environment. |

**HMIS Classification**

| | |
|---|---|
| **Health hazard**: | 1 |
| **Flammability**: | 0 |
| **Physical hazards**: | 0 |

**NFPA Rating**

| | |
|---|---|
| **Health hazard**: | 0 |
| **Fire**: | 0 |
| **Reactivity Hazard**: | 0 |

**Potential Health Effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |

**Ingestion** May be harmful if swallowed.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

| CAS-No. | EC-No. | Index-No. | Concentration |
|---|---|---|---|
| **Aroclor 1232** | | | |
| 11141-16-5 | - | 602-039-00-4 | - |

## 4. FIRST AID MEASURES

**General advice**
Consult a physician. Show this safety data sheet to the doctor in attendance.

**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.

## 5. FIRE-FIGHTING MEASURES

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**Special protective equipment for fire-fighters**
Wear self contained breathing apparatus for fire fighting if necessary.

**Hazardous combustion products**
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

## 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions**
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

**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.

**Methods and materials for containment and cleaning up**
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

## 7. HANDLING AND STORAGE

**Precautions for safe handling**
Normal measures for preventive fire protection.

**Conditions for safe storage**
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

**Personal protective equipment**

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) 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).

**Hand 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.

**Eye protection**
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin and 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.

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

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance**

| | |
|---|---|
| Form | liquid |
| Colour | no data available |

**Safety data**

| | |
|---|---|
| pH | no data available |
| Melting point/freezing point | no data available |
| Boiling point | no data available |
| Flash point | no data available |
| Ignition temperature | no data available |
| Autoignition temperature | no data available |
| Lower explosion limit | no data available |
| Upper explosion limit | no data available |
| Vapour pressure | no data available |
| Density | no data available |
| Water solubility | no data available |
| Partition coefficient: n-octanol/water | no data available |
| Relative vapour density | no data available |
| Odour | no data available |
| Odour Threshold | no data available |

Evaporation rate no data available

## 10. STABILITY AND REACTIVITY

**Chemical stability**
Stable under recommended storage conditions.

**Possibility of hazardous reactions**
no data available

**Conditions to avoid**
no data available

**Materials to avoid**
Strong oxidizing agents

**Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - no data available

## 11. TOXICOLOGICAL INFORMATION

**Acute toxicity**

**Oral LD50**
LD50 Oral - rat - 4,470 mg/kg

**Inhalation LC50**
no data available

**Dermal LD50**
no data available

**Other information on acute toxicity**
no data available

**Skin corrosion/irritation**
no data available

**Serious eye damage/eye irritation**
no data available

**Respiratory or skin sensitization**
no data available

**Germ cell mutagenicity**
no data available

**Carcinogenicity**

| | |
|---|---|
| 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

**Teratogenicity**

no data available

**Specific target organ toxicity - single exposure (Globally Harmonized System)**
no data available

**Specific target organ toxicity - repeated exposure (Globally Harmonized System)**
Ingestion - May cause damage to organs through prolonged or repeated exposure. - Skin

**Aspiration hazard**
no data available

**Potential health effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Ingestion** | May be harmful if swallowed. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |

**Signs and Symptoms of Exposure**
chloracne, hair loss, hyperpigmentation, Liver injury may occur., May cause endocrine disruption.

**Synergistic effects**
no data available

**Additional Information**
RTECS: Not available

## 12. ECOLOGICAL INFORMATION

**Toxicity**

| | |
|---|---|
| Toxicity to fish | LC50 - Onchorhynchus clarki - 1.72 mg/l - 96.0 h |
| Toxicity to algae | Growth inhibition EC50 - Thalassiosira rotula - 0.071 mg/l - 44 h |

**Persistence and degradability**

| | |
|---|---|
| Biodegradability | Biotic/Aerobic<br>Result: 100 % - Readily biodegradable. |

**Bioaccumulative potential**
no data available

**Mobility in soil**
no data available

**PBT and vPvB assessment**
no data available

**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

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

**IMDG**
UN number: 2315 Class: 9 Packing group: II EMS-No: F-A, S-A
Proper shipping name: POLYCHLORINATED BIPHENYLS, LIQUID
Marine pollutant: No

**IATA**
UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid

## 15. REGULATORY INFORMATION

**OSHA Hazards**
No known OSHA hazards

**SARA 302 Components**
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
SARA 313: 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**
No SARA Hazards

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1232 | 11141-16-5 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1232 | 11141-16-5 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1232 | 11141-16-5 | 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

**Further information**

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 Co., 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.

# Material Safety Data Sheet

Version 4.2
Revision Date 06/21/2011
Print Date 12/09/2011

## 1. PRODUCT AND COMPANY IDENTIFICATION

| | | |
|---|---|---|
| Product name | : | Aroclor 1221 |
| Product Number | : | 48587 |
| Brand | : | Supelco |
| Supplier | : | Sigma-Aldrich<br>3050 Spruce Street<br>SAINT LOUIS MO 63103<br>USA |
| Telephone | : | +1 800-325-5832 |
| Fax | : | +1 800-325-5052 |
| Emergency Phone # (For both supplier and manufacturer) | : | (314) 776-6555 |
| Preparation Information | : | Sigma-Aldrich Corporation<br>Product Safety - Americas Region<br>1-800-521-8956 |

## 2. HAZARDS IDENTIFICATION

### Emergency Overview

**OSHA Hazards**
Target Organ Effect

**Target Organs**

Nerves.Nerves.

**GHS Classification**
Specific target organ toxicity - repeated exposure (Category 2)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

**GHS Label elements, including precautionary statements**

Pictogram

Signal word Warning

Hazard statement(s)

| | |
|---|---|
| H373 | May cause damage to organs through prolonged or repeated exposure. |
| H410 | Very toxic to aquatic life with long lasting effects. |

Precautionary statement(s)

| | |
|---|---|
| P273 | Avoid release to the environment. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**HMIS Classification**

| | |
|---|---|
| **Health hazard**: | 0 |
| **Chronic Health Hazard**: | * |
| **Flammability**: | 0 |
| **Physical hazards**: | 0 |

**NFPA Rating**

| | |
|---|---|
| **Health hazard**: | 0 |
| **Fire**: | 0 |

**Reactivity Hazard**: 0

**Potential Health Effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |
| **Ingestion** | May be harmful if swallowed. |

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

| CAS-No. | EC-No. | Index-No. | Concentration |
|---|---|---|---|
| **PCB - Aroclor 1221** | | | |
| 11104-28-2 | - | 602-039-00-4 | - |

## 4. 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.

## 5. FIRE-FIGHTING MEASURES

**Conditions of flammability**
Not flammable or combustible.

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**Special protective equipment for fire-fighters**
Wear self contained breathing apparatus for fire fighting if necessary.

**Hazardous combustion products**
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

## 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions**
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

**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.

**Methods and materials for containment and cleaning up**
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

## 7. HANDLING AND STORAGE

**Precautions for safe handling**
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

**Conditions for safe storage**
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

**Personal protective equipment**

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) 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).

**Hand 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.

**Eye protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin and 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.

