

# **HEALTH AND SAFETY PLAN**

## **For Construction Activities Associated with Christina River Bridge Approaches Project Wilmington, Delaware (DE-0334)**

### **DelDOT Contract T200512102**

#### **Prepared For:**

Delaware Department of Natural Resources and Environmental Control  
Site Investigation and Restoration Section  
391 Lukens Drive  
New Castle, Delaware 19720

#### **On Behalf Of:**

Delaware Department of Transportation  
800 S. Bay Road  
Dover, Delaware 19901

December 2013  
Revised December 2017

#### **Prepared By:**



**BrightFields, Inc.**  
Environmental Services

801 Industrial Street  
Wilmington, Delaware 19801  
(302) 656-9600

BrightFields File: 0985.56.51

## INTERNAL QUALITY CONTROL SHEET

This Health and Safety Plan (HASP) was prepared by BrightFields, Inc. (BrightFields) for use during intrusive activities associated with construction activities associated with the Christina River Bridge Approaches Project in Wilmington, Delaware.

This HASP will be updated, as appropriate, if any new information is found that would affect portions of this plan.

Prepared by:

---

Amanda Finnerty  
Project Manager

Reviewed and Approved by:

---

Jenna E. Harwanko  
Program Manager

## TABLE OF CONTENTS

<b>PROJECT OVERVIEW</b> .....	<b>1</b>
<b>SECTION 1 INTRODUCTION</b> .....	<b>4</b>
1.1    SITE DESCRIPTION .....	4
1.2    SITE BACKGROUND .....	4
1.2.1    Summary of Previous Investigations – Multiple Property Studies .....	5
1.2.2    Summary of Previous Investigations – Specific Properties .....	8
1.3    DESCRIPTION OF INTRUSIVE ACTIVITIES .....	21
<b>SECTION 2 HAZARD ANALYSIS</b> .....	<b>23</b>
2.1    CHEMICAL HAZARDS IN SOIL AND GROUNDWATER .....	23
2.2    OTHER HAZARDS .....	27
2.3    CHEMICALS USED BY SITE WORKERS.....	27
2.4    CHEMICAL CONTAMINANT ROUTES OF ENTRY .....	27
2.4.1    Dermal (Skin) Contact .....	28
2.4.2    Ingestion (Swallowing).....	28
2.4.3    Inhalation (Breathing).....	28
2.4    BIOLOGICAL HAZARDS.....	28
2.5    PHYSICAL HAZARDS .....	29
2.5.1    Excavation/Trenching Hazards .....	29
2.5.2    Confined Space Entry .....	30
2.5.3    Fire/Explosion Hazards.....	31
2.5.4    Heavy Equipment Hazards.....	31
2.5.5    Vehicle and Pedestrian Hazards.....	32
2.5.6    Noise Hazards .....	32
2.5.7    Electrical Hazards .....	32
2.5.8    Utilities.....	33
2.5.9    Weather Hazards.....	33
2.5.10    Heat Stress .....	33
2.5.11    Cold Stress .....	36
<b>SECTION 3 SITE CONTROL &amp; PROTECTIVE MEASURES</b> .....	<b>39</b>
3.1    CONTRACTOR BRIEFING .....	39
3.2    REPORTING ACCIDENTS AND EXPOSURES .....	39
3.3    PERSONAL PROTECTIVE EQUIPMENT.....	40
3.4    AIR MONITORING .....	40
3.4.1    Air Monitoring Equipment .....	41
3.4.2    Air Action Levels & Responses.....	41
3.5    DUST SUPPRESSION PROGRAM .....	44
3.6    ODOR SUPPRESSING PROGRAM .....	45
<b>SECTION 4 LEVEL C WORK ZONES &amp; PROCEDURES</b> .....	<b>46</b>
4.1    RESPIRATORS AND RESPIRATOR CARTRIDGE SPECIFICATIONS.....	46

4.2	LEVEL C SITE CONTROL .....	46
<b>SECTION 5 LEVEL B WORK ZONES &amp; PROCEDURES .....</b>		<b>48</b>
5.1	SUPPLIED AIR RESPIRATOR SPECIFICATIONS .....	48
5.2	LEVEL B SITE CONTROL .....	48
<b>SECTION 6 DECONTAMINATION (CLEANSING) PROCEDURES .....</b>		<b>50</b>
6.1	PERSONNEL CLEANSING .....	50
6.2	EQUIPMENT CLEANSING .....	50
6.3	VEHICLE CLEANSING .....	50
6.4	SPILL CONTAINMENT PROCEDURES .....	51
6.5	WASTE DISPOSAL PROCEDURES .....	51
<b>SECTION 7 KEY PERSONNEL AND RESPONSIBILITIES .....</b>		<b>52</b>
7.1	ENVIRONMENTAL PROJECT MANAGER .....	52
7.2	SAFETY OFFICER .....	52
7.3	SITE MANAGER .....	53
7.4	FIELD PERSONNEL (VARIOUS) .....	53
<b>SECTION 8 EMERGENCY RESPONSE PLAN &amp; PROCEDURES .....</b>		<b>55</b>
8.1	EMERGENCY TELEPHONE NUMBERS .....	55
8.2	MEDICAL EMERGENCIES .....	56
8.3	FIRE/EXPLOSION EMERGENCIES .....	57
<b>SECTION 9 REFERENCES .....</b>		<b>58</b>

## **FIGURES**

---

- FIGURE 1 Site Location/Topographic Map
- FIGURE 2 Project Location Map
- FIGURE 3A Areas of Concern - East
- FIGURE 3B Areas of Concern - West
- FIGURE 4 Dust Action Level Areas

## **TABLE**

---

- TABLE 1 – Summary of Known and Possible Contaminants
- TABLE 2A - Dust Action Levels – Wilmington Coal Gas Site - South
- TABLE 2B – Dust Action Levels – Remaining Western Portion
- TABLE 2C – Dust Action Levels – East Side

## **ATTACHMENTS**

---

- ATTACHMENT A – Safety Data Sheets
- ATTACHMENT B – Job Hazard Analysis Forms
- ATTACHMENT C – Example Confined Space Entry Permit and Checklist
- ATTACHMENT D – Health and Safety Plan Review Record
- ATTACHMENT E – Environmental Monitoring Record
- ATTACHMENT F– Accident Investigation Report
- ATTACHMENT G – Directions and Map to Wilmington Hospital
- ATTACHMENT H – Stakeholders Contact List

## **HEALTH AND SAFETY PLAN (Safety Plan)**

This Safety Plan was revised in December 2017 to reflect current project plans. This is a working document and addendums will be issued as necessary.

### **PROJECT OVERVIEW**

**SITE & LOCATION:** The Delaware Department of Transportation (DelDOT) is completing both the Christina River Bridge and Approaches projects to accommodate additional traffic due to the redevelopment along the Wilmington Riverfront. The limits of both projects are shown on Figure 1. The first phase of the project consisted of improvements adjacent to the Riverfront Hotel Site, which was completed in April 2014. Additional phases of the project include activities associated with construction of the Christina River Bridge Approaches such as construction of the bridge and approach roads, the installation of utilities, lighting, drainage infrastructure, landscaping, and hardscaping (Figure 2).

BrightFields has been contracted to identify the locations and types of contaminants that may be encountered during intrusive activities for the Christina River Bridge Approaches project and to develop environmental management documents for use during construction.

The Final Plan of Remedial Action (FPRA) for the Christina River Bridge and Approaches Site issued in October 2016 outlines the cleanup actions required at the Site. The FPRA requires the placement of at least one foot of clean fill or impervious material, the implementation of a Contaminated Materials and Water Management Work Plan (CMWMWP) during construction, for a site Long-Term Stewardship (LTS) Plan to be submitted to Delaware Department of Natural Resources and Environmental Control (DNREC), and a Remedial Action Completion Report (RACR) be submitted to DNREC after remedial actions have been completed. In addition, the Final Plan requires the institution of an environmental covenant limiting the site use, interference with remedy, and limiting withdrawal of site groundwater.

The construction of the Christina River Bridge began in May 2017 and construction of the Approaches is anticipated to begin in Spring 2018. On-site health and safety oversight and environmental management of all aspects of this project will be provided by the Delaware Department of Natural Resources and Environmental Control (DNREC) or DNREC's Hazardous Site Cleanup Act (HSCA)-certified environmental consultant.

**PURPOSE OF THIS HEALTH & SAFETY PLAN:** The purpose of this Health and Safety Plan

(HASP) is to evaluate the potential health and safety concerns related to exposure of workers to environmental contamination, establish site work zones and provide guidelines for safe work practices and Personal Protective Equipment (PPE) requirements to protect workers from environmental contaminants.

It is anticipated that most of the project activities can be completed in modified OSHA Level D PPE, which includes the addition of nitrile gloves and reflective safety vests. It is necessary throughout all stages of intrusive activities associated with the construction, that workers who come in contact with native site soil and groundwater be required to wear nitrile gloves and booties to prevent dermal contact with potential contaminants in the soil and/or groundwater. Some of the intrusive activities, depending on their location within the project area, may require an upgrade to OSHA Level C PPE, which is discussed further in Section 4.

Most of the project activities can be completed by 24-hour HAZWOPER trained personnel in modified level D PPE. If a PPE upgrade to level C is required, the personnel must be 40-hour HAZWOPER trained and medically monitored. The Safety Officer will determine if site conditions are unsafe for workers, at which time additional worker training, specific personal protective equipment, and/or health and safety monitoring may be required. This safety plan will serve as a guidance document for all intrusive work associated with the Christina River Bridge Approaches Project.

This Health and Safety Plan does not address OSHA safety requirements contained in 29CFR1926, Construction Industry Regulations, related to excavation and construction safety.

**TYPES OF INTRUSIVE ACTIVITIES:** This Safety Plan covers the activities of workers under contract for the Christina River Bridge Approaches Project. Types of intrusive activities include, but are not limited to: excavation for the installation of utilities, light poles, bollards, road beds, drainage infrastructure, landscaping, and hardscaping.

**SCHEDULED DATES:** This HASP is in effect for the duration of the project. Construction for the Christina River Bridge Approaches project is anticipated to begin in Spring 2018.

**MINIMUM TRAINING REQUIREMENTS:** All workers performing intrusive activities associated with the Christina River Bridge Approaches Project must have, at a minimum, a Health & Safety briefing regarding the environmental conditions and 24-hour HAZWOPER training with documentation of a current 8-hour update. During intrusive work, all workers will be monitored by a 40-hour HAZWOPER trained representative from DNREC's designated environmental consultant.

**Note:** This is a general Health and Safety Plan for the Christina River Bridge Project. This plan is to be used in conjunction with the Christina River Bridge Approaches Contaminated Materials and Water Management Work Plan (CMWMWP) (BrightFields, Revised December 2017).

A letter must be provided indicating key personnel for each portion of the Project (Safety Officer, Site Manager, Site Foreman, etc.). This plan must also be reviewed and approved by a Certified Industrial Hygienist (CIH) retained by each major construction company operating on the site.



## **SECTION 1 INTRODUCTION**

### **1.1 SITE DESCRIPTION**

The Christina River Bridge Approaches (Site) project area encompasses multiple tax parcels along either side of the Christina River in Wilmington, Delaware (Figure 2). A Site Specific Assessment (SSA) was performed by BrightFields in April 2009 to investigate the properties associated with Christina River Bridge Orange A Alignment and found several areas of environmental concern associated with this bridge option. After further evaluation by transportation engineers, the Orange B Alignment became the preferred option. As shown in Figure 2, the approaches begin at Beech Street, continue south to the southern extent of the Shipyard Shops (west of the Christina River), the bridge crosses over the River, and approaches continue through the 707 S. Market Street Jablow property (north of James Court) and connect to Market Street, Walnut Street, and Garasches Lane (east of the Christina River).

The Site was historically maintained as undeveloped marsh land, commercial, and industrial properties. Retail businesses and a riverwalk are located to the west of the River, north of the proposed bridge landing road. To the east of the River are various businesses including retail shops, electroplating, asphalt sealing, a rim and wheel distributor, a glass and tire distributor, landscaping, metal works, a car shop, and a truck service business. Additional properties have non-operational businesses.

There are many Delaware Department of Natural Resources and Environmental Control (DNREC) Hazardous Substance Cleanup Act (HSCA) sites and Tank Management Section (TMS) sites within and surrounding the Christina River Bridge Approaches project. Some of these sites have been remediated; however, residual contamination may remain and or extend into the project area.

### **1.2 SITE BACKGROUND**

The purpose of this section is to summarize existing reports from previous investigations in the project area. In general, the properties surrounding the project area have historically been used for commercial and industrial purposes. The following section summarizes previous investigations and remediation that has occurred on properties along the project area. The first section presents investigations that cover multiple sites and large portions of the project area. The second section presents investigations in order from North to South on the west side of the Christina River and then follows the approaches extending South to North on the east side of the River. The sites discussed below are shown on Figure 2 and potential areas of concern are shown on Figures 3A and 3B.

## 1.2.1 Summary of Previous Investigations – Multiple Property Studies

### 1.2.1.1 South Wilmington Environmental Assessment, Quadrant 1 & 2 (DNREC, 1996)

DNREC completed an Environmental Assessment of South Wilmington (east), Quadrants 1 and 2 (DE-286) in 1996 which consisted of a large investigation effort performed by DNREC - Site Investigation and Restoration Branch (SIRB) to collect samples from various properties encompassing approximately 110 acres of South Wilmington. Quadrant 1 is the area between South Walnut Street and Buttonwood Street and is bordered to the north and south by B Street and Garasches Lane, respectively. A total of 51 soil samples were collected from the East Assessment Area through test pit excavation and borings. Two samples, one shallow and one deep, were collected from test pit TP-26, located east of South Market Street within the area of the Christina River Bridge Approaches. Samples TP26S and TP26D were field screened for inorganics and organic compounds using DNREC's Mobile Laboratory. Several inorganics, pesticides, polychlorinated biphenyls (PCBs), Gasoline Range Organics (GRO), and Diesel Range Organics (DRO) were detected in TP26D and TP26S, but were below Risk Based Concentration (RBC) criteria. Polycyclic aromatic hydrocarbons (PAHs) were detected in TP 26S above 0.5 mg/kg, but were not detected in TP26D above 0.01 mg/kg. One monitoring well, MW-5 was installed toward the south end of the Christina River Bridge Approaches. Analysis reported iron and manganese concentrations exceeding RBC criteria in the filtered groundwater samples. DNREC concluded that trace amounts of volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), and Tentatively Identified Compounds (TICs) in monitoring well MW-5 may be related to tar and roofing asphalt reportedly dumped in the area during the 1950s or a former gasoline station shown on historic maps.

### 1.2.1.2 South Wilmington Environmental Assessment, Quadrant 3 & 4 (DNREC, 1996)

DNREC completed the South Wilmington Environmental Assessment, Quadrants 3 and 4 (DE-286) in 1996 which consisted of a large investigation effort performed by DNREC-SIRB to collect samples from various properties encompassing 85-acres in South Wilmington. Quadrant 3 is the area between South Market Street and the Christina River. Quadrant 4 is located between South Market and South Walnut Streets, and south of B Street. This includes those properties along James Court, which are south of the eastern approach.

Three shallow soil samples were collected (SS-17, SS-18, and SS-100) and screened for select parameters. Screening results showed concentrations above the RBC criteria in at least one sample for arsenic, lead, GRO, and DRO. Two soil samples were sent for laboratory analysis. Confirmation

laboratory results indicated that arsenic and lead concentrations were below Industrial RBC criteria but the lead concentration in one sample exceeded the residential RBC criteria. Several SVOCs, including benzo[a]pyrene, were reported at concentrations which exceeded the RBC criteria. One PCB, Aroclor 1260, was detected at a concentration above the residential RBC criteria.

One surface water sample and one sediment sample were also collected as a part of the Environmental Assessment. In the surface water sample, aluminum, iron, and lead concentrations exceeded the Ambient Water Quality Criteria (AWQC) freshwater chronic criteria. In the sediment sample, GRO and DRO were not detected during screening. Confirmatory laboratory analytical results indicated 14 inorganic constituents above the Industrial or Residential RBC, and/or three times the background concentration for that particular analyte. PCBs exceeded the RBC Residential and Background level criteria. No notable VOCs or SVOCs were detected at concentrations exceeding the RBC criteria.

#### 1.2.1.3 Christina River Bridge Site Specific Assessment (BrightFields, 2009)

On behalf of the Delaware Department of Transportation, under contract to DNREC, BrightFields conducted a Site Specific Assessment (SSA) of the 32-acre area for the initial proposed Christina River Bridge alignment. A total of 39 soil borings were advanced on either side of the Christina River, revealing mostly imported fill on the west side of the river and industrial fill on the east side. Laboratory analysis indicated that several contaminants including metals (arsenic and lead), PAHs (benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, and dibenz[a,h]anthracene), PCBs, and some petroleum compounds are potential contaminants of concern under a restricted use scenario. Five monitoring wells were installed and groundwater samples were collected from each well. Arsenic was detected above the Uniform Risk-Based Standards (URS) criteria and the City of Wilmington Industrial Pretreatment Regulations limit. Although other metals (aluminum, barium, iron, and manganese) were detected at elevated concentrations in the groundwater, they are not considered contaminants of concern. Four sediment samples were collected and screened. One sediment sample was sent for confirmatory analysis. Metals, one VOC, and PAHs were identified as potential contaminants of concern in sediment. In general, the possible sources of the contamination include spillage from prior USTs, filling activities that previously occurred in this area of the City, and/or from current or past site operations.

#### 1.2.1.4 Market Street Safety Improvements Environmental Summary Report (BrightFields, 2009)

In September 2009, BrightFields performed soil and groundwater sampling along the Market Street from A Street to just north of the Market/Walnut Street split. The purpose of the sampling was to

characterize environmental conditions prior to safety improvements including relocating overhead utilities underground, installation of drainage infrastructure, importing up to four feet of fill to raise the roadway elevation, and installation of landscaping and hardscaping.

A total of 27 borings were drilled along South Market Street and 67 soil samples were collected. All 67 soil samples were screened for metals using X-Ray Fluorescence (XRF). A total of 27 samples were submitted for confirmatory analysis at a HSCA-certified laboratory. Based on the XRF screening results, field observations, existing data, and estimated soil quantities, the project area was broken down into eleven disposal grids. Analysis of the disposal grid soil samples indicated concentrations of lead above the URS criteria and petroleum products above the Delaware Risk-Based Corrective Action Program (DERBCAP) Tier 0 action levels. Groundwater samples were collected at four locations and analyzed for the City of Wilmington Discharge Permit parameters. Concentrations of arsenic, copper, and zinc exceeded both the DNREC URS values and the City of Wilmington Discharge permit limits. Several other metals and some SVOCs exceeded their respective DNREC URS in groundwater samples as well.

Excavated soil and groundwater was managed and properly disposed of as part of the DelDOT Market Street Safety Improvements Project completed in March 2012.