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

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance**

| | |
|---|---|
| Form | liquid |
| Colour | no data available |

**Safety data**

| | |
|---|---|
| pH | no data available |
| Melting point/freezing point | no data available |
| Boiling point | no data available |
| Flash point | no data available |
| Ignition temperature | no data available |
| Autoignition temperature | no data available |
| Lower explosion limit | no data available |
| Upper explosion limit | no data available |
| Vapour pressure | no data available |
| Density | no data available |
| Water solubility | no data available |
| Partition coefficient: n-octanol/water | no data available |
| Relative vapour density | no data available |

| | |
|---|---|
| Odour | no data available |
| Odour Threshold | no data available |
| Evaporation rate | no data available |

## 10. STABILITY AND REACTIVITY

**Chemical stability**
Stable under recommended storage conditions.

**Possibility of hazardous reactions**
no data available

**Conditions to avoid**
no data available

**Materials to avoid**
Strong oxidizing agents

**Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.
Other decomposition products - no data available

## 11. TOXICOLOGICAL INFORMATION

**Acute toxicity**

**Oral LD50**
LD50 Oral - rat - 3,980 mg/kg

**Inhalation LC50**
**Dermal LD50**
no data available

**Other information on acute toxicity**
no data available

**Skin corrosion/irritation**
**Serious eye damage/eye irritation**

**Respiratory or skin sensitization**
no data available

**Germ cell mutagenicity**
no data available

**Carcinogenicity**

| | |
|---|---|
| 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**
Reproductive toxicity - rabbit - Oral
Effects on Newborn: Biochemical and metabolic.
Reproductive toxicity - rat - Subcutaneous
Maternal Effects: Uterus, cervix, vagina.
Reproductive toxicity - rat - Subcutaneous
Effects on Fertility: Other measures of fertility

no data available

**Teratogenicity**

no data available

**Specific target organ toxicity - single exposure (Globally Harmonized System)**

**Specific target organ toxicity - repeated exposure (Globally Harmonized System)**
May cause damage to organs through prolonged or repeated exposure.
no data available

**Aspiration hazard**
no data available

**Potential health effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Ingestion** | May be harmful if swallowed. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |

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

**Synergistic effects**
no data available

**Additional Information**
RTECS: Not available

## 12. ECOLOGICAL INFORMATION

**Toxicity**

| | |
|---|---|
| Toxicity to fish | LC50 - Oncorhynchus clarki - 1.17 mg/l - 96.0 h |

**Persistence and degradability**

| | |
|---|---|
| Biodegradability | Biotic/Aerobic Biochemical oxygen demand<br>Result: 100 % - Readily biodegradable. |

**Bioaccumulative potential**
no data available

**Mobility in soil**
no data available

**PBT and vPvB assessment**
no data available

**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

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

**IMDG**
UN number: 2315 Class: 9 Packing group: II EMS-No: F-A, S-A
Proper shipping name: POLYCHLORINATED BIPHENYLS, LIQUID
Marine pollutant: No

**IATA**
UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid

## 15. REGULATORY INFORMATION

**OSHA Hazards**
Target Organ Effect

**SARA 302 Components**
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
SARA 313: 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**

| | CAS-No. | Revision Date |
|---|---|---|
| PCB - Aroclor 1221 | 11104-28-2 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| PCB - Aroclor 1221 | 11104-28-2 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| PCB - Aroclor 1221 | 11104-28-2 | 1993-04-24 |

**California Prop. 65 Components**

| | CAS-No. | Revision Date |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause cancer.<br>PCB - Aroclor 1221 | 11104-28-2 | 2008-08-01 |

**California Prop. 65 Components**

| | CAS-No. | Revision Date |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.<br>PCB - Aroclor 1221 | 11104-28-2 | 2008-08-01 |

## 16. OTHER INFORMATION

**Further information**

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 Co., 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.

# Material Safety Data Sheet

Version 4.3
Revision Date 06/30/2011
Print Date 12/09/2011

## 1. PRODUCT AND COMPANY IDENTIFICATION

| | | |
|---|---|---|
| Product name | : | Aroclor 1016 |
| Product Number | : | 48591 |
| Brand | : | Supelco |
| Supplier | : | Sigma-Aldrich<br>3050 Spruce Street<br>SAINT LOUIS MO 63103<br>USA |
| Telephone | : | +1 800-325-5832 |
| Fax | : | +1 800-325-5052 |
| Emergency Phone # (For both supplier and manufacturer) | : | (314) 776-6555 |
| Preparation Information | : | Sigma-Aldrich Corporation<br>Product Safety - Americas Region<br>1-800-521-8956 |

## 2. HAZARDS IDENTIFICATION

### Emergency Overview

**OSHA Hazards**
No known OSHA hazards

**GHS Classification**
Acute toxicity, Oral (Category 5)
Specific target organ toxicity - repeated exposure (Category 2)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

**GHS Label elements, including precautionary statements**

Pictogram

Signal word: Warning

Hazard statement(s)

| | |
|---|---|
| H303 | May be harmful if swallowed. |
| H373 | May cause damage to organs through prolonged or repeated exposure. |
| H410 | Very toxic to aquatic life with long lasting effects. |

Precautionary statement(s)

| | |
|---|---|
| P273 | Avoid release to the environment. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**HMIS Classification**

| | |
|---|---|
| **Health hazard**: | 1 |
| **Flammability**: | 0 |
| **Physical hazards**: | 0 |

**NFPA Rating**

| | |
|---|---|
| **Health hazard**: | 0 |
| **Fire**: | 0 |
| **Reactivity Hazard**: | 0 |

**Potential Health Effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |
| **Ingestion** | May be harmful if swallowed. |

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

| CAS-No. | EC-No. | Index-No. | Concentration |
|---|---|---|---|
| **Aroclor 1016** | | | |
| 12674-11-2 | - | 602-039-00-4 | - |

## 4. FIRST AID MEASURES

**General advice**
Consult a physician. Show this safety data sheet to the doctor in attendance.

**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.

## 5. FIRE-FIGHTING MEASURES

**Conditions of flammability**
Not flammable or combustible.

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**Special protective equipment for fire-fighters**
Wear self contained breathing apparatus for fire fighting if necessary.

**Hazardous combustion products**
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

## 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions**
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

**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.

**Methods and materials for containment and cleaning up**
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

## 7. HANDLING AND STORAGE

**Precautions for safe handling**
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

**Conditions for safe storage**
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

**Personal protective equipment**

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) 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).

**Hand 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.

**Eye protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin and 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.

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

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance**

| | |
|---|---|
| Form | liquid |
| Colour | no data available |

**Safety data**

| | |
|---|---|
| pH | no data available |
| Melting point/freezing point | no data available |
| Boiling point | no data available |
| Flash point | no data available |
| Ignition temperature | no data available |
| Autoignition temperature | no data available |
| Lower explosion limit | no data available |
| Upper explosion limit | no data available |
| Vapour pressure | no data available |
| Density | no data available |
| Water solubility | no data available |
| Partition coefficient: n-octanol/water | no data available |
| Relative vapour density | no data available |
| Odour | no data available |
| Odour Threshold | no data available |

Evaporation rate no data available

## 10. STABILITY AND REACTIVITY

**Chemical stability**
Stable under recommended storage conditions.

**Possibility of hazardous reactions**
no data available

**Conditions to avoid**
no data available

**Materials to avoid**
Strong oxidizing agents

**Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.
Other decomposition products - no data available

## 11. TOXICOLOGICAL INFORMATION

**Acute toxicity**

**Oral LD50**
LD50 Oral - rat - 2,300 mg/kg

**Inhalation LC50**
no data available

**Dermal LD50**
no data available

**Other information on acute toxicity**
no data available

**Skin corrosion/irritation**
no data available

**Serious eye damage/eye irritation**
no data available

**Respiratory or skin sensitization**
no data available

**Germ cell mutagenicity**
no data available

**Carcinogenicity**

| | |
|---|---|
| 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**
Reproductive toxicity - rat - Oral
Effects on Newborn: Biochemical and metabolic.
Reproductive toxicity - Monkey - Oral
Effects on Newborn: Behavioral.
Reproductive toxicity - Mammal - Oral

Effects on Fertility: Other measures of fertility Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4). Effects on Newborn: Growth statistics (e.g., reduced weight gain).

no data available

**Teratogenicity**

Developmental Toxicity - rat - Oral
Specific Developmental Abnormalities: Central nervous system.

no data available

**Specific target organ toxicity - single exposure (Globally Harmonized System)**
no data available

**Specific target organ toxicity - repeated exposure (Globally Harmonized System)**
May cause damage to organs through prolonged or repeated exposure.

**Aspiration hazard**
no data available

**Potential health effects**

| | |
|---|---|
| **Inhalation** | May be harmful if inhaled. May cause respiratory tract irritation. |
| **Ingestion** | May be harmful if swallowed. |
| **Skin** | May be harmful if absorbed through skin. May cause skin irritation. |
| **Eyes** | May cause eye irritation. |

**Synergistic effects**
no data available

**Additional Information**
RTECS: Not available

## 12. ECOLOGICAL INFORMATION

**Toxicity**

| | |
|---|---|
| Toxicity to fish | LC50 - Oncorhynchus mykiss (rainbow trout) - 0.0010 mg/l - 96.0 h |

**Persistence and degradability**

| | |
|---|---|
| Biodegradability | Biotic/Aerobic Biochemical oxygen demand |

**Bioaccumulative potential**

| | |
|---|---|
| Bioaccumulation | Pimephales promelas (fathead minnow) -<br>Bioconcentration factor (BCF): 42,500 |

**Mobility in soil**
no data available

**PBT and vPvB assessment**
no data available

**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.

## 13. DISPOSAL CONSIDERATIONS

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

**IMDG**
UN number: 2315 Class: 9 Packing group: II EMS-No: F-A, S-A
Proper shipping name: POLYCHLORINATED BIPHENYLS, LIQUID
Marine pollutant: No

**IATA**
UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid

## 15. REGULATORY INFORMATION

**OSHA Hazards**
No known OSHA hazards

**SARA 302 Components**
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
SARA 313: 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**
No SARA Hazards

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1016 | 12674-11-2 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1016 | 12674-11-2 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Aroclor 1016 | 12674-11-2 | 1993-04-24 |

**California Prop. 65 Components**

| | CAS-No. | Revision Date |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause cancer.<br>Aroclor 1016 | 12674-11-2 | 2008-08-01 |

**California Prop. 65 Components**

| | CAS-No. | Revision Date |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.<br>Aroclor 1016 | 12674-11-2 | 2008-08-01 |

## 16. OTHER INFORMATION

**Further information**

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 Co., 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.

# International Chemical Safety Cards

## POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

Chlorobiphenyl (54% chlorine)
Chlorodiphenyl (54% chlorine)
PCB
Molecular mass: 327 (average)

ICSC # 0939
CAS # 11097-69-1
RTECS # TQ1360000
UN # 2315
EC # 602-039-00-4
October 20, 1999 Peer reviewed

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. | | In case of fire in the surroundings: powder, carbon dioxide. |
| **EXPLOSION** | | | |
| **EXPOSURE** | | PREVENT GENERATION OF MISTS! STRICT HYGIENE! | |
| **•INHALATION** | | Ventilation. | Fresh air, rest. Refer for medical attention. |
| **•SKIN** | MAY BE ABSORBED! Dry skin. Redness. | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. |
| **•EYES** | | Safety goggles, face shield. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | Headache. Numbness. | Do not eat, drink, or smoke during work. | Rest. Refer for medical attention. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus. | Separated from food and feedstuffs . Cool. Dry. Keep in a well-ventilated room. | Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.<br>Severe marine pollutant.<br>Note: C<br>Xn symbol<br>N symbol<br>R: 33-50/53<br>S: 2-35-60-61<br>UN Hazard Class: 9<br>UN Packing Group: II |

**SEE IMPORTANT INFORMATION ON BACK**



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

# International Chemical Safety Cards

## POLYCHLORINATED BIPHENYL (AROCLOR 1254)

**ICSC: 0939**

| | | |
|---|---|---|
| **IMPORTANT DATA** | **PHYSICAL STATE; APPEARANCE:**<br>LIGHT YELLOW VISCOUS LIQUID.<br><br>**PHYSICAL DANGERS:**<br><br>**CHEMICAL DANGERS:**<br>The substance decomposes in a fire producing irritating and toxic gases .<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV: 0.5 mg/m³ as TWA; (skin); A3; (ACGIH 2004).<br>MAK: 0.05 ppm, 0.70 mg/m³; H; Peak limitation category: II(8); Carcinogen category: 3B; Pregnancy risk group: B; (DFG 2004).<br>OSHA PEL: TWA 0.5 mg/m$^3$ skin<br>NIOSH REL*: Ca TWA 0.001 mg/m$^3$ See Appendix A *Note: The REL also applies to other PCBs.<br>NIOSH IDLH: Ca 5 mg/m$^3$ See: IDLH INDEX | **ROUTES OF EXPOSURE:**<br>The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.<br><br>**INHALATION RISK:**<br>A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20° C.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>Repeated or prolonged contact with skin may cause dermatitis. Chloracne is the most visible effect. The substance may have effects on the liver . Animal tests show that this substance possibly causes toxic effects upon human reproduction. |
| **PHYSICAL PROPERTIES** | Relative density (water = 1): 1.5<br>Solubility in water:<br>none | Vapour pressure, Pa at 25°C: 0.01<br>Octanol/water partition coefficient as log Pow: 6.30 (estimated) |
| **ENVIRONMENTAL DATA** | In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms. It is strongly advised not to let the chemical enter into the environment.  | |

**N O T E S**

Changes into a resinous state (pour point) at 10°C. Distillation range: 365°-390°C. Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.

Transport Emergency Card: TEC (R)-90GM2-II-L

**ADDITIONAL INFORMATION**

# International Chemical Safety Cards

## NICKEL

**ICSC: 0062**

Ni
Atomic mass: 58.7
(powder)

ICSC # 0062
CAS # 7440-02-0
RTECS # QR5950000
EC # 028-002-00-7
October 17, 2001 Peer reviewed

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Flammable as dust. Toxic fumes may be released in a fire. | | Dry sand. NO carbon dioxide. NO water. |
| **EXPLOSION** | Finely dispersed particles form explosive mixtures in air. | Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting. | |
| **EXPOSURE** | | PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! | |
| **•INHALATION** | Cough. Shortness of breath. | Local exhaust or breathing protection. | Fresh air, rest. |
| **•SKIN** | | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| **•EYES** | | Safety spectacles, or eye protection in combination with breathing protection. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | | Do not eat, drink, or smoke during work. | Rinse mouth. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Vacuum spilled material. Carefully collect remainder, then remove to safe place. Personal protection: P2 filter respirator for harmful particles. | Separated from strong acids. | Xn symbol<br>R: 40-43<br>S: 2-22-36 |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0062**



# International Chemical Safety Cards

## NICKEL

**ICSC: 0062**

**I**

**PHYSICAL STATE; APPEARANCE:**
SILVERY METALLIC SOLID IN VARIOUS FORMS.

**PHYSICAL DANGERS:**

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation of the dust.