#### 1.2.1.5 Christina River Bridge Subsurface Investigation Report (BrightFields, 2012)

BrightFields performed a subsurface investigation to characterize the site soil to approximately 20 feet bgs in areas which are anticipated to be impacted by the construction of the Christina River Bridge and Approaches. A total of 27 boring locations were drilled and sampled. Screening results indicated concentrations of metals (arsenic, lead, iron, antimony, and manganese) exceeding their respective restricted use URS criteria were present in soil samples. Confirmatory analyses reported concentrations of metals and SVOCs (benzo[a]pyrene) above the URS criteria. PCBs, arsenic, lead, PAHs (specifically benzo[a]pyrene), petroleum hydrocarbons, and VOCs were present in the soil across the area. In groundwater, an area of concern due to elevated levels of arsenic in historic samples was identified, but no groundwater samples were collected during the Subsurface Investigation.

#### 1.2.1.6 Christina River Bridge Subsurface Investigation Report #2 (BrightFields, 2016)

In September 2013, additional borings were advanced and a total of 32 soil samples were collected from the Dravo Shipyard property, the Jablow property, and the Industraplate Corporation property. Screening of soil samples identified arsenic at concentrations exceeding its default Delaware background concentration as well as detectable concentrations of PAHs, TPH (Total Petroleum

Hydrocarbons), and Tentatively Identified Compounds (TICs). Laboratory analytical data reported concentrations of various metals and SVOCs exceeding the URS. This report also includes a summary of findings from test holes advanced in 2015 and summaries of contaminants associated with all of the DNREC SIRS and TMS sites located within the 2015 bridge and approaches alignment.

## **1.2.2 Summary of Previous Investigations – Specific Properties**

### **1.2.2.1 Wilmington Coal Gas Site – South (DE-0114)**

The Wilmington Coal Gas Site – South is located at Beech Street and Madison Street. The former Wilmington Coal Gas Site is separated into two (north and south) sections by Beech Street. Past uses include a manufactured gas plant which operated from 1889 until 1961, a vehicle storage area, an electrical substation, and a storage building. The surrounding area has mainly been industrial and commercial properties, including ship and car building operations.

Numerous investigations and evaluations have been performed at the site, which was placed on the State priority list in January 1993. Some notable investigations on the property are summarized below. In 1993, Duffield Associates prepared a Preliminary Environmental Site Assessment (ESA) for proposed land acquisition and road improvements to South Madison and Beech Streets. Soil samples contained elevated PAH concentrations when compared to the New Jersey Department of Environmental Protection and Energy (NJDEPE) proposed clean-up standards (DNREC had not yet established standards for clean-up). In 1994, Earth Tech prepared a Facility Evaluation summarizing field investigations and performed a Human Health Risk Assessment. Notable detections in soil samples include PAHs; benzene, toluene, ethylbenzene, and xylenes (BTEX); metals (arsenic, iron, and lead in the surface soil and copper, zinc, and lead in the subsurface soil); and cyanide (in the subsurface). In groundwater samples, notable detections include PAHs, BTEX, and cyanide. Samples of Dense Non-Aqueous Phase Liquid (DNAPL) were also collected and found to be #2 Fuel Oil.

A particular concern on the site is Non-Aqueous Phase Liquid (NAPL), which has led to close monitoring of the site. In 1996, a bio-venting/bio-sparging remedy was implemented and operated for eight years. The system was effective at removing the lighter fraction of hydrocarbons, but not the extent of the NAPL. In 2007, DNREC-SIRB prepared a NAPL Delineation Report for the Wilmington Coal Gas West Site and the Stadium Site (discussed in Section 2.2.2). The investigation found mainly fill across both sites and evidence of soil contamination including visually, by odor, and by photo-ionization detector (PID) readings. Analytical results reported PAHs and TPH in several of the samples. DNREC believed that the Wilmington Coal Gas Site was the source of the

contamination. In 2010, AECOM prepared a Focused Feasibility Study (FFS) Report to evaluate additional remedial alternatives.

In December 2010, an Amended Final Plan of Remedial Action was published, which proposed coal tar NAPL remediation through solidification/stabilization and excavation, implementation of a Groundwater Management Zone (GMZ), recording of an Environmental Covenant (EC), development of a Contaminated Material Management Plan, and preparation of a Long Term Stewardship (LTS) plan for soil and asphalt caps. In-situ solidification began in December 2012 and continued through April 2013. In January 2014, AECOM submitted a Final Site Closure Report and Remedial Activity Summary to DNREC outlining the remedial actions performed on the Site. Remedial actions to the Site included the in-situ stabilization (ISS) performed in the southwestern portion of the property (ISS-1) and in the area southeast of the coal gas holder (ISS-2) and, as shown in Figure 3B. Additionally, a combustion turbine was decommissioned and a 30,000-gallon above-ground storage tank (AST) was removed from the Site. A total of 12,042 cubic yards of contaminated soil was remediated through ISS. ISS-1 area was backfilled with a stone dust cap, paved with asphalt and ISS-2 area was backfilled with excavated soil that met reuse requirements with a one-foot topsoil cap. A LTS plan for the southern parcel of the site was prepared by AECOM and was submitted by Delmarva Power & Light Company (DP&L) in February 2015.

The LTS plan requires semi-annually gauging of the monitoring wells and groundwater sampling of the monitoring wells for metals, BTEX, PAHs, and TPH, as well as removing NAPL if significant accumulations are observed. It also requires semi-annual inspection of stormwater structures for sedimentation, erosion, or blockage; visual inspection of topography for any changes; and annual inspection of the integrity of the asphalt and vegetative cap. Repairs to the cap, including reseeded and maintenance of the stormwater structures, will be conducted as necessary.

The February 2015 LTS plan, as well as the January 2014 Final Site Closure Report and Remedial Activity Summary, were approved by DNREC in January 2016. A Certificate of Completion of Remedy (COCR) for the Wilmington Coal Gas – South Site was recorded with the New Castle County Recorder of Deeds on May 5, 2016. In July 2016, the property title was transferred from DP&L to the Riverfront Development Corporation (RDC).

DNREC-SIRS continues to conduct Operation and Maintenance (O&M) inspections of the items required by the Amended Final Plan of Remedial Action. The most recent Operations and Maintenance inspection was conducted on August 11, 2017.

#### 1.2.2.2 Stadium Site (DE-1004)

The Stadium Site is currently the location of Frawley Stadium and the associated parking areas. It was historically part of a larger shipyard.

In 1992, Duffield Associates (Duffield) prepared a Phase II ESA for the Proposed Wilmington Multipurpose Sports Stadium and found trace concentrations of several target analytes and compounds in soil and groundwater samples. The concentrations were considered acceptable when compared to NJDEPE proposed clean-up standards. Petroleum product was observed in subsurface soil along the northern site boundary, possibly from historic practices on a neighboring site. The Phase II ESA also mentioned an undated ESA by Medlab Environmental Testing, Inc., a 1991 Limited Environmental Risk Assessment by Tetra Tech, a 1992 Phase I ESA by Schranze and Associates, and a 1992 Proposed Phase II ESA by Schranze and Associates. The reports documented that the site was historically used as a shipyard and past analyses showed elevated levels of metals (arsenic, lead, cadmium, and chromium), petroleum hydrocarbons, and SVOCs in the fill material and groundwater. In 1997, Duffield performed a subsurface evaluation in the northwestern portion of the site to evaluate the presence of petroleum hydrocarbons. The petroleum found during the evaluation was characterized as coal tar oil, which is relatively immobile in unsaturated soil. The report also mentions that, in 1992, Delmarva Power assessed the petroleum condition and found a free product plume approximately 200 feet by 100 feet and up to eight inches thick located in the southwestern corner of the southern parcel. As mentioned in Section 2.2.1, in 2007 DNREC released a NAPL Delineation Report for the Wilmington Coal Gas West Site and the Stadium Site. PAHs and TPH were reported in many of the samples.

DNREC-SIRS issued a memorandum dated February 19, 2016, regarding the decision to administratively close the Stadium Site, as it is being addressed as part of the Wilmington Coal Gas – Southern Section (DE-0114).

#### 1.2.2.3 Dravo Shipyard – Harbor Associates (DE-1096)

The Dravo Shipyard consists of approximately 120 acres that were historically used for shipbuilding and other heavy industrial activities. Much of the area was marshland that was filled with slag and other industrial waste products. A 48-acre portion of the Dravo Shipyard was divided into two DNREC sites, the former Amer property (DE-1092) and the Harbor Associates property (DE-1096), and investigated jointly. The Harbor Associates site consists of approximately 33 acres located on the western and southern portion of the former Dravo Shipyard. These two DNREC sites were then divided into four operable units (OUs) for investigation and remediation purposes. OU-I addressed soil in approximately 30 acres, OU-II addressed groundwater for approximately 48 acres (including

the area in OU-I) and soil for 18 acres, OU-III addressed a proposed storm water management system near the riverfront, and OU-IV addressed sediment along the Christina River. The following summary focuses primarily on the Harbor Associates (DE-1096) portion of the Dravo Shipyard area, the location of the western approaches.

A letter from 1979 indicated that a 500-gallon underground storage tank (UST) was located at the south end of the Madison Street property. In 1993, Schranze & Associates, PC performed a Phase II Environmental Assessment and found localized elevated levels of zinc and lead in surficial soil samples. A 1,000-gallon UST was removed in 1998. In 1998, a Brownfield Preliminary Assessment II was performed by DNREC to characterize contamination on the site. Notable detections include arsenic, lead, and SVOCs (mainly benzo[a]pyrene) in soil and sediment samples, as well as metals (aluminum, lead, iron, and manganese) in surface water samples. In 1999, EA Engineering, Science, and Technology (EA) performed a Remedial Investigation/Feasibility Study and compared contaminant concentrations to disposition criteria and suggested placing an impermeable cap over the site. The maximum detected lead concentration in soil exceeded the DNREC unlimited re-use criteria. Metals (aluminum, iron, and manganese) exceeded their respective URS values in groundwater samples. In 2000, EA prepared an OUIV Analytical Sediment Summary Report. Concentrations of several VOCs, PAHs, and metals (arsenic, lead, chromium, and zinc) exceeded their respective URS criteria in sediment samples. In February 2001, a Final Plan of Remedial Action which required containment of impacted soil, a deed restriction for non-residential use, notification and approval from DNREC prior to future intrusive activity, placement of a groundwater management zone (GMZ), and development of an O&M Plan for the containment system. In 2012, an O&M Plan was prepared for the site, excluding two properties that are being addressed by current owners, the Riverfront Hotel Parcel and the Amer Parcel. The 2012 O&M Plan states that ECs will be placed on the different parcels within the site. Currently, this property is used for commercial retail space, a riverwalk, a parking lot, and open land.

DNREC-SIRS continues to conduct Operation and Maintenance (O&M) inspections of the items required by the Final Plan of Remedial Action. The most recent Operations and Maintenance inspection was conducted on November 1, 2016.

Because one of the areas where the elevated PCBs were found during the Subsurface #1 Investigation may be disturbed by the CRB and/or approaches projects, BrightFields attempted to delineate the PCBs. Delineation samples were collected in 2016 and 2017. The elevated PCB area was not able to be delineated during these sampling events. The PCB concentrations were found in one area to be higher than the concentrations that were initially found. Given the high concentrations of PCBs, the characterization and cleanup in this area is regulated by the United States



Environmental Protection Agency (USEPA) Toxic Substance Control Act (TSCA) as well as DNREC-SIRS. BrightFields submitted the PCB summary report to DNREC on November 29, 2017. The area is within the limit of construction for the CRB and approaches projects but is currently surrounded by an orange construction fence and is not being disturbed.

#### 1.2.2.4 Riverfront Hotel (DE-1518)

The Riverfront Hotel site is located in an area of the Wilmington Riverfront that has been in continuous industrial use since the late 1700s. Specific uses included steamship construction and paper production. The site, previously part of the Dravo Shipyard Harbor Associates Voluntary Cleanup Program Site (DE-1096), was certified as a Brownfield in February 2012.

In 2012, Weston Solutions, Inc. (Weston) submitted a Brownfield Remedial Investigation which detailed contamination including benzo[a]pyrene and arsenic in soils, VOCs and various metals in groundwater, and benzene in soil gas. In 2012, a Final Plan of Remedial Action was published which outlined the future use of the property as a hotel and required proper management of contaminated materials. In addition, it required an EC to restrict future land use to commercial and industrial purposes and prohibit groundwater well installation for drinking water. Redevelopment and construction activities for a ten-story hotel structure were completed in April 2014. An Environmental Covenant for the Riverfront Hotel Site was recorded with the New Castle County Recorder of Deeds on August 12, 2015.

DNREC-SIRS continues to conduct O&M inspections of the items required by the Final Plan of Remedial Action. The most recent O&M inspection was conducted on October 27, 2015. A COCR is being withheld pending final payment to DNREC.

#### 1.2.2.5 Jablow Property (DE-1329, 3-002382)

The Jablow Property is a 6-acre property located at 707 South Market Street. The site has been in commercial/industrial use since the 1960s as an auto salvage and repair facility. Prior to its current use, the subject property was used as a beef slaughterhouse since the 1930s. In 2006, it was certified as a Brownfield.

In 2004, Tetra Tech performed a Phase I ESA and observed probable surficial soil contamination, a possible UST, and several known or potential pollution sources. Tetra Tech also performed a Phase II ESA in 2004 and found that concentrations of metals in shallow and deep soil as well as groundwater exceeded DNREC URS unrestricted use criteria. Organic contaminants were also detected at unknown concentrations in soil and groundwater. Possible sources of contamination identified during the site investigation included more than 100 drums, tanks, vessels, and batteries,

many of which were observed to be damaged. In 2006, three USTs were removed and cleaned and the excavation was backfilled and sampled. Solid and hazardous wastes were removed from five acres of the site. Additional hazardous and non-hazardous wastes remained onsite. In 2007, Advanced Geological Services performed a geophysical investigation and found three anomalies, none of which were believed to be USTs. At this time, Tetra Tech also advanced eight soil borings. Two samples collected from near one of the anomalies had TPH-GRO, benzene, and total BTEX levels higher than the Delaware Risk-Based Corrective Action Program Tier 0 levels. In July 2007, 238.75 tons of soil that had been excavated with the USTs was disposed of offsite and DNREC issued a No Further Action letter. In 2012, LandmarkJCM performed a Brownfield Investigation. Analyses detected concentrations above the URS for metals, SVOCs, one pesticide, and one PCB in soil samples and for metals and one VOC in groundwater samples. In August 2013, BrightFields performed a PCB Delineation. PCBs were reported at concentrations below the DNREC 2013 Screening Level in all samples analyzed. All samples were screened for lead and select samples were sent for confirmatory analysis, some of which exceeded the DNREC 2013 Screening Level, the DNREC URS for restricted use, and/or the hazardous waste regulatory criteria (for Toxicity Characteristic Leaching Procedure (TCLP) lead). The report was submitted to DNREC in April 2014.

BrightFields performed an additional hazardous lead delineation and removal effort between November 2016 and January 2017 due to concerns about previously-detected lead concentrations in soil areas that were likely to be disturbed during bridge/utility construction activities. Four lead soil hotspots were identified from previous investigations as either known or suspected to contain characteristically hazardous lead concentrations. BrightFields performed delineation sampling at all four locations in November 2016 and determined that lead was not present at hazardous concentration in two of the four locations. BrightFields returned to the Jablow Property in January 2017, and excavated the remaining two hotspot areas. Approximately 80 cubic yards of soil with hazardous concentrations of lead was removed and subsequently disposed at Republic Environmental Systems landfill in Hatfield, Pennsylvania. The excavation areas were backfilled with approved fill material and confirmatory samples were taken from both excavations to verify that the hazardous lead containing soil had been removed.

In response to a comment letter issued by DNREC on February 16, 2017 BrightFields prepared and submitted a Supplemental Brownfield Investigation Report (BIR) to address additional information requested by DNREC. The Supplemental BIR was approved by DNREC-SIRS in a letter dated March 28, 2017. Following approval of the Supplemental BIR, a PPRA was issued in May 2017 and was adopted as the FPRA in June 2017. Following the issuance of the PPRA in May 2017, R.E. Pierson began construction work for the Christina River Bridge project. While clearing and grubbing

the site, a large amount of debris was unearthed. The debris was removed, segregated, and properly disposed. It is likely that additional debris may be present.

#### 1.2.2.6 Industraplate Corporation

Industraplate Corporation is located at 5 James Court. The property is currently owned by Robert H. Wahl Revocable Trust and is bordered by the Jablow Property to the north, the James Court and Bald, LLC property to the east, the James Court Associates, LLC Property to the south, and the Christina River to the west. A precision electroplating business currently operates on this property. Industraplate is a regulated Air Program and Hazardous Waste Generator facility.

In 1984, Stablex-Reutter Inc. completed a Baseline Monitoring Report with information regarding sampling and analyses of Industraplate's wastewater discharge to the Wilmington publicly-owned treatment works. Samples were analyzed for cyanide, cadmium, lead, and pH. In 1986, DNREC inspected the facility, which performs specialty precision electroplating. They had plating baths of aluminum, nickel, cadmium, copper, zinc, and chromium as well as an anodizing bath. There were two hazardous waste streams (Chromium Waste Stream and Stripping Process Waste Stream) that were generated on a regular basis. A Small Quantity Generator (SQG) Waste Evaluation in 1992 summarized the processes and recorded two violations in regards to the lack of land disposal restriction notification forms and accumulation time for drums exceeding the 180 day time frame. The Waste Evaluation report also stated that the facility was clean and there were no signs of spillage at the plating operations area. In August 1992, DNREC Hazardous Waste Management Branch issued a Notice of Violation to Industraplate for the two violations noted in the Hazardous Waste Evaluation Report.

#### 1.2.2.7 733 S. Market Street (DE-1502, 3-000454)

733 South Market Street (formerly known as Tire Sales & Service and Bentley Truck Services, Inc. and formerly owned by First State Enterprises and Gene Associates C/O Eastern States Leasing LLC, respectively) is bordered by James Court to the north, South Market Street to the east, several commercial/industrial properties to the south, and Cobra Machine & Fabrication property to the west. The property is currently owned by Dun-Rite Tires Plus Wheels, Inc., who operates a rim and tire sales business.

Between 1994 and 1995, a 2,000-gallon UST was removed from the site and in 1995 the DNREC UST Branch completed a Tank Removal Report. BTEX and TPH were detected in soil samples collected from the former tank area, with contamination increasing downward in the tank pit. In 1996, First State Enterprises informed DNREC that a 1,000-gallon heating oil tank was in use at the

facility. Laboratory analysis indicated that there had been a release, so J&M Industries emptied and properly removed the tank. In 1996, DNREC reviewed the analytical data for samples collected from around the former 2,000-gallon gasoline UST and issued a No Further Action letter. In addition, J&M proposed a plan for an oil recovery system which DNREC approved. Samples collected from around the former 1,000-gallon heating oil UST showed detections of diesel range petroleum hydrocarbons (DRPH) and DNREC required additional investigation to determine the extent of contamination. In October 1996, Duffield submitted a Hydrogeologic Report and Proposed Corrective Action Work Plan which proposed a Product Collection System and summarized the subsurface evaluation at the facility. Free phase petroleum was observed floating in all of the test pits, but the fill layer acted as a trap and kept the water and product perched. As a result, Duffield did not perform the Geoprobe borings or groundwater samples. In 1997, Duffield submitted a Product Collection Summary Report outlining the installation of product collection sumps and the test pit evaluation. Petroleum hydrocarbons were detected in soil samples. The product collection sumps began operating in November 1996 and showed heavy oil accumulation. By June 1998, the total volume of petroleum removed was estimated to be 56.2 gallons. In December 1998, the DNREC UST Branch issued a No Further Action letter. It appears that Tire Sales & Service removed the product collection sumps and backfilled the area at this time as well. In 2011 a Brownfield Investigation Report was prepared for the site. There are no contaminants of concern in surface or subsurface soil. Contaminants of concern in groundwater are arsenic, iron, and manganese. In May 2012, a Final Plan of Remedial Action was published requiring that soil excavation be performed in accordance with the Contaminated Materials and Water Management Work Plan (CMWMWP) and Health and Safety Plan (HASP) and the site owner to record an EC. The Site is currently awaiting redevelopment and remedial actions.

#### 1.2.2.8 Hessler Property (DE-1169 and DE-1203)

The Hessler Property is located at 401 Garasches Lane. It is approximately 8.5 acres and is surrounded by commercial and light industrial properties. In 2001, a portion of the Hessler Property was certified as a Brownfield and identified by DNREC-SIRS as facility DE-1169. In 2002, a second portion of the Hessler Property was certified as Brownfield and identified by DNREC-SIRS as facility DE-1203. The owner entered into the Voluntary Cleanup Program in 2003. In December 2014, DNREC administratively closed the Hessler Property Site identified as facility DE-1169 and began classifying both portions of the property as Hessler Property Site DE-1203.

DNREC completed a Brownfield Preliminary Assessment II in April 2001, which revealed fill and debris across the site and petroleum-like odors in several test pit excavations. Elevated concentrations of metals (arsenic and lead), PAHs, PCBs, and pesticides were detected in soil

samples. In addition, contaminants related to petroleum were detected in many of the soil samples. In groundwater samples, iron and arsenic exceeded benchmark levels.

The Hessler Property Site was entered into a Brownfield Development Agreement by Cornerstone West Community Development Corporation in February 2015. BrightFields conducted a Brownfield Investigation on the Site in January 2015 and submitted the final BI report to DNREC in June 2015. The final Brownfield Investigation report was approved by DNREC in July 2015. Metals (antimony, arsenic, total chromium, chromium VI, copper, iron, lead, and zinc), PAHs, and total PCBs were detected in the surface soil above DNREC January 2015 screening levels. Metals (aluminum, antimony, arsenic, barium, cadmium, total chromium, chromium VI, cobalt, copper, lead, mercury, nickel, silver, and zinc), PAHs, and total PCBs were detected in the subsurface soil above DNREC January 2015 screening levels. TCLP lead was detected in soil above RCRA hazardous waste criteria. Metals (arsenic, barium, chromium, iron, lead, and manganese), SVOCs (benzo[a]pyrene and benzo[b]fluoranthene), and VOCs (TCE and vinyl chloride) were detected in the Site dissolved groundwater above DNREC January 2015 screening levels. Metals (aluminum, arsenic, barium, cadmium, copper, iron, lead, manganese, mercury, and zinc) and organics (benz[a]anthracene, benzo[a]pyrene, pyrene, and 4,4'DDE) were detected above DNREC January 2015 screening levels in surface water. Metals (antimony, arsenic, cadmium, total chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc), cyanide, and PAHs were detected in sediment above DNREC January 2015 screening levels. Visual observation and laboratory analysis indicated the presence of potential asbestos-containing material (ACM) in test pit TP-06.

A Supplemental Investigation to delineate the extent of elevated arsenic, lead, and asbestos-containing material (ACM) previously identified on the Site was performed by BrightFields in June 2015. Twenty-two soil borings were advanced and ten test pits were excavated as part of the Supplemental Investigation. Based on field observations and analytical data, ACM is primarily concentrated at a depths ranging from 5 to 10 feet below ground surface within the vicinity, and extending to the south, of test pit TP-06 (excavated during the 2015 Brownfield Investigation). Based on observations made during initial and supplementary test pit excavations and knowledge that the property was historically used for landfilling operations, it is likely that additional debris may be encountered during excavation.

A Focused Feasibility Study (FFS) was completed in September 2015. The study evaluated several different remedial actions to address remediation of site COCs. The recommended remedial actions include a phased approach which will be incorporated with the development of the property and provide for evaluation of each action before implementing additional remedial actions. The first recommended remedial action is to place an institutional control on the site to prevent disturbance of

buried ACM on the central portion of the site and to prohibit the withdrawal of groundwater. In conjunction with the development of the property, an impervious cover will be placed on the entire site and monitoring wells installed. The monitoring wells will be sampled to evaluate if groundwater contamination is naturally attenuating or if additional remedial measures are necessary. If additional remedial actions are required to address the groundwater contamination, a permeable reactive barrier along the ditch on the eastern boundary of the property may be installed. If additional remedial actions are required to address surface water contamination, reactive core mats may be installed on the western side and bottom of the ditch along the eastern property line. A PPRA for the site currently is being drafted by DNREC. DNREC has requested that an area approximately 20 feet in width be preserved between the ditch and the planned future road to allow for installation of a groundwater treatment system, if determined to be necessary.

#### 1.2.2.9 Shuster Auto Salvage (DE-1178)

Shuster Auto Salvage is located at 601 South Market Street. Historically, the site was a salvage yard including a storage area and a car crusher.

The property was included in the South Wilmington Environmental Assessment, Quadrants 3 & 4 completed by DNREC in 1996. Elevated concentrations of arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, zinc, and bis(2-ethylhexyl) phthalate were detected in soil samples. A monitoring well installed on the northern portion of the property revealed elevated levels of arsenic, iron, and manganese in both filtered and unfiltered samples. In 2001, Environmental Alliance completed the South Wilmington Salvage Yards Remedial Investigation which indicated TPH-DRO and arsenic present at concentrations exceeding HSCA levels in soil and dissolved iron exceeding the HSCA level in groundwater. In 2009, Environmental Alliance performed a Remedial Investigation and found that the chemicals of concern in soil and groundwater include metals, VOCs, SVOCs, and TPH.

A PPRA was issued in February 2017 and was adopted as the FPRA in April 2017. Following the issuance of the FPRA, a Contaminated Materials Management Plan for the Shuster Auto Salvage Site was prepared and submitted by Environmental Alliance on behalf of the Riverfront Development Corporation.

#### 1.2.2.10 524 A & B South Walnut Street (DE-1235)

The 524 A & B South Walnut Street property is located between Garasches Lane and C Street. Historically, the site was used as a junkyard from the 1930s through the early 1960s. The eastern portion of the site was owned by railroad companies through 1988.

Geotechnical investigations in 1973, 1974, and 1987 showed fill including rocks, broken concrete, trash, cinders, slag, incinerated rubbish, rags, wood, glass, plastic, and coal from 0 to 15 feet below grade across the Site. In December 1997 and December 2000, Tetra Tech performed Phase I Environmental Site Assessments. Tetra Tech subsequently performed a Remedial Investigation (RI) in September 2001. The RI reported elevated concentrations of arsenic, lead, PAHs, PCBs, and SVOCs (benzo[a]pyrene and dibenz[a,h]anthracene) in the soil. Concentrations of metals (mainly arsenic), SVOCs, PCBs, and pesticides exceeded their respective DNREC URS values in shallow groundwater samples.

A PPRA was issued in August 2002 and was adopted as the FPRA in July 2002. The 2002 Final Plan of Remedial Action required that a deed restriction be placed on the property and that the pavement and landscaped areas be kept in good condition through an O&M Plan. A Certificate of Completion of Remedy was issued on September 9, 2002. DNREC-SIRS continues to conduct O&M inspections of the items required by the Final Plan of Remedial Action. The most recent Operations and Maintenance inspection was conducted on February 20, 2017.

#### 1.2.2.11 American Tank Cleaning Company (DE-1180, 7-000200, 3-001515)

American Tank Cleaning Company is located at 535 South Market Street. The tank trailer cleaning business has operated since 1980. Tanks containing both hazardous and non-hazardous wastes have been cleaned by the company. There were three USTs onsite; two were removed in 1987 and the third was removed in 1994.

The site was investigated as a part of the 1996 South Wilmington Environmental Assessment, Quadrants 3 & 4 by DNREC and some PCBs were detected in the soil. In 2001, Environmental Alliance completed the South Wilmington Salvage Yards Remedial Investigation which reported iron and manganese in groundwater samples collected from the western portion of the site and lead in soil samples.

The site was certified as a Brownfield in January 2016 and is identified as DNREC-SIRS facility DE-1180. A Remedial Investigation was conducted in 2015 by Environmental Alliance. During the investigation, one subsurface soil sample collected from fill material exhibited a total PCB concentration greater than 50 parts per million. Based on the findings of the investigation, a PCB-Delineation Investigation and Feasibility Study were recommended to evaluate the extent of PCB contamination and evaluate potential remedies for the Site. The Remedial Investigation Report was approved by DNREC in a letter dated December 29, 2016. A PCB-delineation Investigation was conducted by Environmental Alliance in May and June 2017. The investigation identified PCB concentrations exceeding 50 ppm in several shallow soil samples. Based on the results of the

delineation of PCBs in shallow soil, a removal action of approximately 59 cubic yards of surficial soil was recommended. A Feasibility Study has not yet been performed for the site.

#### 1.2.2.12 Lamplugh Property (DE-1319, 3-001029)

The Lamplugh Property (also known as B&M Auto) property is a 4.29-acre property located at 525 South Market Street. Based on previous investigations, this site may have been used as a gas station. Three USTs were removed in the 1980s. Based on the soil sample results from the removal, DNREC recommended a Hydrogeologic Investigation be performed on the property. Based on the Brownfield Investigation, which included a Hydrogeologic Investigation, performed by BrightFields in 2004, it was concluded that lead, PAHs, and arsenic are contaminants that may be found in the soil near this property. Metals, SVOCs, and PCBs were detected in sediment samples from previous investigations at concentrations exceeding their respective URS. Arsenic and naphthalene may be encountered in the groundwater in the vicinity of this property. The Brownfield Investigation Report (including Hydrogeologic Report) was approved by DNREC in a letter dated March 29, 2005. A Proposed Plan of Remedial Action has not been issued for the property.

#### 1.2.2.13 M&N Property (DE-1496)

The M&N Property is located at 516 South Market Street. Past uses include a skate park, an auto sales yard, and a wire shelving supply house. Soil and groundwater contamination is believed to be associated with historical fill deposited prior to commercial uses. The M&N Property was certified as a Brownfield in October 2010 and is identified as DNREC-SIRS facility DE-1496.

Environmental Alliance performed a Brownfield Investigation in 2011. Surface soil is generally clean while the subsurface soil contains arsenic, lead, and SVOCs such as PAHs. Groundwater contains dissolved iron, manganese, arsenic, aluminum, and antimony. A FPRA was issued in August 2011 stating that an EC would be recorded limiting the site to light industrial or commercial use and groundwater well installation and disturbance of soil will be prohibited unless prior written approval from DNREC was obtained, a LTS Plan would be developed and implemented, and a Contaminated Materials Management Plan would be developed and implemented. These items were completed and DNREC issued a Certificate of Completion of Remedy in late 2011. DNREC-SIRS continues to conduct O&M inspections of the items required by the Final Plan of Remedial Action. The most recent Operations and Maintenance inspection was conducted on October 12, 2016.

#### 1.2.2.14 International Petroleum Corporation (DE-1278, 3-000001)

The International Petroleum Corporation (IPC) property is located at 505 South Market Street. The property has been historically used as a petroleum facility since early 1900s, with reports of



operations dating back to 1931. Prior to IPC, site operators included a fuel oil distributor and a home heating-oil company. Property ownership has been transferred several times, but processing and recycling of petroleum products has continued. Heritage-Crystal Clean (formerly IPC) of Siemens Industries currently operates on the site.

In 1991, WIK Associates conducted an initial investigation of soil and groundwater quality. The investigation indicated the presence of VOCs and SVOCs in the soil and groundwater. In 2001, Environmental Resources Management (ERM) conducted a limited soil and groundwater investigation at the Site. Additional soil and groundwater samples were collected. The investigation indicated the presence of TPH and methyl tertiary butyl ether (MTBE) in soil and VOCs and SVOCs in groundwater. Based on the November 2003 ERM Remedial Investigation Report, previous soil samples contained PCBs (Aroclor 1260), pesticides, and metals (notably arsenic, lead, and iron). The ERM RI report also indicated that four tanks; two 6,000-gallon tanks, one 5,000-gallon tank, and one 550-gallon tank were removed in 1992 from the eastern side of the site that was formerly a gas station. BTEX and TPH-GRO were detected in the site soil around the USTs. The contaminants that may be encountered in the soil in the vicinity of this property are PCBs, pesticides, metals (notably arsenic, lead, and mercury), VOCs, SVOCs, and TPH-GRO. BTEX, MTBE, naphthalene, PAHs, and free product may be encountered in groundwater in the vicinity of this property. In May 2005, a FPRA was prepared for the site to continue including the site in the City of Wilmington GMZ, place a deed of restriction on the property, require preparation and submittal of an O&M Plan, and to require monitoring of the status of the phytoremediation and wetland restoration effort along the waterfront. The interim action for groundwater as a part of the FPRA included the continued monitoring, recovery, and removal of free-product petroleum from the on-site product recovery wells as well as a current evaluation of groundwater contamination.

ERM, on behalf of Siemens Industries, prepared and submitted a Supplemental Plan of Remedial Action (SPRA) in June 2017 which presented a work plan for removal of free-product petroleum (LNAPL) from on-site recovery wells as the final work task under the approved 2005 Final Plan of Remedial Action. In a response letter dated September 27, 2017, DNREC-SIRS indicated that a SPRA would not be approved until additional efforts are conducted to characterize the extent and severity of LNAPL contamination at the site.

#### 1.2.2.15 Christina Landing Retail Center (DE-1401, 3-002400)

The Christina Landing Retail Center, also known as the Howard Street Commercial Development, is located at 310 South Market Street. The property is located at the northern extent of the project area on the east side of the Christina River; therefore, only the southern portion of the site will be encountered during construction activities. Historically, the site was used as a metals salvage yard to

process scrap metal from the 1950s through 2005. Operations included crushing metal objects and equipment which may have resulted in a release of PCBs.

Various investigations indicate PCBs, arsenic, lead, and some PAHs to be the main contaminants of concern in soil, sediment, and groundwater on the property. In 2005, Duffield Associates performed a Modified Phase I ESA with Limited Sampling and found concentrations of benzo[a]pyrene, dibenz[a,h]anthracene, PCBs, arsenic, and lead exceeding URS standards in soil samples. Duffield Associates collected additional samples for the 2005 Preliminary Supplemental Remedial Evaluation to investigate a possible PCB “hotspot” and address other data gaps. PCB concentrations ranged from 9.6 mg/kg to 5,300 mg/kg and manganese and iron were detected in groundwater samples exceeding the DNREC groundwater quality standards. A 2007 Remedial Investigation/Feasibility Study (RI/FS) summarized all non-PCB data and compared different remedial actions. A Self-implementing On-Site Cleanup and Disposal of PCB Remediation Waste/Risk Based Disposal Approval Plan (Hybrid Plan) was submitted to DNREC and USEPA Region 3 in October 2007. In January 2008, contaminated soil was excavated and sampled for disposal. In April 2008, PCB-contaminated soil was excavated and a low-permeability clay cap was installed over the residual contamination, which was later covered with a parking lot. At that time, two gasoline USTs were discovered and removed from the site. A FPRA was issued in January 2009 and outlined the cleanup of PCB-contaminated soil, placement of marker fabric, and installation of an asphalt cap. In addition, the FPRA required the implementation of an environmental oversight program during redevelopment, the institution of ECs, and restriction of groundwater through the City of Wilmington GMZ. These remedial actions were completed and the COCR was recorded on February 4, 2010.

DNREC-SIRS and the property owner continue to conduct O&M inspections of the items required by the FPRA. The most recent Operations and Maintenance inspection was conducted on August 11, 2017. A Five-Year Remedy Evaluation Report was prepared and submitted by Weston on behalf of the Buccini/Pollin Partners I, LLC in December 2016 and was approved by DNREC in a letter dated December 28, 2016.

### **1.3 DESCRIPTION OF INTRUSIVE ACTIVITIES**

The Christina River Bridge Approaches project area may contain contaminants that are related to past and current industrial use. DNREC’s designated HSCA-certified environmental consultant will manage, test (if necessary) and dispose of any soil and/or groundwater generated during intrusive activities.

Intrusive activities covered by this HASP include, but are not limited to:

- Excavation of trenches for the installation of utilities (such as electric lines, manholes, storm drains, and drainage swales) and light poles
- Backfilling of all excavated areas
- Management of native site soil, including stockpiling and disposal
- Stockpiling of soil consistent with Christina River Bridge Approaches Project CMWMWP (BrightFields, revised December 2017)
- Dewatering activities
- Test pits and test holes
- Street-scaping such as installation of pavers and benches
- Landscaping such as tree pits
- Hardscaping such as concrete, sidewalks, and asphalt

This HASP will serve as a guidance document for intrusive work associated with the Christina River Bridge Approaches Project and will provide a summary of the following:

- Soil and groundwater contaminants associated with the Site (Section 2.1)
- Site control and protective measures (Section 3)
- Safe work procedures for subsurface work (Sections 4, 5 and 6)
- Key Personnel and responsibilities (Section 7)
- Emergency response procedures (Section 8)

## SECTION 2 HAZARD ANALYSIS

### 2.1 CHEMICAL HAZARDS IN SOIL AND GROUNDWATER

Chemicals that may be encountered in the soil and groundwater, during intrusive activities associated with the Christina River Bridge Approaches Project, include antimony, arsenic, barium, cyanide, lead, manganese, mercury, pesticides, petroleum hydrocarbons, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs). All of these compounds are possible remnants from historic industrial use of the land. A summary of known and possible contaminants associated with sites located within and adjacent to the Christina River Bridge Approaches project limits is included in Table 1. With the possible exception of VOCs and petroleum hydrocarbons, which can volatilize into the air, the other compounds tend to adhere to sediment and dust, and can be transported along with these soil materials. See Attachment A for Safety Data Sheets (SDS) for the potential contaminants of concern. Since construction for the Christina River Bridge and the Approaches will be performed in different stages, a separate HASP has been prepared for the Christina River Bridge for any chemicals that may be encountered.

To serve as a reference and a warning, this section provides a brief summary of the actions of each of these chemicals on the human body; however, the goal of this HASP is to prevent worker exposure to all of these compounds, so that no one working on the project has to worry about, or endure, any of these symptoms.