| | | |
|---|---|---|
| **IMPORTANT DATA** | Dust explosion possible if in powder or granular form, mixed with air.<br><br>**CHEMICAL DANGERS:**<br>Reacts violently, in powder form, with titanium powder and potassium perchlorate, and oxidants such as ammonium nitrate, causing fire and explosion hazard. Reacts slowly with non-oxidizing acids and more rapidly with oxidizing acids. Toxic gases and vapours (such as nickel carbonyl) may be released in a fire involving nickel.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV:<br>(Inhalable fraction)<br>1.5 mg/m³ as TWA A5 (not suspected as a human carcinogen); (ACGIH 2004).<br>MAK: (Inhalable fraction) sensitization of respiratory tract and skin (Sah);<br>Carcinogen category: 1;<br>(DFG 2004).<br>OSHA PEL*†: TWA 1 mg/m$^3$ *Note: The PEL does not apply to Nickel carbonyl.<br>NIOSH REL*: Ca TWA 0.015 mg/m$^3$ See Appendix A<br>*Note: The REL does not apply to Nickel carbonyl.<br>NIOSH IDLH: Ca 10 mg/m$^3$ (as Ni) See: 7440020 | **INHALATION RISK:**<br>Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br>May cause mechanical irritation. Inhalation of fumes may cause pneumonitis.<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation exposure may cause asthma. Lungs may be affected by repeated or prolonged exposure. This substance is possibly carcinogenic to humans. |
| **PHYSICAL PROPERTIES** | Boiling point: 2730°C<br>Melting point: 1455°C<br>Density: 8.9<br>g/cm3 | Solubility in water:<br>none |
| **ENVIRONMENTAL DATA** | | |

**N O T E S**

At high temperatures, nickel oxide fumes will be formed. Depending on the degree of exposure, periodic medical examination is suggested. The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Anyone who has shown symptoms of asthma due to this substance should avoid all further contact with this substance.

**ADDITIONAL INFORMATION**

**ICSC: 0062** **NICKEL**

# International Chemical Safety Cards

## ZINC POWDER

**ICSC: 1205**

Blue powder
Merrillite
Zn
Atomic mass: 65.4
(powder)

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

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire. | NO open flames, NO sparks, and NO smoking. NO contact with acid(s), base (s) and incompatible substances (see Chemical Dangers). | Special powder, dry sand, NO other agents. NO water. |
| **EXPLOSION** | Risk of fire and explosion on contact with acid(s), base(s), water and incompatible substances. | Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Prevent deposition of dust. | In case of fire: cool drums, etc., by spraying with water but avoid contact of the substance with water. |
| **EXPOSURE** | | PREVENT DISPERSION OF DUST! STRICT HYGIENE! | |
| •**INHALATION** | Metallic taste and metal fume fever. Symptoms may be delayed (see Notes). | Local exhaust. | Fresh air, rest. Refer for medical attention. |
| •**SKIN** | Dry skin. | Protective gloves. | Rinse and then wash skin with water and soap. |
| •**EYES** | | Safety spectacles. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| •**INGESTION** | Abdominal pain. Nausea. Vomiting. | Do not eat, drink, or smoke during work. Wash hands before eating. | Rinse mouth. Refer for medical attention. |

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

**SEE IMPORTANT INFORMATION ON BACK**

# International Chemical Safety Cards

## ZINC POWDER

**ICSC: 1205**

**I M P O R T A N T D A T A**

**PHYSICAL STATE; APPEARANCE:**
ODOURLESS GREY TO BLUE POWDER.

**PHYSICAL DANGERS:**
Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

**CHEMICAL DANGERS:**
Upon heating, toxic fumes are formed. The substance is a strong reducing agent and reacts violently with oxidants. Reacts with water and reacts violently with acids and bases forming flammable/explosive gas (hydrogen - see ICSC0001) Reacts violently with sulfur, halogenated hydrocarbons and many other substances causing fire and explosion hazard.

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

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation and by ingestion.

**INHALATION RISK:**
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

**EFFECTS OF SHORT-TERM EXPOSURE:**
Inhalation of fumes may cause metal fume fever. The effects may be delayed.

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
Repeated or prolonged contact with skin may cause dermatitis.

**PHYSICAL PROPERTIES**

Boiling point: 907°C
Melting point: 419°C
Relative density (water = 1): 7.14
Solubility in water: reaction
Vapour pressure, kPa at 487°C: 0.1
Auto-ignition temperature: 460°C

**ENVIRONMENTAL DATA**

**N O T E S**

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

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

**ADDITIONAL INFORMATION**

**ICSC: 1205** **ZINC POWDER**

# International Chemical Safety Cards

## COPPER

**ICSC: 0240**

Cu
(powder)

ICSC # 0240
CAS # 7440-50-8
RTECS # GL5325000
September 24, 1993 Validated

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Combustible. | NO open flames. | Special powder, dry sand, NO other agents. |
| **EXPLOSION** | | | |
| **EXPOSURE** | | PREVENT DISPERSION OF DUST! | |
| **•INHALATION** | Cough. Headache. Shortness of breath. Sore throat. | Local exhaust or breathing protection. | Fresh air, rest. Refer for medical attention. |
| **•SKIN** | Redness. | Protective gloves. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| **•EYES** | Redness. Pain. | Safety goggles. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | Abdominal pain. Nausea. Vomiting. | Do not eat, drink, or smoke during work. | Rinse mouth. Refer for medical attention. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Sweep spilled substance into containers. Carefully collect remainder. Then remove to safe place. (Extra personal protection: P2 filter respirator for harmful particles). | Separated from - See Chemical Dangers. | R:<br>S: |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0240**



# International Chemical Safety Cards

## COPPER

**ICSC: 0240**

**I**

**M**

**P**

**PHYSICAL STATE; APPEARANCE:**
RED POWDER, TURNS GREEN ON EXPOSURE TO MOIST AIR.

**PHYSICAL DANGERS:**

**CHEMICAL DANGERS:**

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation and by ingestion.

**INHALATION RISK:**
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

| | | |
|---|---|---|
| **O**<br>**R**<br>**T**<br>**A**<br>**N**<br>**T**<br>**D**<br>**A**<br>**T**<br>**A** | Shock-sensitive compounds are formed with acetylenic compounds, ethylene oxides and azides. Reacts with strong oxidants like chlorates, bromates and iodates, causing explosion hazard.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV: 0.2 mg/m³ fume (ACGIH 1992-1993).<br>TLV (as Cu, dusts & mists): 1 mg/m³ (ACGIH 1992-1993).<br>Intended change 0.1 mg/m³<br>Inhal.,<br>A4 (not classifiable as a human carcinogen);<br>MAK: 0.1 mg/m³ (Inhalable fraction)<br>Peak limitation category: II(2) Pregnancy risk group: D (DFG 2005).<br>OSHA PEL*: TWA 1 mg/m$^3$ *Note: The PEL also applies to other copper compounds (as Cu) except copper fume.<br>NIOSH REL*: TWA 1 mg/m$^3$ *Note: The REL also applies to other copper compounds (as Cu) except Copper fume.<br>NIOSH IDLH: 100 mg/m$^3$ (as Cu) See: 7440508 | **EFFECTS OF SHORT-TERM EXPOSURE:**<br>Inhalation of fumes may cause metal fume fever. See Notes.<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>Repeated or prolonged contact may cause skin sensitization. |

| | | |
|---|---|---|
| **PHYSICAL PROPERTIES** | Boiling point: 2595°C<br>Melting point: 1083°C<br>Relative density (water = 1): 8.9 | Solubility in water:<br>none |
| **ENVIRONMENTAL DATA** | | |

**N O T E S**

The symptoms of metal fume fever do not become manifest until several hours.