**Aluminum** is a silver-white solid, odorless metal that is insoluble in water. Small particles of aluminum may be present in the soil. It is a skin irritant and may cause contact dermatitis following exposure. Although it is listed as a non-hazardous if ingested or inhaled, prolonged or repeated exposure may damage target organs.

**Antimony** is a blue- or silvery-white brittle metal, used in many industrial applications (most notably as a hardener for lead and for flame-proofing). Small particles of antimony may be present in the soil. If it enters the body, antimony is toxic and can cause headaches, dizziness, depression, vomiting, or death.

**Arsenic** is a silver-gray or tin-white brittle metal, used in many industrial applications. It is odorless and solid. Small particles of arsenic may be present in the soil. If it enters the body, it can affect the liver, kidneys, skin, lungs, and lymphatic system. It can cause ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy (damage to the peripheral nerves), respiratory irritation, and hyperpigmentation of the skin. Arsenic is a known carcinogen.

**Barium** is a yellowish-white, soft metal, but in nature barium occurs in a combined state, principally barite (barium sulfate) and witherite (barium carbonate). Both of these compounds have limited water solubility. Various barium compounds are used in drilling mud, pyrotechnic devices, ceramics, paints, enamels, optical glasses, and is used to remove trace gas from vacuum and television tubes. It may also be found as a natural component of fossil fuel and is present in the air, water, and soil. Exposure to barium can occur through the air, water, or food. Clinical features of barium poisoning include acute gastroenteritis, loss of deep reflexes with onset of muscular paralysis and progressive muscular paralysis. The muscular paralysis appears to be related to severe hypokalemia (low blood potassium). Baritosis has been observed in individuals occupationally exposed to inhalation of barium compound dust. There is no evidence that barium is carcinogenic.

**Cadmium** is a lustrous, silver-white, ductile, very malleable metal. Its surface has a bluish tinge and the metal is soft enough to be cut with a knife, but it tarnishes in air. It is soluble in acids but not in alkalis. It is similar in many respects to zinc but it forms more complex compounds. Exposure to cadmium can occur with people who live near hazardous waste sites or factories that release cadmium into the air and people that work in the metal refinery industry. Over exposure to this metal may have the following adverse health effects: diarrhea, stomach pains and severe vomiting, bone fractures, reproductive failure and possible infertility, damage to the central nervous system, psychological disorders, genetic damage, and possible cancer development.

**Chromium** is a silver, odorless brittle metal. It is sensitive to air and incompatible with strong oxidizing agents and strong acids. Chromium compounds can irritate the respiratory tract, leading to lung, nasal, or sinus cancer. Dust formation should be avoided. Dermal exposure can result in dermatitis.

**Copper** is a soft, ductile metal with high thermal and electrical conductivity. A freshly exposed surface will have a reddish-orange color. Tarnished copper will have a greenish appearance. Copper can be very hazardous in the case of significant ingestion. Copper is hazardous in the case of eye contact or inhalation. Copper is slightly hazardous in the case of skin contact. Chronic copper toxicity does not normally occur in humans because of transport systems that regulate absorption and excretion.

**Cyanide** is usually found in a compound form. It can be a colorless gas or a white solid with a faint almond odor and is used in many industrial applications. Cyanide-containing wastes are commonly found in soils at former manufactured gas plant (MGP) sites. Blue residues from the ferric ferrocyanide waste may be found in the soil. Small amounts of cyanide may also be present in the groundwater. Cyanide is harmful if ingested and may cause breathing difficulties, chest pain,

vomiting, blood changes, headaches, and enlargement of the thyroid gland, seizures, loss of consciousness, coma, and death.

**Iron** is a black to grey solid metal that is odorless and tasteless. It is flammable and insoluble in water. Small particles of iron may be present in the soil. Iron is slightly hazardous upon skin contact, ingestion, and inhalation. If it enters the body, it can damage the liver, cardiovascular system, upper respiratory tract, and pancreas. Prolonged or repeated skin contact may cause hypersensitivity.

**Lead** is heavy, ductile, soft, gray solid, used in many industrial applications. It is insoluble in water. Small particles of lead may be present in the soil. Breathing elevated concentrations of lead dust poses a significant health hazard, and can be toxic to the central and peripheral nervous system, including the brain, spinal cord, motor and sensory nerves. Symptoms of overexposure due to dermal (skin) contact include: malnutrition, constipation, acute abdominal pain, hypertension, anemia, gingival lead line (a blue-black line at the gum-tooth border), involuntary shaking, and paralysis of the wrist.

**Manganese** is a gray-white brittle and hard metal, used in many industrial applications, especially for steel. It decomposes slowly in cold water. Small particles of manganese may be present in the soil. It is harmful if inhaled or ingested and can cause irritation, reproductive disorders, nervous system disturbances, cough, tight chest, low back pain, weakness in legs, and sleepiness.

**Mercury** compounds can be inhaled and absorbed through the lungs, and may pass through the skin, but the compounds can also be absorbed through the stomach if swallowed. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems. Acute (short-term) exposure to very high exposures to mercury vapor in the air can cause acute poisoning. Symptoms usually begin with cough, chest tightness, trouble breathing, and upset stomach. These may lead to pneumonia, which can be fatal. Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation. If the inorganic mercury compounds are swallowed, nausea, vomiting diarrhea and severe kidney damage can occur. Chronic (long-term) Exposure to any form of mercury on a repeated basis, or even from a single, very high exposure can lead to the disease of chronic mercury poisoning. The three main symptoms are gum problems, mood and mental changes, and problems with the nervous system (generally a fine tremor of the hand).

**Zinc** is a bluish-white, lustrous metal. Zinc can be very hazardous in the case of significant

ingestion. Zinc is hazardous in the case of eye contact or inhalation. It is slightly hazardous in the case of skin contact. Chronic zinc toxicity does not normally occur in humans because of transport systems that regulate absorption and excretion. However, excessive absorption of zinc suppresses copper and iron absorption.

**Organochlorine Pesticides** Symptoms of organophosphate or carbamate poisoning include blurred vision, salivation, diarrhea, tremors, headache, dermal irritation, respiratory problems, dizziness, nausea and vomiting, wheezing, and sometimes seizures, coma, and death. Mild to moderate pesticide poisoning mimics gastroenteritis, bronchitis, or intrinsic asthma. Mild signs of acute pesticide poisoning includes nausea, vomiting, diarrhea, or wheezing and are often not recognized as being potentially linked to pesticide toxicity. Rashes and other skin reactions are another major manifestation of pesticide toxicity. Chronic effects of pesticide exposure may include adverse effects on neurological function, cancer, reproductive harm, reduced growth and development, and birth defects.

**Petroleum hydrocarbons** (such as LNAPL, DRO, and GRO) are mixtures of organic compounds, including gasoline, fuel oils, and lubricants. These compounds may have soaked into the soil, or be present floating on the groundwater. They are toxic if ingested (swallowed) and can cause irritation and/or illness if inhaled (breathed) or absorbed through the skin. Potential symptoms of overexposure due to inhalation include: eye irritation and nose/throat irritation. Potential symptoms of overexposure due to ingestion include: dizziness, drowsiness, headache, nausea. Potential symptoms of overexposure due to dermal contact include: dry and cracking skin.

**PCBs** are a group of chlorinated organic compounds used in the past in electrical transformers, capacitors, heat transfer and hydraulic systems, adhesives, paints and sealants. They are colorless to light colored, viscous liquids with a mild hydrocarbon odor. PCBs are insoluble in water and are potentially carcinogenic. These compounds may have soaked into the soil. Elevated concentrations of PCBs in dust pose a significant health hazard. Target organs include the skin, eyes, and liver. Symptoms of overexposure due to inhalation include eye irritation and chloracne.

**PAHs** (e.g., benzo[a]pyrene, benz[a]anthracene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and naphthalene) are semi-volatile organic compounds that are generally insoluble in water and are potentially carcinogenic. They are components in heavy petroleum hydrocarbons (oils, greases, tars), and are found in coal and ash. Potential symptoms of overexposure include: excitability, malnutrition, nausea, profuse sweating, jaundice, renal (kidney) shutdown, and dry skin.

**VOCs** (such as benzene, toluene, ethylene, ethylbenzene, trichloroethylene (TCE), vinyl chloride, and xylenes) are volatile organic compounds that are generally somewhat soluble in water and are

potentially carcinogenic. They are the lighter components in petroleum hydrocarbons such as gasoline and light oils. Potential symptoms of inhalation exposure include: excitability, headaches, dizziness, nausea, malnutrition, profuse sweating, jaundice, and renal (kidney) shutdown. Skin contact may produce irritation, dermatitis, and dry skin.

**Methyl tert-Butyl Ether (MTBE)** is also a VOC. It is a clear, water-like liquid that is extremely flammable. It has a sweet, ether-like smell and is highly aromatic. It is highly mobile in soil, and could be present in site groundwater. Ingestion may lead to nausea, vomiting, diarrhea, tremors, convulsions, loss of consciousness and respiratory arrest. Overexposure as a result of inhalation can lead to headaches, dizziness, loss of balance, unconsciousness, and respiratory failure.

## **2.2 OTHER HAZARDS**

**Asbestos** is the name of a group of naturally-occurring minerals that separate into strong, very fine fibers. The fibers are heat-resistant and extremely durable, and, because of these qualities, asbestos became useful in construction and industry. It is often found in roofing shingles, floor and ceiling tiles, gaskets, and coatings. Asbestos fibers generally do not break down in the environment, evaporate, and are not water-soluble. When the asbestos containing material can be crushed releasing the fibers, the material is considered “friable.” In this condition, fibers can be released and pose a health risk, such as lung cancer from inhaling the fibers. Asbestos mainly affects the lungs and membranes surrounding the lungs. Exposure over time to asbestos may increase risk of lung disease and cancer. However, as long as the surface is stable, not damaged, and well-sealed against the release of its fibers and not damaged, the material is considered safe until damaged in some way.

## **2.3 CHEMICALS USED BY SITE WORKERS**

Chemicals brought onto the project area for use in construction activities will be properly labeled in accordance with OSHA's Hazard Communication requirements (29 CFR 1926.65). Safety Data Sheets will be provided to the Safety Officer by the contractor who brings a hazardous substance onto the site. Other site workers will be briefed on the presence of hazardous substances, and will be informed of the location of SDS sheets.

## **2.4 CHEMICAL CONTAMINANT ROUTES OF ENTRY**

The potential routes of entry into the body for the contaminants that may be encountered during work activities are dermal (skin) contact, ingestion (swallowing), and/or inhalation (breathing) of dust or vapors.



### **2.4.1 Dermal (Skin) Contact**

Skin contact from contaminants within the soil will need to be prevented. Nitrile gloves and in some areas tyvek coveralls and boot covers will be required to be worn to prevent skin contact, and workers will carry out cleansing procedures, such as washing hands with soap and water, before performing other activities or leaving the site. If necessary, geotextile fabric, or plastic, and/or stone should be utilized in excavations to limit worker contact with contaminated materials. If skin irritations are found to occur within an area, work will stop and re-evaluation of the work area will be performed by the onsite Safety Officer.

### **2.4.2 Ingestion (Swallowing)**

Accidental ingestion of soil may occur within the work area. In order to prevent contamination by ingestion the following will be enforced: no smoking will be allowed during intrusive activities and employees will wash their hands before eating and before engaging in other non-intrusive activities.

### **2.4.3 Inhalation (Breathing)**

The breathing in of contaminants that drift into the air due to airborne VOC vapors or dust releases could present a risk where there are high concentrations of organic contaminants and/or metals. Air and dust monitoring will be performed by the onsite Safety Officer during active excavation work to evaluate safe working conditions. Section 3.4 describes the monitoring equipment and action levels that will be used during intrusive work. When necessary, dust will be controlled through dust reduction practices such as wetting exposed surfaces. If dust cannot be controlled, the safety officer will stop work or upgrade the level of PPE.

## **2.4 BIOLOGICAL HAZARDS**

### **Insect Bites/Stings**

Protective outer clothing such as gloves, hard hats, and coveralls can reduce the potential for insect bites and stings. Insect bite symptoms may include redness, rash, swelling, chills, fever, diarrhea, and vomiting. Any worker who has been bitten or stung and shows symptoms of a severe reaction will seek medical assistance immediately. Workers who know that they are allergic to insects will advise their employer and Safety Officer prior to field activities and will carry an antidote kit, if necessary.

In heavily vegetated areas, to prevent contact with disease-carrying ticks, workers will wear long-sleeved shirts, long pants, and steel toe safety boots that extend above the ankle with socks pulled

over pants cuffs. Workers will thoroughly check clothing, skin, and hair for the presence of ticks at the end of each workday. If a tick is found attached to the body, it should be removed by gently tugging with tweezers where the mouthparts enter the skin. The tick should not be killed prior to removal.

## **2.5 PHYSICAL HAZARDS**

Many potential physical hazards could be present during intrusive activities associated with the Christina River Bridge Approaches Project. These physical hazards may include, but are not limited to:

- General safety
- Excavation/Trenching Hazards
- Fire/explosion
- Heavy equipment
- Vehicle and pedestrian
- Noise
- Electrical
- Utilities
- Weather
- Heat stress
- Cold Stress

Prior to beginning work, Crew Leaders will inspect project work areas visually for the presence of general safety hazards (e.g. trip/slip hazards, unstable surfaces or steep grades, sharp objects). If hazards are present, these hazards will be either removed or recorded, and precautionary measures will be taken to prevent injury. Site specific Job Hazard Analysis (JHA) forms for specific tasks associated with this project are included in Attachment B.

### **2.5.1 Excavation/Trenching Hazards**

Open excavations and trenches pose a variety of hazards to site workers including: cave-in hazards (worsened by water accumulation in some excavations); contact with underground utilities; vehicle and pedestrian traffic hazards; dangers from falling loads; hazardous air (atmospheres) within and emitted from excavations; stability of adjacent structures; and loose rock and soil. OSHA's standard for excavations (29 CFR 1926.650-652) will be enforced and followed at excavation areas.

Personnel are not permitted underneath loads being removed from an excavation. When mobile equipment is operated adjacent to an excavation, or must approach the edge of an excavation, a warning system will be used, such as the use of barricades, hand or mechanical signals, or stop logs. Where the stability of adjacent building walls, other structures, or the active roadways are endangered by excavation operations, support systems such as sheeting, shoring, bracing, or

underpinning will be provided to make sure that the structures are stable.

Entry into Trenches and Excavations: Site personnel are not permitted to enter trenches and excavations without permission of the Safety Officer and/or the Site Manager. These representatives will first evaluate existing and predictable hazards associated with trench or excavation collapse. They have the authority to restrict access to excavations and trenches and to take prompt corrective measures to eliminate those hazards. Trenches and excavations must be inspected by the Safety Officer or the Site Manager prior to anyone entering. These representatives must document their findings, including assumptions used in determining that the excavation is safe for entry and that conditions required for safe entry have been met. Protective systems (e.g., sloping, benching, and supports/shields) will be used at all times in accordance with the requirements of 29 CFR 1926.652 and implemented prior to personnel entering the trench or excavation.

Trenches and excavations must be inspected daily by a “competent person” to ensure that safe conditions are present and to identify potentially hazardous situations. Prior to personnel entering a trench or excavation, enter/exit methods must be implemented and tested, including provisions for emergency exit from excavations. One or more stairways, ladders, ramps, or other safe means of exit will be located in trench excavations that are 4 ft or more in depth so that personnel do not have to travel more than 25 ft to get to the exit point. Loose rock and soil that could fall and injure personnel entering trenches and excavations must be removed or otherwise stabilized prior to entry. Personnel shall not work in trenches and excavations in which water has accumulated or is accumulating.

### **2.5.2 Confined Space Entry**

Confined space entry procedures are required by OSHA at all excavations/trenches that are 4 ft or more below the ground surface. Therefore, confined space entry is a possibility for work conducted under this HASP.

The National Institute of Occupational Safety and Health (NIOSH) defines Confined Space as "any space which, by design, has limited openings for entry and exit; unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy. The Occupational Safety and Health Administration (OSHA) in 1926.21 "Safety training and education" paragraph 5, sub-paragraph ii, defines Confined Space as "any space having a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere. Confined or enclosed spaces include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 feet deep such as pits, tubs, vaults, and vessels." OSHA 1926 is the construction industry standard.

In the event that confined space entry is necessary, a confined space program must be provided and a Confined Space Entry Permit prepared by the confined space supervisor and reviewed by the Safety Officer before entry will be allowed. An example of a confined space permit and checklist are included in Attachment C.

### **2.5.3 Fire/Explosion Hazards**

There is always a potential for fire and/or explosion emergencies. Workers will always be alert for unexpected events, such as ignition of chemicals or sudden release of materials under pressure, and will be prepared to act in these emergencies.

Each field vehicle will be equipped with a fire extinguisher. Workers will be trained in the proper use of fire control equipment. However, professionals will handle large fires that cannot be controlled with fire extinguishers. The proper authorities will be notified in these instances. (See Section 7, Emergency Response Plan and Procedures).

In the event of a fire, all workers will report to a predetermined meeting location, unless this location has become dangerous due to the existing emergency.

### **2.5.4 Heavy Equipment Hazards**

The use of heavy equipment during excavation may pose safety hazards to site workers. Only trained, experienced personnel will operate or work around heavy equipment. If possible, personnel will remain outside the turning radius of large, moving equipment. At a minimum, personnel will maintain visual contact with the equipment operator. No guards, safety appliances, or other devices may be removed or made ineffective unless repairs or maintenance are required, and then only after power has been shut off and locked out. Safety devices will be replaced once repair or maintenance is complete. When not operational, equipment will be set and locked so that it cannot be activated, released, dropped, etc. Working backup alarms should be maintained on all moving, heavy equipment, so as to alert workers and pedestrian traffic of vehicles backing up.

All equipment powered by steam or combustion engines will be properly positioned so that release of exhaust does not endanger workers or obstruct the view of the operator. Gasoline-operated equipment will be re-fueled properly to prevent fire hazards; power will be off, no smoking allowed, and proper dispensing equipment will be used. When equipment such as backhoes and loaders are not in use, all buckets must be lowered to the ground.

### **2.5.5 Vehicle and Pedestrian Hazards**

Due to the operational nature and function of the project location, vehicular traffic is expected to be of utmost concern in the work areas. If vehicles or pedestrians are required to approach an area involving intrusive activities, they could be at risk from site hazards, and/or they could present a hazard to site workers. Construction equipment will be located in an area that does not present a hazard to bystanders. If needed, barriers will be used to separate the work areas from both vehicular and pedestrian traffic areas and to prevent inadvertent entry into the work area. In areas where pedestrians or vehicles are encountered, safety cones will be placed around the work area to create a barrier. The barrier will be maintained even when work is not being performed in the area to prevent unauthorized access and to make the work site visible.

### **2.5.6 Noise Hazards**

Work around large equipment often creates excessive noise. Noise can cause workers to be startled, annoyed, or distracted; it can cause pain, physical damage to the ear, and temporary and/or permanent hearing loss; and it can interfere with communication. If workers are subjected to noise exceeding an 8-hr time-weighted average (TWA) sound level of 85 dBA (decibels on the A-weighted scale), hearing protection will be used with an appropriate noise reduction rating (NRR) to comply with OSHA Regulations 29 CFR 1910.95 and reduce noise levels to or below the permissible values.

### **2.5.7 Electrical Hazards**

Overhead power lines, electrical wiring, electrical equipment, and buried cables pose electric shock risks to workers, and can cause burns, muscle twitches, heart fibrillation, and other physical injuries, as well as fire and explosion hazards. Workers will take appropriate protective measures when working near live electrical equipment, including making an initial inspection of the work area to identify potential spark sources, maintaining a safe distance from the equipment, proper illumination of work areas, placement of barriers to prevent inadvertent contact, and use of electrically nonconductive equipment. If overhead lines cannot be shut-off (deenergized) prior to the start of work, a 10-ft distance will be maintained between overhead energized power lines with a voltage of 50 kilovolts (kV) and elevated equipment parts. This distance will be increased by 4 inches for every 10 kV greater than 50 kV. For example, workers will maintain a distance of 11.7 ft from energized power lines with a voltage of 100 kV (10 feet + (5 x 4 inches)) (OSHA's standard for Electrical Safety-related Work Practices (29 CFR 1910.331-335)).

### **2.5.8 Utilities**

Underground utilities pose hazards to workers involved in intrusive operations. These hazards include electrical shocks, explosion, and asphyxiation, as well as costly and annoying hazards associated with damaging communication, sewer, and water lines. Prior to commencement of intrusive operations, underground utilities, including buried wires, pipes, tanks, etc., will be visibly marked with flags or marking paint to alert workers of unsafe areas. Personnel should be aware that, although an area may be cleared, it does not mean that unexpected hazards will not be encountered.

### **2.5.9 Weather Hazards**

Weather conditions will always be taken into consideration. Heavy rains, electrical storms, high winds, and extreme temperatures, for example, may create dangerous situations for workers. Equipment performance may also be impaired because of inclement weather.

Wind direction will be observed, and both chemical and physical hazards will be evaluated. If exposure to organic vapors or dust is anticipated, workers will locate upwind of the excavation. Wind direction often changes abruptly and without warning, so personnel should always be prepared to reposition, if necessary.

### **2.5.10 Heat Stress**

The potential for heat stress is a primary concern during field work in the spring and summer months. This subsection has been included to address the potential for heat related illnesses.

Heat stress usually is a result of protective clothing decreasing natural body ventilation, although it may occur at any time that work is being performed at elevated temperatures. Factors, such as a worker's acclimatization, level of physical fitness, age, and work rate may increase or decrease his susceptibility to heat stress. Before assigning a task to an individual worker, all of these factors will be taken into account to ensure that the task will not endanger the worker's health.

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physiological reactions can occur, resulting in mild symptoms (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to severe or even fatal. Because heat stress is one of the most common and potentially serious illnesses at hazardous waste sites, regular monitoring and other preventative measures are vital. Site workers must learn to recognize and treat the various forms of heat stress. The best approach is preventative heat stress management. In general:

- Have workers drink 16 ounces of water before beginning work (in the morning and after lunch). Provide disposable 4-ounce cups and water that is maintained at 50-60°F. Urge workers to drink one to two cups of water every 20 minutes for a total of one to two gallons per day. Provide a cool area for rest breaks. Discourage the intake of coffee during work hours. Monitor for signs of heat stress.
- Acclimate workers to site work conditions by slowly increasing workloads, i.e., do not begin site work activities with extremely demanding activities.
- Provide cooling devices to aid natural body ventilation. These devices, however, add weight and their use should be balanced against worker efficiency. An example of a cooling aid is long cotton underwear which acts as a wick to absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.
- In extremely hot weather, conduct field activities in the early morning and evening.
- Ensure that adequate shelter is available to protect personnel against heat as well as cold, rain, snow, etc., which can decrease physical efficiency and increase the probability of both heat and cold stress. If possible set up the command post in a shaded area.
- In hot weather, rotate shifts of workers who are required to wear impervious clothing.
- Good hygienic standards must be maintained by frequent changes of clothing and showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

Illness resulting from exposure to extreme heat is possible during field operations. Personnel, especially those in the work area, will be familiar with the signs, symptoms and treatment of heat related illnesses, including:

### **Heat Exhaustion**

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. The condition is much less dangerous than heat stroke, but it nonetheless must be treated.

- Symptoms - Pale, clammy, moist skin; profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, breathing is shallow. The person may have a headache, may vomit, exhibit slurred speech and may be dizzy.
- Treatment - Remove the person to a cool or shaded area and give plenty of liquids to consume, loosen clothing, place in a head-low position, and provide bed rest. Consult a physician, especially in severe cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have the person drink one to two cups of water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be about one to two gallons per day.

## **Heat Stroke**

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of heat-regulating mechanisms of the body. With heat stroke, the individual's temperature control system that causes sweating stops working correctly. Body temperature rises so high that brain damage and death will result if the person is not cooled quickly.

- Symptoms - Hot, dry, flushed skin, although the person may have been sweating earlier, nausea, dizziness, confusion, convulsions, rapid respiratory and pulse rate, unconsciousness or coma.
- Treatment - Cool the victim quickly. If the body temperature is not brought down quickly, permanent brain damage or death will result. Soak the victim in cool, but not cold water; sponge the body with cool water or pour water on the body to reduce the temperature to a safe level (102°F). Observe the victim and obtain medical help. Do not give coffee, tea, or alcoholic beverages. If symptoms of heat stroke are observed, the victim will be transported to the hospital immediately.

## **Heat Cramps**

Heat cramps are caused by perspiration that is not balanced by adequate fluid intake. Heat cramps are often the first sign of a condition that can lead to heat stroke.

- Symptoms - Acute painful spasms of voluntary muscles, e.g., abdomen and extremities.
- Treatment - Remove victim to a cool area and loosen clothing. Have the patient drink one to two cups of water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be one to two gallons per day.

## **Heat Rash**

Heat rash is caused by continuous exposure to heat and humid air and chafing clothes. The condition decreases the ability to tolerate heat.

- Symptoms - Mild red rash, especially in areas of the body that come into contact with protective gear.
- Treatment - Decrease amount of time in protective gear and provide powder to help absorb moisture and decrease chafing.

Some preventive measures to avoid heat related illness include:

- Frequent resting in cool or shaded areas



- Consumption of large quantities of fresh potable water. Diluted electrolyte beverages may also be consumed as a secondary source of fluid replacement.

Heat stress monitoring will be conducted in a manner that anticipates and prevents the onset of heat stress symptoms through the monitoring of heat and humidity coupled with OSHA work-rest schedules. A suggested work-rest schedule is:

<b>Ambient Temperature</b>	<b>Work</b>	<b>Rest</b>
70°F	3 hours	15 min.
75°F	2-1/2 hours	15 min.
80°F	2 hours	15 min.
85°F	1-1/2 hours	15 min.
90°F	1 hour	15 min.

If heat related illness is suspected or observed, the affected person will be moved to a cool or shaded area and given plenty of liquids to consume. If symptoms of heat stroke are observed, the victim will be transported to the hospital immediately.

### **2.5.11 Cold Stress**

Persons working outdoors in low temperatures, especially at or below freezing, are subject to cold stress. Exposure to extreme cold for a short time causes severe injury to the surface of the body or results in profound generalized cooling, eventually causing death. Areas of the body which have high-surface-area-to-volume ratios, such as fingers, toes, and ears are the most susceptible.

Protective clothing generally does not afford protection against cold stress. In many instances, it increases susceptibility.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air; thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked.

Illness resulting from exposure to extreme cold is possible during field operations. Personnel, especially those in the work area, will be familiar with the signs, symptoms and treatment of cold

related illnesses, including:

### **Frostbite**

Local injury resulting from cold is included in the generic term frostbite. Frostbite of the extremities can be categorized into the following:

- Frost nip or incipient frostbite is characterized by sudden blanching or whitening of skin.
- Superficial frostbite is characterized by skin with a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep frostbite is characterized by tissues that are cold, pale, and solid.

To administer first aid for frostbite: Take the victim indoors and rewarm the areas quickly in water that is between 39 and 41 degrees C (102-105 degrees F). Give a warm drink (water or juices, not coffee, tea, or alcohol). The victim must not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, even though the tissue will be very painful as it thaws. Then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep the victim warm, and get immediate medical care.

After thawing, the victim should try to move the injured areas a little, but no more than can be done alone, without help. Seek medical attention as soon as possible.

NOTE:

- Do not rub the frostbitten part (this may cause gangrene).
- Do not use ice, snow, gasoline, or anything cold on the frostbitten area.
- Do not use heat lamps or hot water bottles to rewarm the part.
- Do not place the part near a hot stove.

### **Hypothermia**

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperatures. Symptoms are usually exhibited in four stages:

- Shivering.
- Apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95 degrees F.

- Unconsciousness, glassy stare, slow pulse, and slow respiratory rate.
- Death.

If hypothermia is suspected in any field personnel, remove the person to a warmer location until symptoms recede.

## SECTION 3 SITE CONTROL & PROTECTIVE MEASURES

### 3.1 CONTRACTOR BRIEFING

Prior to work, the Safety Officer will brief all workers on the potential hazards in the Project area and protective measures to be put into operation for intrusive activities. Workers are encouraged to ask questions and to voice any concerns they may have during the briefings. Any questions from site workers will be either addressed at the Health & Safety Briefing, or if they require further research, will be answered the next day. In addition to site workers, all personnel and visitors entering the project limits will be given a health and safety briefing and will indicate their understanding of the requirements by signing **Attachment D, Health and Safety Plan Acknowledgement Record**.

The Safety Officer will check to be sure that there is at least one fire extinguisher and one first aid kit present on the site and accessible to the workers.

The Safety Officer will check to make sure that the Emergency Contact numbers and the directions to the Hospital are posted conspicuously in the Work Area. (It is recommended that each work crew post this information in one of their vehicles.)

An evacuation location for the personnel to go in the event of an emergency will be designated by the Site Manager during the briefing. This location will be an upwind point from site activities, which would not be affected by an emergency situation onsite.

### 3.2 REPORTING ACCIDENTS AND EXPOSURES

Accidents, incidents, or worker's concerns will be logged in the **Environmental Monitoring Record** provided as **Attachment E, along with the corrective action/protective measure taken**.

The Site Manager (or crew chief) will complete an Accident Investigation Report as provided in Attachment F and submit it to the Project Manager and Safety Officer within 24 hours of the following types of incidents:

- Job related injuries and illnesses.
- Accidents resulting in significant property damage.
- Accidents involving vehicles and/or vessels.
- Accidents in which there may have been no injury or property damage, but which have a high probability of recurring with at least a moderate risk to personnel or property.

An accident, which results in a fatality or the hospitalization of 3 or more employees, will be reported within 8 hours to the U.S. Department of Labor (1-800-321-OSHA). Each subcontractor is responsible for notification involving their employees.

### **3.3 PERSONAL PROTECTIVE EQUIPMENT**

Based on evaluation of the potential safety and health hazards on the adjacent properties to the Christina River Bridge and Approaches, the generally required level of PPE is described below.

The Safety Officer will review with the workers the appropriate procedures for putting on and removing PPE prior to the start of work tasks. Site workers, prior to use and regularly during use, will inspect their PPE. If a site worker experiences a rip, tear, etc. in the PPE that affects the level of protection offered, that person will immediately leave the work area. Re-entry will not be permitted until the equipment has been repaired or replaced.

The generally required level of PPE will be modified Level D for intrusive work on this project. Modified Level D PPE will consist of: hard hats, steel-toed work boots, safety glasses, long sleeved shirts, long pants, safety vests, and work gloves and nitrile inner gloves. Based on a review of previous environmental investigations and analytical data from soil and groundwater samples collected for the Christina River Bridge and Approaches, additional PPE may be required.

### **3.4 AIR MONITORING**

Air monitoring will be conducted for all intrusive activities occurring within the project limits, initially at the beginning of the day, periodically during the day (every 30 minutes), and when tasks or site conditions change. Both workers and the Safety Officer will be alert for any changes in site subsurface conditions or in the air in order to maintain safe Level D working conditions.

During air monitoring, there are several precautionary response actions. In the event that action levels are exceeded during air monitoring, and they cannot be lessened, an upgrade to Level C PPE (breathing protection) may be necessary. If this occurs, only workers who are 40-hour OSHA HAZWOPER trained, medically monitored, and certified to wear respirators will be allowed in the work zone. It is possible that a new work crew will have to be brought in to complete the work if the initial crew is not certified to wear respirators. Section 4 describes the procedures that apply in the case that Level D conditions cannot be maintained, and workers must upgrade to Level C PPE.

### **3.4.1 Air Monitoring Equipment**

The following air monitoring equipment may be used to evaluate conditions in and around the work area:

- A MiniRAE 3000 PID or equivalent will be used to measure the levels of volatile organic compounds.
- A miniram or equivalent will be used to measure the levels of air borne dust particles.
- An RAE 4-gas meter will be used to measure oxygen, combustible gas, hydrogen sulfide, and carbon monoxide (if necessary).

All air monitoring equipment will be calibrated according to the manufacturer's specifications prior to use each day. The time of calibration, span gas concentration, calibration technique, and name of the person performing the calibration will be recorded in the Safety Officer's log book.

In addition to daily air monitoring levels, the Safety Officer will record the instruments used, estimated temperature, general humidity (dry, moist, wet), wind direction, and estimates of the wind velocity.

In the event that a confined space entry becomes necessary, additional air monitoring for oxygen and combustible gases will be implemented.

### **3.4.2 Air Action Levels & Responses**

Based on the findings of environmental investigations within the project area, elevated concentrations of contaminants could occur in the air during intrusive activities. For the project limits of the Christina River Bridge Approaches, the main contaminants of concern are metals (such as arsenic and lead), PAHs (such as benzo[a]pyrene), petroleum constituents, and coal tar NAPL. Air monitoring will be implemented to monitor the concentrations of VOCs and dust released during site activities. Because the project area encompasses several different properties with varying contaminants of concern (COCs), the properties have been grouped into three separate areas with three separate air action levels based on their COCs.

If levels of VOCs are greater than 5 ppm above background for more than one minute in the breathing zone on a continued basis, the Safety Officer will direct that work be stopped until the source of the problem is found and corrected.

#### **Action Levels for Total Organic Vapors**

Continued VOC concentrations and/or dust levels in the breathing zone that are above general site

background, and cannot be controlled by general ventilation or dust suppression, will require the following levels of protection.

<u>VOC Concentration Range – All Work Areas</u>	<u>Level of Protection</u>
0-5 ppm    above background	Level D
>5 ppm    above background	Stop work, evacuate workers, and find source of problem (possible Level C upgrade)

Insufficient concentrations of oxygen, combustible gases, hydrogen sulfide, or carbon monoxide in the breathing zone that are above general site background and cannot be controlled by general ventilation or other engineering controls will require the following levels of protection.

**Action Level for Oxygen**

<u>Oxygen Concentration Range</u>	<u>Level of Protection</u>
19.5 – 21.5%	Level D
<19.5%	Stop work, evacuate workers, and implement more stringent engineering control or possible Level B
>21.5%	Stop work, evacuate workers, and exit area, implement more stringent engineering controls

<u>Action Level for Combustible Gas</u>	<u>Level of Protection</u>
Less than 10% of LEL	Level D – Continue work
10% - 25% of	Stop work, evacuate workers, and take action to reduce below 10%.
Greater than 25% of LEL	Stop work, evacuate workers, and exit area, implement more stringent engineering controls.

<u>Action Level for Hydrogen Sulfide</u>	<u>Level of Protection</u>
Less than 5 ppm	Level D – Continue Work
5 ppm to 9 ppm for 1 minute	Stop work, evacuate workers, and implement engineering controls.
A reading greater than 10 ppm	Stop work, evacuate workers, and upgrade to Level B.

<u>Action Level for Carbon Monoxide</u>	<u>Level of Protection</u>
Less than 50 ppm	Level D – Continue Work
50 ppm to 199 ppm for 1 minute	Stop work, evacuate workers, and implement more stringent engineering controls.
A reading greater than 200 ppm	Stop work, evacuate workers, and possible upgrade to Level C.

**Action Levels for Dust**

Using an action level equal to half of the Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) or National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL) (whichever is lower) and the maximum detected soil contaminant concentration, approximate contaminant concentrations in dust and corresponding particulate readings were calculated. Tables 2A, 2B, and 2C show a summary of the most representative calculations for the dust action levels for the Christina River Bridge Approaches project area. Contaminant concentrations were calculated for each side of the River from the October 2012 BrightFields Subsurface Investigation Report for Christina River Bridge Approaches Contaminants of Concern (COC) posting maps. Table 2A shows the air action levels for the Wilmington Coal Gas –South Site. Table 2B shows air action levels for the remaining western portion of the Christina River Bridge Approaches project area. Table 2C shows the air action levels for the east side of the Christina River Approaches project. These areas are shown on Figure 4.

For the work being performed for the Christina River Bridge Approaches Project, engineering controls will be implemented if levels of airborne dust particles exceed the following levels. The Safety Officer may direct that work be stopped until the source of the problem is found and corrected. Please note that the action levels listed below and shown on Tables 2A, 2B, and 2C are for the COC with the lowest Action Level only.

**Action Level for Dust for the Wilmington Coal Gas – South Site (See Table 2A )**

<u>Action Level for Dust</u>	<u>Level of Protection</u>
>0.25 mg/m <sup>3</sup>	Level D plus engineering controls such as wetting surface
>0.5 mg/m <sup>3</sup>	Stop work, evacuate workers, and implement more stringent engineering control or possible Level C



**Action Level for Dust for the Remaining Western Portion (See Table 2B )**

<u>Action Level for Dust</u>	<u>Level of Protection</u>
>5 mg/m <sup>3</sup>	Level D plus engineering controls such as wetting surface
>15 mg/m <sup>3</sup>	Stop work, evacuate workers, and implement more stringent engineering control or possible Level C

**Action Level for Dust for the East Side (See Table 2C )**

<u>Action Level for Dust</u>	<u>Level of Protection</u>
0.5 mg/m <sup>3</sup>	Level D plus engineering controls such as wetting surface
>0.85 mg/m <sup>3</sup>	Stop work, evacuate workers, and implement more stringent engineering control or possible Level C

The Safety Officer will continue to monitor the area and will continue the evacuation of personnel until conditions return to normal or until the workers upgrade their level of PPE. Engineering site controls such as wetting, work stoppage to allow dust to dissipate, or ventilation (venting dust away from workers) will be used, if necessary to return conditions to normal. Rotation of workers to minimize the time the worker is exposed is not acceptable.

If necessary, the Safety Officer will contact appropriate authorities and/or emergency groups to make sure that there is no harmful impact to human health, safety and/or the environment in the project area or in the surrounding vicinity.