**ADDITIONAL INFORMATION**

| | |
|---|---|
| | |

**ICSC: 0240** **COPPER**



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

# International Chemical Safety Cards

## CHROMIUM

**ICSC: 0029**

Chrome
Cr
Atomic mass: 52.0
(powder)

ICSC # 0029
CAS # 7440-47-3
RTECS # GB4200000
October 27, 2004 Peer reviewed

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Combustible under specific conditions. | No open flames if in powder form. | In case of fire in the surroundings: use appropriate extinguishing media. |
| **EXPLOSION** | | Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting. | |
| **EXPOSURE** | | PREVENT DISPERSION OF DUST! | |
| •**INHALATION** | Cough. | Local exhaust or breathing protection. | Fresh air, rest. |
| •**SKIN** | | Protective gloves. | Remove contaminated clothes. Rinse skin with plenty of water or shower. |
| •**EYES** | Redness. | Safety goggles. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| •**INGESTION** | | Do not eat, drink, or smoke during work. | Rinse mouth. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Personal protection: P2 filter respirator for harmful particles. | | R:<br>S: |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0029**



# International Chemical Safety Cards

## CHROMIUM

**ICSC: 0029**

**I**

**M**

**P**

**PHYSICAL STATE; APPEARANCE:**
GREY POWDER

**PHYSICAL DANGERS:**
Dust explosion possible if in powder or granular form, mixed with air.

**ROUTES OF EXPOSURE:**

**INHALATION RISK:**
A harmful concentration of airborne particles can be reached quickly when dispersed.

| | |
|---|---|
| **O R T A N T D A T A** | **CHEMICAL DANGERS:**<br>Chromium is a catalytic substance and may cause reaction in contact with many organic and inorganic substances , causing fire and explosion hazard.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV: (as Cr metal, Cr(III) compounds) 0.5 mg/m³ as TWA A4 (ACGIH 2004).<br>MAK not established.<br>OSHA PEL*: TWA 1 mg/m$^3$ See Appendix C *Note: The PEL also applies to insoluble chromium salts.<br>NIOSH REL: TWA 0.5 mg/m$^3$ See Appendix C<br>NIOSH IDLH: 250 mg/m$^3$ (as Cr) See: 7440473<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br>May cause mechanical irritation tothe eyesandthe respiratory tract.<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** |
| **PHYSICAL PROPERTIES** | Boiling point: 2642°C<br>Melting point: 1900°C<br>Density: 7.15 g/cm³<br><br>Solubility in water:<br>none |
| **ENVIRONMENTAL DATA** | |

**N O T E S**

The surface of the chromium particles is oxidized to chromium(III)oxide in air. See ICSC 1531 Chromium(III) oxide.

**ADDITIONAL INFORMATION**

| | |
|---|---|
| | |

**ICSC: 0029** **CHROMIUM**



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

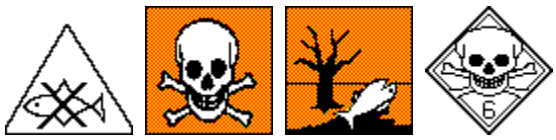
# International Chemical Safety Cards

## ARSENIC

**ICSC: 0013**

Grey arsenic
As
Atomic mass: 74.9

ICSC # 0013
CAS # 7440-38-2
RTECS # CG0525000
UN # 1558
EC # 033-001-00-X
October 18, 1999 Peer reviewed



| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Combustible. Gives off irritating or toxic fumes (or gases) in a fire. | NO open flames. NO contact with strong oxidizers. NO contact with hot surfaces. | Powder, water spray, foam, carbon dioxide. |
| **EXPLOSION** | Risk of fire and explosion is slight when exposed to hot surfaces or flames in the form of fine powder or dust. | Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting. | |
| **EXPOSURE** | | PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN! | IN ALL CASES CONSULT A DOCTOR! |
| **•INHALATION** | Cough. Sore throat. Shortness of breath. Weakness. See Ingestion. | Closed system and ventilation. | Fresh air, rest. Artificial respiration may be needed. Refer for medical attention. |
| **•SKIN** | Redness. | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse skin with plenty of water or shower. |
| **•EYES** | Redness. | Face shield or eye protection in combination with breathing protection if powder. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | Abdominal pain. Diarrhoea. Nausea. Vomiting. Burning sensation in the throat and chest. Shock or collapse. Unconsciousness. | Do not eat, drink, or smoke during work. Wash hands before eating. | Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Evacuate danger area! Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. | Separated from strong oxidants, acids, halogens, food and feedstuffs. Well closed. | Do not transport with food and feedstuffs.<br>Marine pollutant.<br>T symbol<br>N symbol<br>R: 23/25-50/53<br>S: 1/2-20/21-28-45-60-61<br>UN Hazard Class: 6.1<br>UN Packing Group: II |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0013**

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

# International Chemical Safety Cards

## ARSENIC

**ICSC: 0013**

**I M P O R T A N T D A T A**

**PHYSICAL STATE; APPEARANCE:**
ODOURLESS, BRITTLE, GREY, METALLIC-LOOKING CRYSTALS.

**PHYSICAL DANGERS:**

**CHEMICAL DANGERS:**
Upon heating, toxic fumes are formed. Reacts violently with strong oxidants and halogens, causing fire and explosion hazard. Reacts with acids to produce

**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: 0.01 mg/m³ as TWA A1 (confirmed human carcinogen); BEI issued (ACGIH 2004).
MAK:
Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004).
OSHA PEL: 1910.1018 TWA 0.010 $mg/m^3$
NIOSH REL: Ca C 0.002 $mg/m^3$ 15-minute See Appendix A
NIOSH IDLH: Ca 5 $mg/m^3$ (as As) See: 7440382

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

**INHALATION RISK:**
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly, when dispersed.

**EFFECTS OF SHORT-TERM EXPOSURE:**
The substance is irritating to the eyes the skin and the respiratory tract. The substance may cause effects on the gastrointestinal tract cardiovascular system central nervous system kidneys , resulting in severe gastroenteritis, loss of fluid, and electrolytes, cardiac disorders shock convulsions and kidney impairment Exposure above the OEL may result in death. The effects may be delayed. Medical observation is indicated.

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the mucous membranes, skin, peripheral nervous system liver bone marrow , resulting in pigmentation disorders, hyperkeratosis, perforation of nasal septum, neuropathy, liver impairment anaemia This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

**PHYSICAL PROPERTIES**

Sublimation point: 613°C
Density: 5.7 g/cm³

Solubility in water:
none

**ENVIRONMENTAL DATA**

The substance is toxic to aquatic organisms. It is strongly advised that this substance does not enter the environment.

**N O T E S**

The substance is combustible but no flash point is available in literature. Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. Refer also to cards for specific arsenic compounds, e.g., Arsenic pentoxide (ICSC 0377), Arsenic trichloride (ICSC 0221), Arsenic trioxide (ICSC 0378), Arsine (ICSC 0222).

Transport Emergency Card: TEC (R)-61GT5-II

**ADDITIONAL INFORMATION**





**IMPORTANT LEGAL NOTICE:**

# International Chemical Safety Cards

## MERCURY

**ICSC: 0056**

Quicksilver
Liquid silver
Hg
Atomic mass: 200.6

ICSC # 0056
CAS # 7439-97-6
RTECS # OV4550000
UN # 2809
EC # 080-001-00-0
April 22, 2004 Peer reviewed

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

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Evacuate danger area in case of a large spill! Consult an expert! Ventilation. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Chemical protection suit including self-contained breathing apparatus. | Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs Well closed. | Special material. Do not transport with food and feedstuffs.<br>T symbol<br>N symbol<br>R: 23-33-50/53<br>S: 1/2-7-45-60-61<br>UN Hazard Class: 8<br>UN Packing Group: III |

**SEE IMPORTANT INFORMATION ON BACK**



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

# International Chemical Safety Cards

## MERCURY

**ICSC: 0056**

**IMPORTANT DATA**

**PHYSICAL STATE; APPEARANCE:**
ODOURLESS, HEAVY AND MOBILE SILVERY LIQUID METAL.

**PHYSICAL DANGERS:**

**CHEMICAL DANGERS:**
Upon heating, toxic fumes are formed. Reacts violently with ammonia and halogens causing fire and explosion hazard. Attacks aluminium and many other metals forming amalgams.