**3.5 DUST SUPPRESSION PROGRAM**

If necessary, a dust suppression program will be implemented for all activities that create sustained airborne dust concentration in the breathing zone that exceed the action levels outlined above. These activities include but are not limited to the following field activities:

- Excavation/Backfilling/Stockpiling/Loading of Soil
- Vehicles Entering and Exiting the project limits
- Sheeting and Shoring of Excavation

- Dewatering Activities

When needed, water will be used to minimize the amount of dust created by field activities. The following procedures will be implemented to ensure that minimal amounts of dust remain airborne:

- Sufficient amounts of water will be available at all work areas.
- Each work crew will maintain equipment to disperse water.
- If a significant volume of dust is generated during field activities, the area will be sprayed with water. A sufficient amount of water will be used to cover the area, but not so much that mud is created.
- At any time during activities that the soil becomes dry and a significant volume of dust becomes airborne and action levels are exceeded, all activities will be halted and the area will be re-sprayed with water.

The Safety Officer, based upon environmental monitoring and visible dust emissions, will determine if dust in the breathing zone will require dust suppression. If dust suppression is required, all excavation and soil handling work will be stopped until the dust can be reduced to safe levels through wetting and/or engineering controls.

### **3.6 ODOR SUPPRESSION PROGRAM**

Odor suppressing foam may be used in areas where Level C upgrade is necessary (Section 3.4.2). It is the responsibility of the designated environmental consultant to determine if this engineering control is necessary. This control will be used to shield not only the contractor from elevated concentrations of VOCs in the breathing zone, but also pedestrians in the vicinity of the work area. The foam will be applied to the walls and bottom of the excavation prior to the installation of the utility trench.

## SECTION 4 LEVEL C WORK ZONES & PROCEDURES

### 4.1 RESPIRATORS AND RESPIRATOR CARTRIDGE SPECIFICATIONS

Use of Level C PPE may be necessary during intrusive activities in the project area. If it becomes necessary to upgrade to Level C for reasons of elevated VOC or dust concentrations, only personnel who are 40-hour OSHA HAZWOPER trained, medically monitored, and certified to wear a respirator will be allowed in the work zone. Workers must show proof of the required training and certifications. Facial hair that interferes with a tight respirator face seal will be removed if work requires respiratory equipment.

- If the upgrade to Level C PPE is necessary because of elevated dust levels, then personnel will wear full-face respirators with air purifying cartridges suited for removal of dust and mists.
- If the upgrade to Level C PPE is necessary because elevated VOC concentrations, after continued attempts at venting, are in excess of 5 ppm above background, then personnel will wear full-face respirators with air-purifying cartridges suited for removal of organic vapors.
- If upgrade to Level C PPE is necessary because of elevated VOC concentrations and elevated dust levels, then personnel will wear full-face respirators with air purifying cartridges suited for the removal of dust, mists, and organic vapors (combination cartridges).

All cartridges will be changed at a minimum of once daily. Water saturation or heavy dust (particulate) concentrations will necessitate more frequent changing of the cartridges. Cartridge changes will also occur when personnel begin to notice increased inhalation resistance.

Quantitative respirator fit tests are required for all personnel wearing air-purifying (negative pressure) respirators. The fit test must be for the style and size of the respirator used by the individual. No personnel with facial hair that interferes in the respirator's sealing surface will be permitted to wear a respirator. Respirators will be checked daily by trained workers for signs of failure. Respirators and associated equipment will be properly decontaminated and hygienically cleaned after use.

### 4.2 LEVEL C SITE CONTROL

An upgrade to Level C PPE requires that the work area be divided into three different zones: the exclusion zone, contamination-reduction zone, and the support zone. The detailed descriptions of

each are as follows:

**Exclusion Zone (Work Zone or the area within the project Limit of Disturbance (LOD)):** This zone will be clearly delineated to prohibit unauthorized access from untrained personnel or bystanders. This area has the highest potential for exposure to hazardous conditions.

**Contamination-Reduction Zone (Decontamination Area 10 to 30 feet outside the Work Zone, depending on site conditions):** Decontamination of personnel, equipment, etc. will be performed in this location. Personnel in this area will be required to wear PPE that is one level less than that worn in the Work Zone (in other words, Level D, if work in the Exclusion Zone is performed in Level C). They will also be prepared to upgrade their PPE and to enter the exclusion zone in case of emergency situations.

**Support Zone:** All other locations, such as vehicles and trailers.

Only authorized personnel will be permitted in the Work and Decontamination Zones. Entering these zones will require putting on the required PPE prior to entry. Using the "buddy system," at least two people will be in the Work Zone and Decontamination Zone at all times. While in the Work Zone and Decontamination Zone, personnel are prohibited from engaging in the following activities:

- Eating, drinking, smoking, chewing gum, chewing tobacco, etc.
- Working before or after daylight hours without adequate lighting and special permission.

## SECTION 5 LEVEL B WORK ZONES & PROCEDURES

### 5.1 SUPPLIED AIR RESPIRATOR SPECIFICATIONS

Use of Level B PPE is not anticipated during intrusive activities in the project area. Level B may be required if it becomes necessary to upgrade to Level B for reasons of insufficient oxygen or elevated VOCs. Only personnel who are trained, medically monitored, and certified to wear a respirator will be allowed in the work zone. Workers must show proof of the required training and certifications. Facial hair that interferes with a tight respirator face seal will be removed if work requires respiratory equipment.

- If the upgrade to Level B PPE becomes necessary then personnel will wear full-face supplied air respirators.

Quantitative respirator fit tests are required for all personnel wearing supplied air (positive pressure) respirators. The fit test must be for the style and size of the respirator used by the individual. No personnel with facial hair that interferes in the respirator's sealing surface will be permitted to wear a respirator. Respirators will be checked daily by trained workers for signs of failure. Respirators and associated equipment will be properly decontaminated and hygienically cleaned after use.

### 5.2 LEVEL B SITE CONTROL

An upgrade to Level B PPE requires that the work area be divided into three different zones: the exclusion zone, contamination-reduction zone, and the support zone. The detailed descriptions of each are as follows:

**Exclusion Zone (Work Zone or the area within the project Limit of Disturbance (LOD)):** This zone will be clearly delineated to prohibit unauthorized access from untrained personnel or bystanders. This area has the highest potential for exposure to hazardous conditions.

**Contamination-Reduction Zone (Decontamination Area 10 to 30 feet outside the Work Zone, depending on site conditions):** Decontamination of personnel, equipment, etc. will be performed in this location. Personnel in this area will be required to wear PPE that is one level less than that worn in the Work Zone (in other words, Level C, if work in the Exclusion Zone is performed in Level B). They will also be prepared to upgrade their PPE and to enter the exclusion zone in case of emergency situations.

**Support Zone:** All other locations, such as vehicles and trailers.

Only authorized personnel will be permitted in the Work and Decontamination Zones. Entering these zones will require putting on the required PPE prior to entry. Using the "buddy system," at

least two people will be in the Work Zone and Decontamination Zone at all times. While in the Work Zone and Decontamination Zone, personnel are prohibited from engaging in the following activities:

- Eating, drinking, smoking, chewing gum, chewing tobacco, etc.
- Working before or after daylight hours without adequate lighting and special permission.

## **SECTION 6**

### **DECONTAMINATION (CLEANSING) PROCEDURES**

#### **6.1 PERSONNEL CLEANSING**

Before leaving the work area, workers will take the following precautions to prevent the tracking of contaminated soil, water or other materials. Soap and water for decontamination must be on site during all activities.

- Remove boot covers, if worn. If not, scrape soil from boots and wipe off dust with moist cloth or paper towel.
- Remove outer gloves, coveralls, and respirator, if worn.
- Remove and discard inner gloves.
- Wash hands, face, and other exposed skin with soap and water.
- Shower and shampoo as soon as possible at the end of the workday, before dining or social activities.

Prior to leaving the project area, and prior to entering a vehicle, place non-disposable coveralls in plastic bags. Launder non-disposable clothing worn in the exclusion zone prior to reuse, separately from other laundry items.

Place disposable coveralls, boot covers, gloves, and respirator cartridges into bags for pickup by the trash collection. If clothing is contaminated by hazardous materials, the Safety Officer may direct separation of clothing into containers for special disposal.

#### **6.2 EQUIPMENT CLEANSING**

If it is dusty or dirty, wet wipe equipment used on site with cloths or paper towels and clean water prior to leaving the site.

#### **6.3 VEHICLE CLEANSING**

In areas with elevated soil contaminants, prior to leaving the site, inspect vehicle tires and bodies for soil. Soil will be removed and the vehicles will be washed thoroughly before exiting the site. Water run-off from decontamination of the vehicles will be maintained within the Project area, and will either be allowed to recharge, discharged to a sanitary sewer, or collected, depending on the level of contamination. The wash-down area will be maintained to prevent possible contaminated water from draining into water bodies or storm drains. Vehicle cleaning is not anticipated during the

project.

#### **6.4 SPILL CONTAINMENT PROCEDURES**

Small incidental spills, i.e., those that cause no injury to personnel or the public, will be cleaned up quickly. For large spills, (those that contaminate personnel or the environment), attend to first aid measures first and stop the source of the spill, if possible. The Site Manager and/or Safety Officer will notify the Project Manager as quickly as possible, and the Project Manager will notify the appropriate people.

Spills of hazardous materials or wastes that are listed by EPA as having a reportable quantity value will be reported to appropriate federal, state, and local agencies if a reportable quantity or greater is released. It is the property owner's responsibility to contact appropriate federal, state, and local agencies (see Section 8, Emergency Response Plan & Procedures).

#### **6.5 WASTE DISPOSAL PROCEDURES**

Used, disposable PPE will be placed in the trash receptacle. If clothing is contaminated by hazardous materials, the Safety Officer may direct separation of clothing into containers for special off-site disposal.

Potentially contaminated soil, water, materials, and equipment will be disposed of properly, as approved by DNREC or DNREC's designated HSCA-certified environmental consultant. Any excavated soil will either be moved to the designated contingency staging area for further testing or off-site disposal at an approved facility, or reused as backfill in the excavation, if suitable.

If groundwater is encountered and it is necessary to dewater, DNREC's designated HSCA-certified environmental consultant will work with the Contractor to calculate the discharge rate and volume and to develop a plan for the collection, pre-treatment, temporary storage, testing and disposal of the City water through a temporary discharge permit.

In the event that oily subsurface liquids are encountered, DNREC will be notified, and collection, temporary storage, testing and disposal arrangements will be made by DNREC's designated HSCA-certified environmental consultant. For detailed waste disposal procedures refer to the Contaminated Materials and Water Management Work Plan for the Christina River Bridge Approaches Project (BrightFields, revised December 2017).



## **SECTION 7**

### **KEY PERSONNEL AND RESPONSIBILITIES**

The personnel described below are each responsible for oversight of any intrusive work that is performed for the Christina River Bridge Approaches Project. Their duties and responsibilities are described as follows:

#### **7.1 ENVIRONMENTAL PROJECT MANAGER**

The responsibilities of the Environmental Project Manager include:

- Reviewing the plans for each intrusive project as they come up, to evaluate the potential for exposure to contaminated soil and/or groundwater. Based on this evaluation, the Project Manager will recommend whether the intrusive work can be completed by standard laborers, or whether an OSHA-trained contractor is needed. The Project Manager will also determine whether on-site health & safety monitoring is necessary for the task.
- Developing a plan for the management and disposal of contaminated soil and/or other materials generated during the project.
- Making certain adequate notification of subsurface work and soil disposal management is provided to pertinent agencies and personnel prior to intrusive activities.
- Communicating safety and health issues, and emergency information with the construction management supervisor, DelDOT.
- Providing overall supervisory control for safety and health and contaminated materials management procedures in effect for the project.
- Assigning an on-site Safety Officer, if necessary, and assuring that the Safety Officer will enforce the Safety Plan.
- Making sure that adequate safety resources, including personnel and equipment, are available to support the project.

#### **7.2 SAFETY OFFICER**

The Safety Officer will be on site during intrusive subsurface activities and will be responsible for daily compliance with site safety and health requirements.

The Safety Officer is required to have, as a minimum, the 40-hour OSHA HAZWOPER training. The duties of the Safety Officer include:

- With the assistance of the Project Manager, providing an initial safety and health briefing to site workers, project personnel and/or others as appropriate.
- Conducting daily inspections of the site.
- Conducting necessary air monitoring during subsurface work.
- Stopping work when imminent safety or health risks exist, or as outlined in this Safety Plan.
- Investigating and preparing incident reports as necessary.
- During an emergency, the Safety Officer will be responsible for determining if previously existing hazardous conditions have improved sufficiently to allow resumption of work operations.

### **7.3 SITE MANAGER**

Site Managers from the construction company will be responsible for completion of their task(s). The name of each Site Manager will be provided to the team as assigned. The Site Manager's responsibilities include:

- Reviewing health and safety documentation to ensure compliance with this Safety Plan.
- Working with Safety Officer to identify, evaluate, and control workplace hazards.
- During an emergency, the Site Manager will be responsible for taking measures to reduce injury and illness, primarily by evacuating personnel as quickly as possible. She will also communicate with off-site emergency responders, and coordinate activities of on-site and off-site emergency responders.

### **7.4 FIELD PERSONNEL (VARIOUS)**

The following personnel are authorized to perform Level D intrusive activities on this project:

- Workers with a minimum OSHA 24-hour Hazardous Waste Operations (HAZWOPER) training with current 8-hour update, only if they receive an initial safety briefing, they are monitored by the Safety Officer, and wear the required PPE. Workers must show proof of the required training and certifications.

The following personnel are authorized to perform Level C and B intrusive activities on this project:

- Workers with OSHA 40-hour HAZWOPER training and respirator training, and who are medically monitored and certified to wear a respirator. Workers must show proof of the

required training and certifications.

Responsibilities of the field personnel include:

- Reading and signing this Safety Plan.
- Following the Safety Plan and applicable safety and health rules, regulations, and procedures to ensure a safe work environment.
- Reviewing the location of evacuation areas, exit routes, and directions to the nearest hospital.
- Determining the location of the nearest operating telephone for emergency use.
- Using required controls and safety devices, including personal protective equipment, if necessary.
- Notifying his/her supervisor and the onsite Safety Officer of suspected safety or health hazards.
- Notifying his/her supervisor and the onsite Safety Officer of injuries or exposures.

## SECTION 8 EMERGENCY RESPONSE PLAN & PROCEDURES

Prior to work start-up, personnel will familiarize themselves with this Safety Plan. The Site Manager will make this plan available for inspection and copying by subcontractors.

- Review the location of evacuation areas, exit routes, and directions to the nearest hospital.
- Determine the location of the nearest operating telephone for emergency use.

### 8.1 EMERGENCY TELEPHONE NUMBERS

In the event of an emergency, the information available at that time will be evaluated and appropriate steps will be taken to implement the emergency response plan. The Site Manager will assume command of the situation until arrival of off-site emergency response personnel. He/She will call the appropriate emergency services, evacuate personnel to the pre-designated evacuation location as needed, and take any other steps necessary to gain control over the emergency.

The following list of emergency telephone numbers and procedures for reporting an emergency are shown below and in **Attachments G and H**. Emergency phone numbers will be posted and/or placed in the glove compartment of all field vehicles:

### **Dial 911 for Police, Fire and Ambulance**

**Site Location Map and route to hospital is shown in Attachment G:**

Wilmington Hospital  
 (302) 733-1000  
 14<sup>th</sup> and Washington Streets  
 Wilmington, DE 19801

<b>BrightFields, Inc., Environmental Consultant</b>		(302) 656-9600 or (800) 846-5248
<b>Environmental Project Manager (BrightFields):</b>	<b>Amanda Finnerty</b>	cell phone (302) 420-6125
<b>Safety Officer (BrightFields):</b>	<b>Nick Piane</b>	cell phone (302) 420-1711
<b>DNREC Project Officer</b>	<b>Robert Asreen</b>	(302) 395-2600
<b>Poison Control Center:</b>		(800) 722-7112
<b>National Response Center:</b>		(800) 424-8802
<b>DNREC Emergency Response</b>		(800) 662-8802

For contact list of additional stakeholders please see Attachment H.

## **Give the following information when reporting an emergency:**

1. Name and location of person reporting
2. Location of accident/incident (will vary depending on location of work)
3. Name and affiliation of injured party
4. Description of injuries, fire, spill, or explosion
5. Status of medical aid and/or other emergency control efforts
6. Details of chemicals involved
7. Summary of accident, including suspected cause and time it occurred
8. Temporary control measures taken to minimize further risk.

## **Do not hang up until the dispatcher tells you to!**

This information is not to be released under any circumstances to parties other than those listed in this section and emergency response team members. Once emergency response agencies have been notified, the Project Manager and Safety Officer will be notified immediately, if they are not already present.

### **8.2 MEDICAL EMERGENCIES**

Personnel will always be alert for signs and symptoms of illnesses related to chemical, physical, and disease factors onsite. Severe injuries resulting from accidents will be recognized as medical emergencies and treated as such.

In a medical emergency, the Site Manager will stop work, and personnel will move to the pre-designated evacuation location away from the work area. Victims who are heavily contaminated with toxic or dangerous materials will be decontaminated before being transported from the site.

Personnel trained in first aid will evaluate the nature of the injury, determine if the victim can be moved safely, and initiate first aid assistance immediately. The local Emergency Medical Services (DIAL 911) will be notified immediately, if needed. A fellow worker will accompany any injured workers to the hospital to inform the admitting clerk that the injury is work-related and to assist in completing the insurance forms.

No persons will re-enter the work area until the cause of the injury has been determined, and the work area is determined to be safe.

### **8.3 FIRE/EXPLOSION EMERGENCIES**

A fire or explosion will be immediately recognized as an emergency. The Site Manager will announce the emergency, evacuate personnel to the pre-designated evacuation location, and notify the local emergency services.

Decontamination will take place after all personnel have been safely evacuated to the pre-designated evacuation location.

Personnel trained in fire suppression, spill control, and other emergency response procedures will attempt to deal with these situations. Other than small fires or spills, site workers will defer to local emergency response services to handle the emergency.

Cleanup after such fire/explosion events may require specialized services. Work will not resume until the site manager declares the incident closed and the work area is safe.

## **SECTION 9 REFERENCES**

AccuQual Laboratories, Inc., 1995, Underground Storage Tank Abandonment Notification Form/Test Request/Chain of Custody Form/Multi-Sample Analytical Report for the Former Jablow Property at 707 South Market Street, March 1995.

Advanced Geological Services, 2007, Geophysical Investigation Results for the Former Jablow Property, July 2007.

AECOM, 2015, Long-Term Stewardship Plan, Wilmington Coal Gas Site – Southern Parcel (DE-0114), January 2015.

AECOM, 2014, Site Closure Report and Remedial Activity Summary (Final), Wilmington Coal Gas Site – Southern Parcel, January 2014.

AECOM, 2010, Focused Feasibility Study Report, Wilmington Coal Gas Site – Southern Parcel (DE-0114), April 2010.

BrightFields, Inc. (BrightFields) 2017, Contaminated Material and Water Management Work Plan For Construction Activities Associated with Christina River Bridge Approaches Project (DE-0334), Revised December 2017.

BrightFields, 2017, PCB Delineation Report, Dravo Shipyard-Harbor Associates (DE-1096), November 2017.

BrightFields, 2017, Supplemental Brownfield Investigation Report, Jablow Property (DE-1329), March 2017.

BrightFields, 2016, Subsurface Investigation Report #2- Additional Borings, April 2016.

BrightFields, 2015, Hessler Property Site Focused Feasibility Study (DE-1203), September 2015.

BrightFields, 2015, Hessler Property Site Supplemental Investigation (DE-1169/1203), June 2015.

BrightFields, 2015, Hessler Property Site Brownfield Investigation (DE-1169/1203), June 2015.

BrightFields to DNREC-SIRS, 2013, Construction Completion Report – Parcel 11 – Delmarva Parking Lot, October 2013.

BrightFields, 2012, Environmental Operations and Maintenance Plan, Dravo Shipyard, October 2012.

BrightFields, 2012, Subsurface Investigation Report, Christina River Bridge, October 2012.

BrightFields, 2011, Brownfield Investigation Report, 733 South Market Street Site, July 2011.

BrightFields, 2009, Health and Safety Plan for Construction Activities Associated with Market Street Safety Improvements Project, December 2009.

BrightFields, 2009, Environmental Summary for Market Street Safety Improvements Project, December 2009.

BrightFields, 2009, Site Specific Assessment Report, April 2009.

BrightFields, 2008, Site Specific Assessment Work Plan Christina River Bridge Focus Area, July 2008.

BrightFields, 2008, Health and Safety Plan for Site Specific Investigation Activities Associated with the Christina River Bridge Focus Area, July 2008.

BrightFields, 2005, Brownfield Investigation Report on B&M Auto, March 2005.

Delaware Department of Natural Resources and Environmental Control (DNREC) to Riverfront Development Corporation, 2010, Brownfield Certification and Funding Eligibility for the M&N Property, DE-1496, October 2010.

DNREC, 2007, Memorandum of Agreement, Department of Natural Resources and Environmental Control, Between: Division of Air and Waste Management and Division of Water Resources, For: City of Wilmington, as Modified July 2007.

DNREC, 2006, NFA Dravo Shipyard (DE-1096), May 2006.

DNREC, 2005, Delaware Hazardous Substance Cleanup Act, 7 Del. C. Part IX Chapter 91, Subchapter II Brownfields Development Program, September 2005.

DNREC, 2005, Delaware Interim Regulations Governing Subchapter II of the Hazardous Substance Cleanup Act, January 2005.

DNREC, 2004, State of Delaware Surface Water Quality Standards, Amended July 11, 2004.

DNREC, 2004, Final Plan of Remedial Action, March 2004.

DNREC, 2004, Proposed Plan of Remedial Action, January 2004.

DNREC, 2003, Remedial Investigation Report Comments, July 2003.

DNREC, 2002, Delaware Regulations Governing Hazardous Substance Cleanup, September 1996, Amended February, 2002.

DNREC, 2001, Hessler Property, Brownfield Preliminary Assessment II, April 2001.

DNREC, 1999, Remediation Standards Guidance Under the Delaware Hazardous Substance Cleanup Act., December 1999.

DNREC, 1998, Letter to Gene Associates, Inc., December 1998.



DNREC, 1998, Letter to First State Enterprises, October 1998.

DNREC, 1998, Letter to First State Enterprises, September 1998.

DNREC-SIRB, 2010, Amended Final Plan of Remedial Action, Wilmington Coal Gas Site – Southern Section, December 2010.

DNREC-SIRB, 2009, Final Plan of Remedial Action, Howard Street Property, January 2009.

DNREC-SIRB, 2007, NAPL Delineation, Summary of Findings Report, Stadium Site (DE-1004), March 2007.

DNREC-SIRB, 2005, Final Plan of Remedial Action, International Petroleum Corporation of Delaware (U.S. Filter Corporation), May 2005.

DNREC-SIRB, 2002, Final Plan of Remedial Action, 524 A & B South Walnut Street, July 2002.

DNREC-SIRB, 2002, Letter to Pettinaro Construction Company, May 2002.

DNREC-SIRB, 2001, Final Plan of Remedial Action, Dravo Shipyard (OU II), February 2001.

DNREC-SIRB, 1998, Brownfield Preliminary Assessment II - Dravo Shipyard - Harbor Associates, June 1998.

DNREC-SIRB, 1998, Voluntary Cleanup Program Agreement for Facility Evaluation Remedial Investigation Feasibility, June 1998.

DNREC-SIRB, 1997, Preliminary Report of Field Investigation Activities - Dravo Shipyard (Amer Industrial Technologies, Inc.) Brownfield Preliminary Assessment II, August 1997.

DNREC-SIRB, 1997, Supplemental Report of Field Investigation Activities - Dravo Shipyard (Amer Industrial Technologies, Inc.) Brownfield Preliminary Assessment II, September 1997.

DNREC-SIRB, 1996, Wilmington Coal Gas – South Section, Proposed Plan of Remedial Action, September 1996.

DNREC-SIRB, 1996, South Wilmington Environmental Assessment Quadrants 3 & 4, April 1996.

DNREC-SIRB, 1996, Environmental Assessment of South Wilmington (East) Quadrants 1 & 2, April 1996.

DNREC-Site Investigation and Restoration Section (SIRS), 2017, Final Plan of Remedial Action for the Shuster Auto Salvage Site (DE-1178), June 2017.

DNREC-SIRS to AECOM, 2016, COCR for the Wilmington Coal Gas – Southern Parcel, May 2016.

DNREC-SIRS, 2016, Memorandum Re: Administratively Closed Site – Stadium Site, DE-1004, February 2016.

DNREC-SIRS, 2016, Final Plan of Remedial Action, Christina River Bridge and Approaches Site (DE-0334), October 2016.

DNREC-SIRS, 2012, Final Plan of Remedial Action, Riverfront Hotel Site (DE-1518), September 2012.

DNREC-SIRS, 2012, Final Plan of Remedial Action, 733 South Market Street Site, May 2012.

DNREC-SIRS to Environmental Alliance, 2011, COCR for the M&N Property Site (DE-1496), December 2011.

DNREC-SIRS, 2011, Final Plan of Remedial Action, M&N Property Site, August 2011.

DNREC TMB, 2008, No Further Action - Tank Removal for Former Jablow Property at 707 South Market Street, January 2008.

DNREC UST Branch, 1998, No Further Action for Tire Sales and Service, 733 S. Market Street, December 1998.

DNREC UST Branch, 1996, William W. Breslin, Approval for Hydrogeologic Work Plan, August 1996.

DNREC UST Branch, 1996, William Breslin at DNREC, Approval For Emergency Recovery, Requiring New Work Plan of Free Product, July 1996.

DNREC UST Branch 1996, (William W. Breslin), Limited Hydrogeologic Investigation Letter for Tire Sales and Service on 733 South Market Street, January 1996.

DNREC UST Branch, 1995, Limited Hydrogeologic Investigation Letter for the Former Jablow Property at 707 South Market Street, June 1995.

DNREC UST Branch, 1995, Tank Removal Report for the Former Jablow Property at 707 South Market Street, February 1995.

DNREC UST Branch, 1994, Regulations Governing Underground Storage Tank Systems for the Former Jablow Property at 707 South Market Street, June 1994.

Dragun, J. and Chekiri, K, 2005, Elements in North American Soils 2nd Edition, Amherst Scientific Publishers, Amherst, MA.

Duffield Associates, 2005, Modified Phase I Environmental Site Assessment with Limited Sampling, 310 South Market Street, January 2005.

Duffield Associates, 2003, Copy of Laboratory data sheet reporting iron and manganese in additional to AS on Sample SB-5 - TW-2B, June 2003.

Duffield Associates, 2003, Remedial Investigation Report Supplemental (Attachments of Revised Table 2 and Lab Data), June 2003.

Duffield Associates, Inc. to DNREC, 1998, Letter to state "No Further Action" is required at the Tire Sales and Service on South Market Street, November 1998.

Duffield Associates from DNREC, 1998, Product Collection System Status Report - Period 1/23/98 to 5/17/98, June 1998.

Duffield Associates to DNREC, 1998, Product Collection System Status Report - Period from 10/1/97 to 1/22/98, March 1998.

Duffield Associates, 1997, Subsurface Evaluation, Wilmington Stadium, November 1997.

Duffield Associates, 1997, Product Collection System Progress Report - Period 4/30/97 to 9/30/97, October 1997.

Duffield Associates to DNREC, 1997, Product Collection System Summary Report (Collection Sump Location Sketch), May 1997.

Duffield Associates to DNREC, 1996, Proposed Scope of Supplemental Exploration, November 1996.

Duffield Associates to DNREC, 1996 Proposed Product Collection System, October 1996.

Duffield Associates to DNREC, 1996, Letter to DNREC RE: 733 South Market Street, August 1996.

Duffield Associates, 1993, Preliminary Environmental Site Assessment, Portions of South Madison/Beech Streets, April 1993.

Duffield Associates, 1992, Proposed Wilmington Multipurpose Sports Stadium Property of Harbor Associates, Inc., September 1992.

EA Engineering, Science, and Technology, 2000, OU IV Analytical Sediment Summary Report, April 2000.

EA Engineering, Science, and Technology, Inc., 2000, Letter regarding Soil from Phase III and IV to Operable Unit II Shipyard Shops, April 2000.

EA Engineering, Science, and Technology, Inc., 2000, Closeout Report Bioretention Swale Area, Dravo Shipyard (OU II) RDC/AMER Property, March 2000.

EA Engineering, Science, and Technology, Inc., 1999, OU II Remedial Investigation/Feasibility Study Dravo Shipyard - Harbor Associates and Former Amer (RDC) Properties, August 1999.

EA Engineering, Science, and Technology, Inc., 1999, Letter with comments on OU II Remedial Investigation/Feasibility Study, May 1999.

EA Engineering, Science, and Technology, Inc., 1998, Interim Action Summary Report and Remedial Investigation/Feasibility Study Harbor Associates and Portion of the Amer Properties, August 1998.

Earth Tech, 1994, Facility Evaluation, Former Wilmington Coal Gas Site, August 1994.

Eastern States Leasing, LLC letter to DNREC, 1998, Removal of the sumps, backfill with DelDOT Type C borrow material and restore this lawn area, December 1998.

Environmental Alliance, 2015, Remedial Investigation Report, American Tank Trailer Cleaning Company (DE-1180), December 2016.

Environmental Alliance to DNREC-SIRS, 2012, Submittal of Remedial Investigation Work Plan, May 2012.

Environmental Alliance, 2011, Brownfield Investigation Report, M&N Property, February 2011.

Environmental Alliance, 2009, Remedial Investigation Report, August 2009.

Environmental Alliance, 2001, Remedial Investigation Report South Wilmington Salvage Yards, June 2001.

ERM to DNREC-SIRS, 2017, Draft Supplemental Plan of Remedial Action for the International Petroleum Corporation Site (DE-1278), June 2017.

ERM, 2003, Remedial Investigation Report on International Petroleum Corporation, November 2003.

J & M Industries, Inc., 1996, Proposal letter to First State Enterprises - Heating Fuel Pit, July 1996.

J & M Industries, Inc., 1996, Fax to DNREC, July 1996.

J & M Industries, Inc., 1996, Fax to DNREC, June 1996.

J & M Industries, Inc., 1996, Fax to DNREC, January 1996.

J & M Industries, Inc., 1995, Proposal to Supply Equipment, Supervision and Labor for Oil Sampling, November 1995.

J & M Industries, Inc., 1995, Fax to DNREC, March 1995.

Kleinfelder, 2006, DERBCAP Tier 1 Assessment Report, August 2006.

LandmarkJCM, 2012, Jablow Property – 707 South Market Street (DE-1329), Brownfields Investigation Report, January 2012.

Meridian Science & Technology, Inc., 1996, Executive Summary Report - USEPA Region III Organic & Inorganic Data Validation Reports, April 1999.

OSHA Standard 29 CFR 1910.95, Occupational Noise Exposure

OSHA Standard 29 CFR 1910.331-335, Electrical Safety-Related Work Practices

OSHA Standard 29 CFR 1926.21, Safety Training and Education

OSHA Standard 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response

OSHA Standard 29 CFR 1926.650-652, Construction Standard for Excavations

OSHA Technical Manual TED 01-00-015, Section III: Health Hazards, Chapter 4 Heat Stress, Table III: 4-2. Permissible Heat Exposure Threshold Limit Value

Pennoni Associates, Inc., 2002, Letter regarding Closeout Report and attached waste manifests, December 2002.

Pettit, Ted and Herb Linn, 1987, A Guide to Safety in Confined Spaces, NIOSH Publication No 87-113, July 1987.

Schranze & Associates, PC, 1993, Phase II Environmental Assessment for the Harbor Associates, Inc. Property, January 1993.

Schranze & Associates, PC, 1992, Phase I Environmental Assessment of the Harbor Associates Property, January 1992.

Sundstrom, R.W. and Pickett, T.E., 1971, The Availability Of Ground Water In New Castle County, Delaware, Water Resources Center, University of Delaware.

Tetra Tech, Inc., 2007, Sampling Results for the Former Jablow Property at 707 South Market Street, November 2007.

Tetra Tech, Inc., 2007, Report of Interim Cleanup Action at the Former Jablow Property at 707 South Market Street, January 2007.

Tetra Tech, Inc., 2006, Proposed Interim Action Work Plan for Former Jablow Property, 707 South Market Street, August 2006.

Tetra Tech, Inc., 2004, Phase II Environmental Site Assessment for the Jablow Property, 707 South Market Street, November 2004.

Tetra Tech, Inc., 2004, Phase II ESA Appendix E Laboratory Analytical Data Asbestos, Groundwater and Soil for the Jablow Property at 707 South Market Street, November 2004.

Tetra Tech, Inc., 2004, Environmental Site Assessment for the Jablow Property - 707 South Market Street, August 2004.

Tire Sales & Service at 733 South Market Street, 1994, Reply Letter to Regulations Governing

Underground Storage Tank Systems for the Former Jablow Property at 707 South Market Street, July 1994.

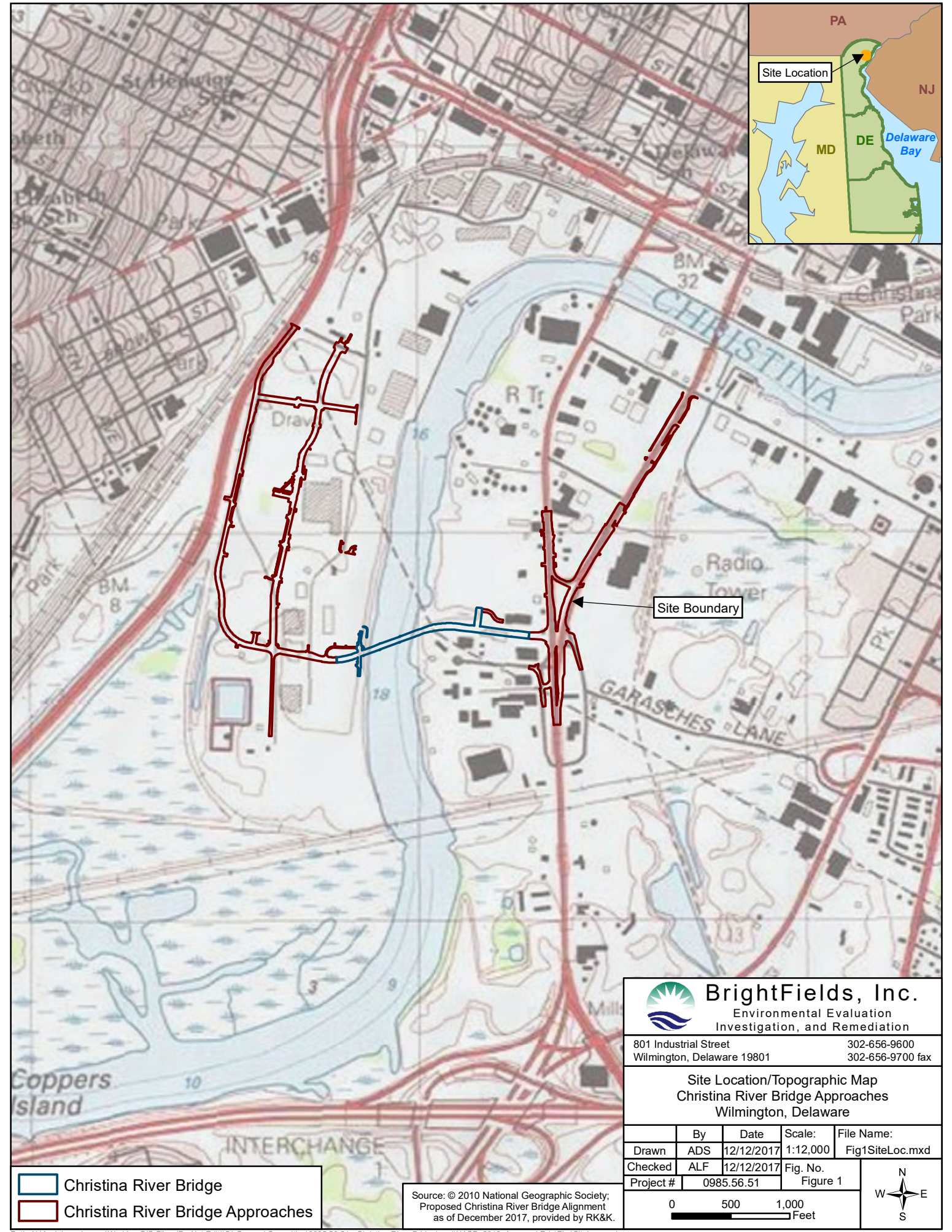
United States Department of Labor, Occupational Safety and Health Administration, Working over

or near water, 1926.106; [https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_id=10669&p\\_table=STANDARDS](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=10669&p_table=STANDARDS)

Weston Solutions, Inc., 2012, Brownfield Remedial Investigation Report, Westin Hotel Property, August 2012.

Weston Solutions, Inc., 2012, Brownfield Remedial Investigation Work Plan for the Westin Hotel Site, June 2012.

# FIGURES



Site Boundary

**BrightFields, Inc.**  
 Environmental Evaluation  
 Investigation, and Remediation

801 Industrial Street  
 Wilmington, Delaware 19801

302-656-9600  
 302-656-9700 fax

Site Location/Topographic Map  
 Christina River Bridge Approaches  
 Wilmington, Delaware

	By	Date	Scale:	File Name:
Drawn	ADS	12/12/2017	1:12,000	Fig1SiteLoc.mxd
Checked	ALF	12/12/2017	Fig. No.	
Project #	0985.56.51		Figure 1	

0 500 1,000 Feet


- Christina River Bridge
- Christina River Bridge Approaches

Source: © 2010 National Geographic Society;  
 Proposed Christina River Bridge Alignment  
 as of December 2017, provided by RK&K.