**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: 0.025 mg/m³ as TWA (skin) A4 BEI issued (ACGIH 2004).
MAK: 0.1 mg/m³ Sh
Peak limitation category: II(8) Carcinogen category: 3B (DFG 2003).
OSHA PEL†: C 0.1 mg/m$^3$
NIOSH REL: Hg Vapor: TWA 0.05 mg/m$^3$ skin
Other: C 0.1 mg/m$^3$ skin
NIOSH IDLH: 10 mg/m$^3$ (as Hg) See: 7439976

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation of its vapour and through the skin , also as a vapour!

**INHALATION RISK:**
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

**EFFECTS OF SHORT-TERM EXPOSURE:**
The substance is irritating to the skin. Inhalation of the vapours may cause pneumonitis. The substance may cause effects on the central nervous systemandkidneys. The effects may be delayed. Medical observation is indicated.

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
The substance may have effects on the central nervous system kidneys , resulting in irritability, emotional instability, tremor, mental and memory disturbances, speech disorders. Danger of cumulative effects. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

**PHYSICAL PROPERTIES**

Boiling point: 357°C
Melting point: -39°C
Relative density (water = 1): 13.5
Solubility in water:
none

Vapour pressure, Pa at 20°C: 0.26
Relative vapour density (air = 1): 6.93
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.009

**ENVIRONMENTAL DATA**

The substance is very toxic to aquatic organisms. In the food chain important to humans, bioaccumulation takes place, specifically in fish.

**N O T E S**

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

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

**ADDITIONAL INFORMATION**

**ICSC: 0056** **MERCURY**

# International Chemical Safety Cards

## LEAD

**ICSC: 0052**

Lead metal
Plumbum
Pb
Atomic mass: 207.2
(powder)

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

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

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

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0052**

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

# International Chemical Safety Cards

# LEAD

**ICSC: 0052**

**I M P O R T A N T D A T A**

**PHYSICAL STATE; APPEARANCE:**
BLUISH-WHITE OR SILVERY-GREY SOLID IN VARIOUS FORMS. TURNS TARNISHED ON EXPOSURE TO AIR.

**PHYSICAL DANGERS:**
Dust explosion possible if in powder or granular form, mixed with air.

**CHEMICAL DANGERS:**
On heating, toxic fumes are formed. Reacts with oxidants. Reacts with hot concentrated nitric acid, boiling concentrated hydrochloric acid and sulfuric acid. Attacked by pure water and by weak organic acids in the presence of oxygen.

**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: 0.05 mg/m³ A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued (ACGIH 2004).
MAK:
Carcinogen category: 3B; Germ cell mutagen group: 3A; (DFG 2004).
EU OEL: as TWA 0.15 mg/m³ (EU 2002).
OSHA PEL*: 1910.1025 TWA 0.050 mg/m$^3$ See Appendix C *Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.
NIOSH REL*: TWA 0.050 mg/m$^3$ See Appendix C *Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.
NIOSH IDLH: 100 mg/m$^3$ (as Pb) See: 7439921

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation and by ingestion.

**INHALATION RISK:**
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

**EFFECTS OF SHORT-TERM EXPOSURE:**

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
The substance may have effects on the blood bone marrow central nervous system peripheral nervous system kidneys , resulting in anaemia, encephalopathy (e.g., convulsions), peripheral nerve disease, abdominal cramps and kidney impairment. Causes toxicity to human reproduction or development.

| **PHYSICAL PROPERTIES** | | |
|---|---|---|
| | Boiling point: 1740°C | Density: 11.34 g/cm3 |
| | Melting point: 327.5°C | Solubility in water: none |

| **ENVIRONMENTAL DATA** | |
|---|---|
| | Bioaccumulation of this chemical may occur in plants and in mammals. It is strongly advised that this substance does not enter the environment.  |

**N O T E S**

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home.

Transport Emergency Card: TEC (R)-51S1872

**ADDITIONAL INFORMATION**

**ICSC: 0052** **LEAD**

# International Chemical Safety Cards

## CADMIUM

**ICSC: 0020**

Cd
Atomic mass: 112.4

ICSC # 0020
CAS # 7440-43-9
RTECS # EU9800000
UN # 2570
EC # 048-002-00-0
April 22, 2005 Peer reviewed


| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Flammable in powder form and spontaneously combustible in pyrophoric form. Gives off irritating or toxic fumes (or gases) in a fire. | NO open flames, NO sparks, and NO smoking. NO contact with heat or acid(s). | Dry sand. Special powder. NO other agents. |
| **EXPLOSION** | Finely dispersed particles form explosive mixtures in air. | Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting. | |
| **EXPOSURE** | | PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! | IN ALL CASES CONSULT A DOCTOR! |
| •**INHALATION** | Cough. Sore throat. | Local exhaust or breathing protection. | Fresh air, rest. Refer for medical attention. |
| •**SKIN** | | Protective gloves. | Remove contaminated clothes. Rinse and then wash skin with water and soap. |
| •**EYES** | Redness. Pain. | Safety goggles or eye protection in combination with breathing protection. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| •**INGESTION** | Abdominal pain. Diarrhoea. Headache. Nausea. Vomiting. | Do not eat, drink, or smoke during work. | Rest. Refer for medical attention. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Evacuate danger area! Personal protection: chemical protection suit including self-contained breathing apparatus. Remove all ignition sources. Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. | Fireproof. Dry. Keep under inert gas. Separated from igntion sources, oxidants acids, food and feedstuffs | Airtight. Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.<br>Note: E<br>T+ symbol<br>N symbol<br>R: 45-26-48/23/25-62-63-68-50/53<br>S: 53-45-60-61<br>UN Hazard Class: 6.1 |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0020**

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

# International Chemical Safety Cards

## CADMIUM

**ICSC: 0020**

**I M P O R T A N T D A T A**

**PHYSICAL STATE; APPEARANCE:**
SOFT BLUE-WHITE METAL LUMPS OR GREY POWDER. MALLEABLE. TURNS BRITTLE ON EXPOSURE TO 80°C AND TARNISHES ON EXPOSURE TO MOIST AIR.

**PHYSICAL DANGERS:**
Dust explosion possible if in powder or granular form, mixed with air.

**CHEMICAL DANGERS:**
Reacts with acids forming flammable/explosive gas (hydrogen - see ICSC0001.) Dust reacts with oxidants, hydrogen azide, zinc, selenium or tellurium , causing fire and explosion hazard.

**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: (Total dust) 0.01 mg/m³
(Respirable fraction)
0.002 mg/m³ as TWA A2 (suspected human carcinogen); BEI issued (ACGIH 2005).
MAK: skin absorption (H);
Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004).
OSHA PEL*: 1910.1027 TWA 0.005 mg/m$^3$ *Note: The PEL applies to all Cadmium compounds (as Cd).
NIOSH REL*: Ca See Appendix A *Note: The REL applies to all Cadmium compounds (as Cd).
NIOSH IDLH: Ca 9 mg/m$^3$ (as Cd) See: IDLH INDEX

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

**INHALATION RISK:**
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

**EFFECTS OF SHORT-TERM EXPOSURE:**
The fume is irritating to the respiratory tract Inhalation of fume may cause lung oedema (see Notes). Inhalation of fumes may cause metal fume fever. The effects may be delayed. Medical observation is indicated.

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
Lungs may be affected by repeated or prolonged exposure to dust particles. The substance may have effects on the kidneys , resulting in kidney impairment This substance is carcinogenic to humans.

**PHYSICAL PROPERTIES**

Boiling point: 765°C
Melting point: 321°C
Density: 8.6
g/cm3

Solubility in water: none
Auto-ignition temperature: (cadmium metal dust) 250°C

**ENVIRONMENTAL DATA**

**N O T E S**

Reacts violently with fire extinguishing agents such as water,foam,carbon dioxideand halons. Depending on the degree of exposure, periodic medical examination is indicated. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Do NOT take working clothes home. Cadmium also exists in a pyrophoric form (EC No. 048-011-00-X), which bears the additional EU labelling symbol F, R phrase 17, and S phrases 7/8 and 43. UN numbers and packing group will vary according to the physical form of the substance.

**ADDITIONAL INFORMATION**

# International Chemical Safety Cards

## BARIUM SULFATE

**ICSC: 0827**

Barium sulphate
Blanc fixe
Artificial barite
$BaSO_4$
Molecular mass: 233.43

ICSC # 0827
CAS # 7727-43-7
RTECS # CR0600000
October 20, 1999 Peer reviewed

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. | | In case of fire in the surroundings: use appropriate extinguishing media. |
| **EXPLOSION** | | | |
| **EXPOSURE** | | PREVENT DISPERSION OF DUST! | |
| **•INHALATION** | | Local exhaust or breathing protection. | Fresh air, rest. |
| **•SKIN** | | Protective gloves. | Remove contaminated clothes. Rinse skin with plenty of water or shower. |
| **•EYES** | | Safety spectacles. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| **•INGESTION** | | Do not eat, drink, or smoke during work. | Rinse mouth. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Personal protection: P1 filter respirator for inert particles. | | R:<br>S: |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0827**

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

# International Chemical Safety Cards

## BARIUM SULFATE

**ICSC: 0827**

| | |
|---|---|
| **IMPORTANT DATA** | **PHYSICAL STATE; APPEARANCE:**<br>ODOURLESS TASTELESS, WHITE OR YELLOWISH CRYSTALS OR POWDER.<br><br>**PHYSICAL DANGERS:**<br><br>**CHEMICAL DANGERS:**<br>Reacts violently with aluminium powder.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV: 10 mg/m³ as TWA; (ACGIH 2004).<br>MAK: (Inhalable fraction) 4 mg/m³; (Respirable fraction) 1.5 mg/m³; (DFG 2004).<br>OSHA PEL†: TWA 15 mg/m$^3$ (total) TWA 5 mg/m$^3$ (resp)<br>NIOSH REL: TWA 10 mg/m$^3$ (total) TWA 5 mg/m$^3$ (resp)<br>NIOSH IDLH: N.D. See: IDLH INDEX<br><br>**ROUTES OF EXPOSURE:**<br>The substance can be absorbed into the body by inhalation of its aerosol.<br><br>**INHALATION RISK:**<br>Evaporation at 20°C is negligible; a nuisance-causing concentration of airborne particles can, however, be reached quickly.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>Lungs may be affected by repeated or prolonged exposure to dust particles , resulting in baritosis (a form of benign pneumoconiosis). |
| **PHYSICAL PROPERTIES** | Melting point (decomposes): 1600°C<br>Density: 4.5 g/cm³<br>Solubility in water: none |
| **ENVIRONMENTAL DATA** | |

**NOTES**

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

**ADDITIONAL INFORMATION**





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

# *APPENDIX D*

# *HOSPITAL INFORMATION AND MAP*

# *FIELD ACCIDENT REPORT*

# FIELD ACCIDENT REPORT

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

PROJECT NAME _____ PROJECT. NO._____

Date of Accident _____ Time _____ Report By _____

Type of Accident (Check One):

( ) Vehicular ( ) Personal ( ) Property

Name of Injured _____ DOB or Age _____

How Long Employed _____

Names of Witnesses _____

_____

Description of Accident _____

_____

_____

Action Taken _____

_____

_____

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

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

_____

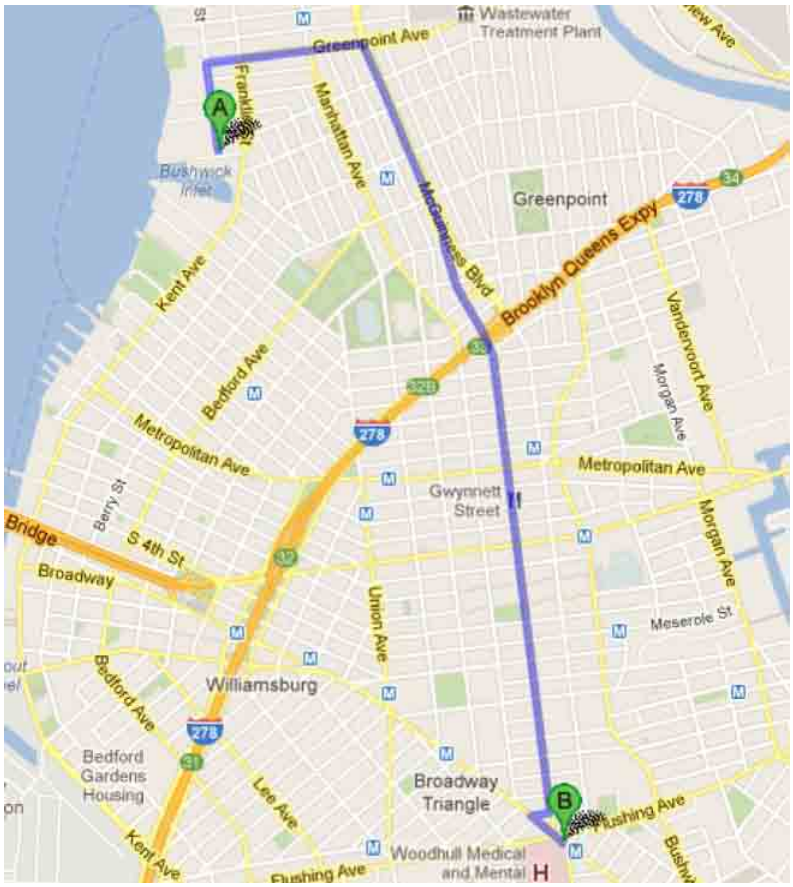
(If not, it is the EMPLOYEE'S sole responsibility to process his/her claim through his/her Health and Welfare Fund.)

INDICATE STREET NAMES, DESCRIPTION OF VEHICLES, AND NORTH ARROW

# HOSPITAL INFORMATION AND MAP

The hospital nearest the site is:

**WOODHUL MEDICAL CENTER**
760 Broadway, Brooklyn, New York 11206
718-963-8000
2.9 Miles – About 9 Minutes




A 11 West St, Brooklyn, NY 11222

| | | |
|---|---|---|
| 1. | Head **north** on **West St** toward **Calyer St**<br>About 57 secs | go 0.2 mi<br>total 0.2 mi |
| 2. | Turn right onto **Greenpoint Ave**<br>About 2 mins | go 0.4 mi<br>total 0.6 mi |
| 3. | Turn right onto **McGuinness Blvd**<br>About 1 min | go 0.5 mi<br>total 1.2 mi |
| 4. | Slight right onto **Graham Ave**<br>About 4 mins | go 1.5 mi<br>total 2.7 mi |
| 5. | Turn right onto **Debevoise St** | go 272 ft<br>total 2.8 mi |
| 6. | Turn left onto **Broadway**<br>Destination will be on the right<br>About 1 min | go 0.1 mi<br>total 2.9 mi |

B 760 Broadway, Brooklyn, NY 11206

# ***ATTACHMENT C***
# *Community Air Monitoring Plan*

# COMMUNITY AIR MONITORING PLAN

FORMER CONSOLIDATED FREGHTWAYS
11 WEST STREET
GREENPOINT, NY

APRIL - 2014

**FORMER CONSOLIDATED FREIGHTWAYS**

**COMMUNITY AIR MONITORING PLAN**
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## *APPENDICES*


Appendix A Action Limit Report


**1.0 INTRODUCTION**

This Community Air Monitoring Plan (CAMP) has been prepared for the drilling and sampling activities to be performed under a Remedial Investigation Work Plan (RIWP) at the Former Consolidated Freightways Terminal Site. The CAMP provides measures for protection for the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the investigation activities) from potential airborne contaminant releases resulting from investigative activities at the site.

Compliance with this CAMP is required during all activities associated with drilling and sampling activities that have the potential to generate airborne particulate matter and volatile organic compounds (VOCs). These activities include drilling and soil and groundwater sampling. This CAMP has been prepared to ensure that investigation activities do not adversely affect passersby, residents, or workers in the area immediately surrounding the Site and to preclude or minimize airborne migration of investigation-related contaminants to off-site areas.

## 1.1 Regulatory Requirements

This CAMP was established in accordance with the following requirements:

- New York State Department of Health's (NYSDOH) Generic Community Air Monitoring Plan as presented in DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC May 3, 2010). This guidance specifies that a community air-monitoring program shall be implemented to protect the surrounding community and to confirm that the work does not spread contamination off-site through the air;

- New York State Department of Environmental Conservation (NYSDEC) Technical and Guidance Memorandum (TAGM) #4031 - Fugitive Dust Suppression and Particulate Monitoring Program at Inactive 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.

## 2.0 AIR MONITORING

Chlorinated volatile organic compounds (VOCs) and petroleum VOCs are the constituents of concern at the Site. The appropriate method to monitor air for these constituents during remediation activities is through real-time VOC and air particulate (dust) monitoring.

### 2.1 Meteorological Data

At a minimum, wind direction will be evaluated at the start of each workday, noon of each workday, and the end of each workday. These readings will be utilized to position the monitoring equipment in appropriate upwind and downwind locations.

### 2.2 Community Air Monitoring Requirements

To establish ambient air background concentrations, air will be monitored at several locations around the site perimeter before activities begin. These points will be monitored periodically in series during the site work. When the drilling area is within 20 feet of potentially exposed populations or occupied structures, the perimeter monitoring points will be located to represent the nearest potentially exposed individuals at the downwind location.

Fugitive respirable dust will be monitored using a MiniRam Model PDM-3 aerosol monitor (or equivalent). Air will be monitored for VOCs with a portable Ionscience 3000 photoionization detector (PID), or equivalent. All air monitoring data will be documented in a site log book by the designated site safety officer. The site safety officer or delegate must ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. All instruments will be zeroed daily and checked for accuracy. A daily log will be kept. If additional monitoring is required, the protocols will be developed and appended to this plan

## 3.0 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 or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. 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.

- 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.

- 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.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

All readings will be recorded and made available for NYSDEC and NYSDOH personnel to review. If an exceedance of the Action Limits occurs, an Action Limit Report, as shown in **Appendix A**, will be completed.

### 3.1 Potential Corrective Measures and VOC Suppression Techniques

If the 15-minute integrated VOC level at the downwind location persists at a concentration that exceeds the upwind level by more than 5 ppm but less than 25 ppm during remediation activities, then vapor suppression techniques will be employed. The following techniques, or others, may be employed to mitigate the generation and migration of fugitive organic vapors:

- Collection of purge water in covered containers;
- storage of excess sample and drill cuttings in drums or covering with plastic

## 4.0 PARTICULATE MONITORING

Air monitoring for particulates (i.e., dust) will be performed continuously during drilling activities using both air monitoring equipment and visual observation at upwind and downwind locations. Monitoring equipment capable of measuring particulate matter smaller than 10 microns ($PM_{10}$) and capable of integrating (averaging) over periods of 15 minutes or less will be set up at upwind (i.e., background) and downwind locations, at heights approximately four to five feet above land surface (i.e., the breathing zone). Monitoring equipment will be MIE Data Ram monitors, or equivalent. The audible alarm on the particulate monitoring device will be set at 90 micrograms per cubic meter ($\mu g/m_3$). This setting will allow proactive evaluation of worksite conditions prior to reaching the action level of 100 $\mu g/m^3$ above background. The monitors will be calibrated at least once per day prior to work activities and recalibrated as needed thereafter. In addition, fugitive dust migration will be visually assessed during all intrusive work activities.

The following summarizes particulate action levels and the appropriate responses:

- If the downwind PM-10 particulate level is 100 $\mu g/m^3$ 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 $\mu g/m^3$ 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 $\mu g/m^3$ above the upwind level, work must be stopped and an evaluation of activities initiated. Work can resume provided that dust suppression measures (as described in Section 2.3.1 below) and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. If an exceedance of the Action Limits occurs, an Action Limit Report as shown in **Appendix A** will be completed.

### 4.1 Potential Particulate Suppression Techniques

If the integrated particulate level at the downwind location exceeds the upwind level by more than 100 $\mu g/m_3$ at any time during drilling activities, then dust suppression techniques will be employed. The following techniques, or others, may be employed to mitigate the generation and migration of fugitive dusts:

- Placement of drill cuttings in drums or covering stockpiles with plastic;
- Misting of the drilling area with a fine water spray from a hand-held spray bottle

Work may continue with dust suppression techniques provided that downwind $PM_{10}$ levels are not more than 150 $\mu g/m^3$ greater than the upwind levels.

There may also be situations where the dust is generated by drilling activities and migrates to downwind locations, but is not detected by the monitoring equipment at or above the action level. Therefore, if dust is observed leaving the working area, dust suppression techniques such as those listed above will be employed.

If dust suppression techniques do not lower particulates to below 150 $\mu g/m^3$, or visible dust persists, work will be suspended until appropriate corrective measures are identified and implemented to remedy the situation.

All air monitoring readings will be recorded in the field logbook and will be available for the NYSDEC and NYSDOH personnel to review.

# 5.0 DATA QUALITY ASSURANCE

## 5.1 Calibration

Instrument calibration shall be documented on instrument calibration and maintenance sheets or in the designated field logbook. All instruments shall be calibrated as required by the manufacturer. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

## 5.2 Operations

All instruments shall be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on-site by the SSO for reference.

## 5.3 Data Review

The SSO will interpret all monitoring data based the established criteria and his/her professional judgment. The SSO shall review the data with the PM to evaluate the potential for worker exposure, upgrades/downgrades in level of protection, comparison to direct reading instrumentation and changes in the integrated monitoring strategy.

Monitoring and sampling data, along with all sample documentation will be periodically reviewed by the PM.

# 6.0 RECORDS AND REPORTING

All air readings must be recorded on daily air monitoring log sheets and made available for review by personnel from NYSDEC and NYSDOH.

# ***APPENDIX A***

**CAMP**
**ACTION LIMIT REPORT**

Project Location: _____

Date: _____ Work Start Time: _____
Work Stop Time: _____

Name: _____

Contaminant: _____ PM-10: _____ VOC: _____

Wind Speed: AM _____ PM _____ Wind Direction: AM _____ PM _____

Temperature: AM _____ PM _____ Barometric Pressure: _____

**DOWNWIND DATA**

Monitor ID #: _____ Location: _____ Level Reported: _____

Monitor ID#: _____ Location: _____ Level Reported: _____

**UPWIND DATA**

Monitor ID #: _____ Location: _____ Level Reported: _____

Monitor ID#: _____ Location: _____ Level Reported: _____

**BACKGROUND CORRECTED LEVELS**

Monitor ID #: Location: _____ Level Reported: _____

**ACTIONS TAKEN**