- Tax Parcels (RK&K Design File)
- Christina River Bridge
- Christina River Bridge Approaches
- Limit of Construction




**BrightFields, Inc.**  
 Environmental Evaluation  
 Investigation, and Remediation

801 Industrial Street      302-656-9600  
 Wilmington, Delaware 19801      302-656-9700 fax

**Project Location Map**  
 Christina River Bridge Approaches  
 Wilmington, Delaware

By	Date	Scale:	File Name:
Drawn	ADS	12/20/2017	1:4,800
Checked	ALF	12/20/2017	Fig. No.
Project #	0985.56.51	Figure 2	

0      200      400  
 Feet



Source: DEMAC - Aerial 2013;  
 Delaware DataMIL - Tax Parcels;  
 Proposed Christina River Bridge Alignment  
 as of December 2017, provided by RK&K.

**Groundwater Notes:**

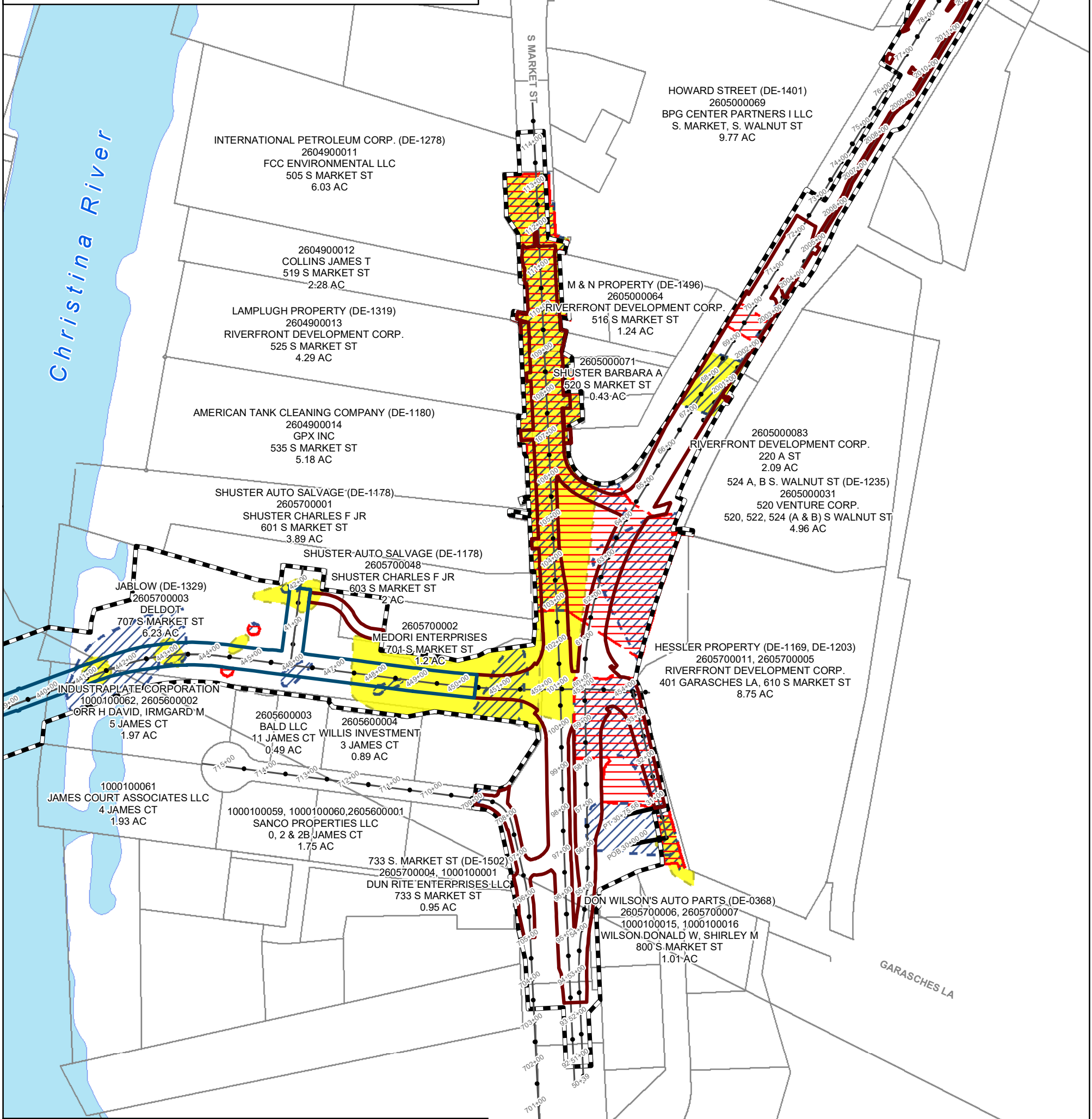
1. MTBE was present in groundwater across 707 Market Street (Jablow Property). The extent of impact is unknown.
2. Metals, VOCs, SVOCs, and TPH were present in the groundwater on the 601 S Market Street (Shusters Auto Salvage) Property. The extent of impacts are unknown.
3. VOCs, SVOCs, and petroleum hydrocarbons were found on the 505 S Market Street Site (International Petroleum Corp). The extent of impacts are unknown.
4. PCBs were identified in the groundwater on the 301 S Market Street Site (Howard Street).
5. Arsenic is present in groundwater across the entire construction area east of the Christina River.
6. Hessler Groundwater - Metals, SVOCs and VOCs (TCE & Vinyl Chloride) were present in the groundwater on the 401 Garasches Lane property.

**Soil Notes:**

1. Potential areas of concern in soil are only shown on properties within limit of construction.
2. PAHs are contaminants of concern throughout the project area.

**Sources:**

1. Proposed Christina River Bridge Alignment as of December 2017, provided by RK&K.
2. Proposed Limit of Construction as of December 2017, provided by RK&K
3. Delaware DataMIL - Tax Parcels.



**Legend**

- Alignment Stations
- Horizontal Alignment
- Tax Parcels (RK&K Design File)
- ▭ Christina River Bridge
- ▭ Christina River Bridge Approaches
- ▭ Limit of Construction
- ▭ Approximate Extent of Arsenic Contamination in Soil (>30 mg/kg)
- ▭ Approximate Extent of Lead Contamination in Soil (>1,000 mg/kg)
- ▭ Approximate Extent of Petroleum and/or VOC Contamination in Soil
- ▭ Surface Water

**BrightFields, Inc.**  
 Environmental Evaluation  
 Investigation, and Remediation

801 Industrial Street  
 Wilmington, Delaware 19801

302-656-9600  
 302-656-9700 fax

**Areas of Concern - East  
 Christina River Bridge Approaches  
 Wilmington, Delaware**

By	Date	Scale:	File Name:
Drawn ADS	12/20/2017	1:3,000	Fig3aEast.mxd
Checked ALF	12/20/2017	Fig. No.	Figure 3a
Project #	0985.56.51		

Source: Delaware DataMIL - Tax Parcels;  
 Proposed Christina River Bridge Alignment  
 as of December 2017, provided by RK&K.

0 125 250 Feet

**Groundwater Notes:**

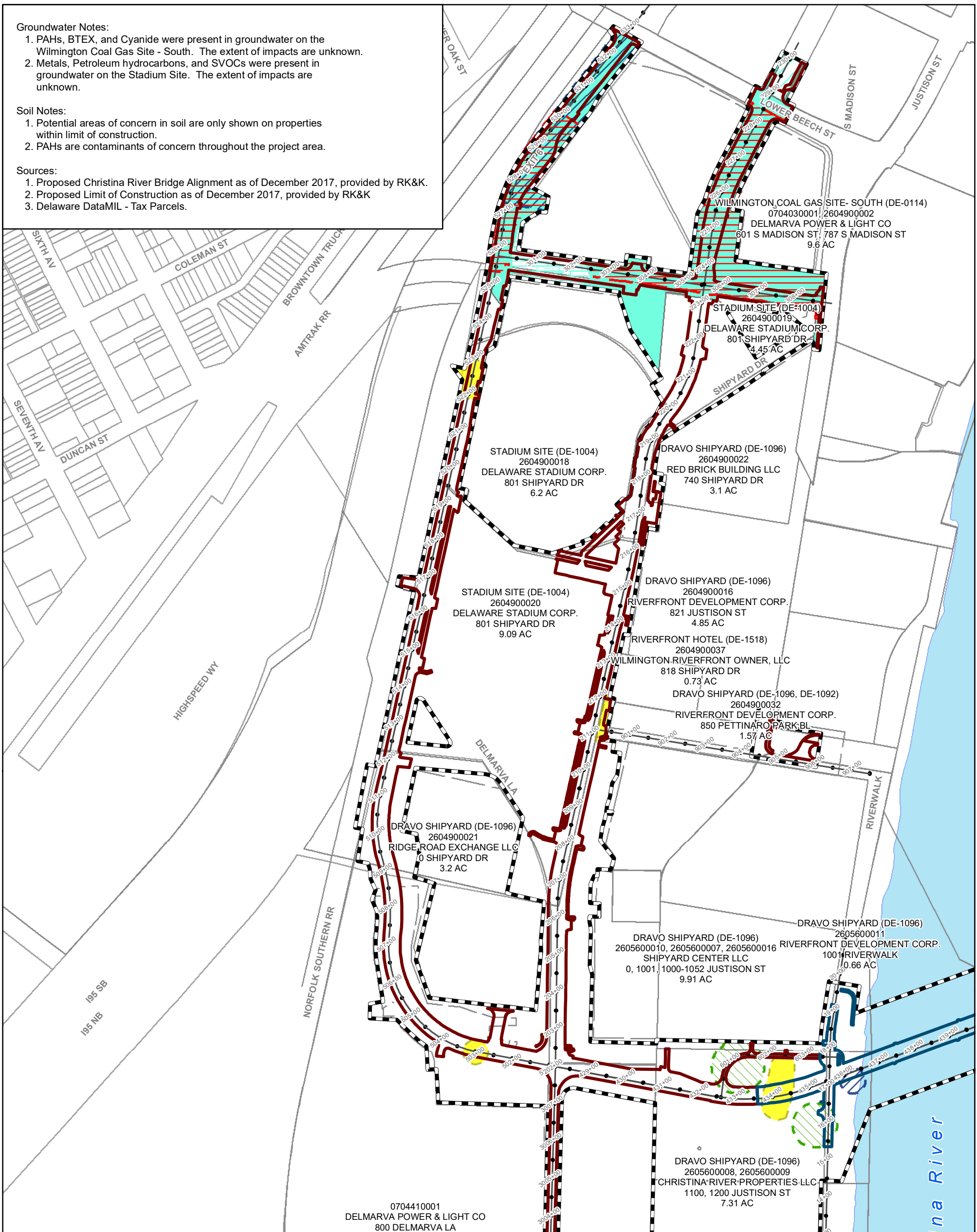
1. PAHs, BTEX, and Cyanide were present in groundwater on the Wilmington Coal Gas Site - South. The extent of impacts are unknown.
2. Metals, Petroleum hydrocarbons, and SVOCs were present in groundwater on the Stadium Site. The extent of impacts are unknown.

**Soil Notes:**

1. Potential areas of concern in soil are only shown on properties within limit of construction.
2. PAHs are contaminants of concern throughout the project area.

**Sources:**

1. Proposed Christina River Bridge Alignment as of December 2017, provided by RK&K.
2. Proposed Limit of Construction as of December 2017, provided by RK&K
3. Delaware DataMIL - Tax Parcels.



**Legend**

- Alignment Stations
- Horizontal Alignment
- Tax Parcels (RK&K Design File)
- Christina River Bridge
- Christina River Bridge Approaches
- Limit of Construction
- ISS Treated Areas
- Approximate Extent of Arsenic Contamination in Soil (>30 mg/kg)
- Approximate Extent of Lead Contamination in Soil (>1,000 mg/kg)
- Approximate Extent of PCB Contamination in Soil (> 1 mg/kg)
- MGP Impacted Areas
- MGP Excavation Areas
- Approximate Extent of Petroleum and/or VOC Contamination in Soil
- Surface Water

**BrightFields, Inc.**  
 Environmental Evaluation  
 Investigation, and Remediation

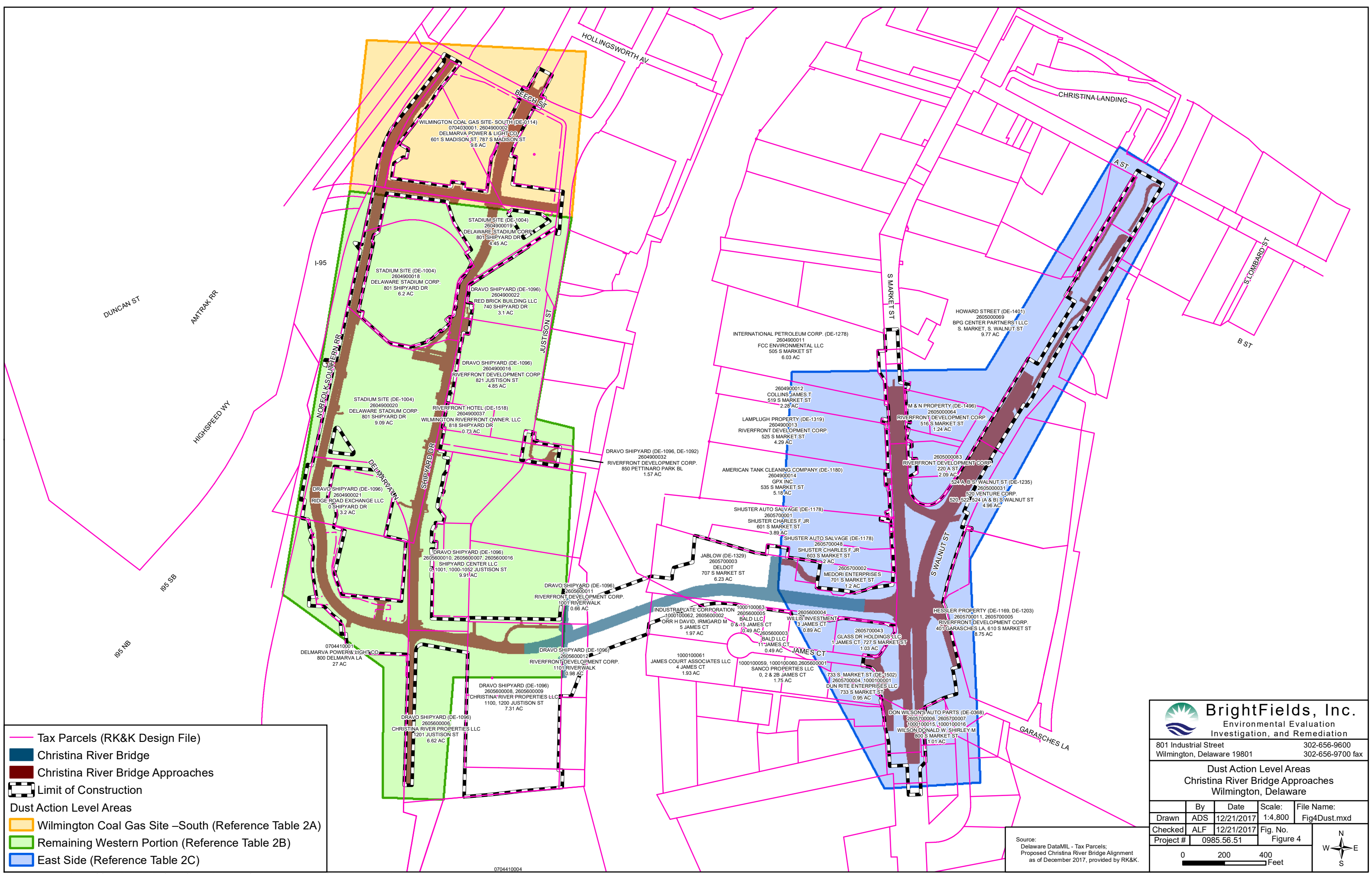
801 Industrial Street  
 Wilmington, Delaware 19801  
 302-656-9600  
 302-656-9700 fax

**Areas of Concern - West**  
 Christina River Bridge Approaches  
 Wilmington, Delaware

Drawn	ADS	12/20/2017	Scale:	File Name:
Checked	ALF	12/20/2017	1:3,000	Fig3bWest.mxd
Project #	0985.56.51	Figure No.	Figure 3b	

Source: Delaware DataMIL - Tax Parcels;  
 Proposed Christina River Bridge Alignment  
 as of December 2017, provided by RK&K.

0 125 250 Feet



— Tax Parcels (RK&K Design File)  
 Christina River Bridge  
 Christina River Bridge Approaches  
 Limit of Construction  
**Dust Action Level Areas**  
 Wilmington Coal Gas Site –South (Reference Table 2A)  
 Remaining Western Portion (Reference Table 2B)  
 East Side (Reference Table 2C)

**BrightFields, Inc.**  
 Environmental Evaluation  
 Investigation, and Remediation

801 Industrial Street  
 Wilmington, Delaware 19801

302-656-9600  
 302-656-9700 fax

**Dust Action Level Areas**  
**Christina River Bridge Approaches**  
**Wilmington, Delaware**

	By	Date	Scale:	File Name:
Drawn	ADS	12/21/2017	1:4,800	Fig4Dust.mxd
Checked	ALF	12/21/2017	Fig. No.	
Project #	0985.56.51		Figure 4	

0      200      400  
 Feet

N  
W    E  
S

# **TABLES**

**Table 1 – Summary of Known and Possible Contaminants**


<b>Christina River Bridge Approaches Project Area</b>				
<b>Site</b>	<b>DNREC ID(s)</b>	<b>Known Soil Contaminants</b>	<b>Known Groundwater Contaminants</b>	<b>Other Possible Contaminants</b>
Wilmington Coal Gas Site – South	DE-0114	BTEX, cyanide, metals (arsenic, iron, lead, copper, & zinc), PAHs, TPH	BTEX, cyanide, metals (arsenic & lead), naphthalene, SVOCs (PAHs)	Coal tar NAPL; historic filling activities
Stadium Site	DE-1004	Metals (arsenic, cadmium, chromium, & lead), petroleum hydrocarbons, SVOCs (PAHs), TPH	Metals (arsenic, cadmium, chromium, & lead), petroleum hydrocarbons, SVOCs	Coal tar NAPL; petroleum product in subsurface soil; historic fill
Dravo Shipyard – Harbor Associates	DE-1096	Metals (arsenic, lead, & zinc), PCBs, SVOCs (benzo[a]pyrene & PAHs), TPH	Metals (aluminum, iron, & manganese)	Metals (arsenic, chromium, lead, & zinc), SVOCs (benzo[a]pyrene & PAHs), & VOCs in sediment; Metals (aluminum, iron, lead, & manganese) in surface water
Riverfront Hotel	DE-1518	Arsenic, benzo[a]pyrene	Metals (arsenic), VOCs	
Jablow	DE-1329	Metals, SVOCs, pesticides, PCBs	Metals, VOCs	BTEX (benzene) & TPH-GRO around a former UST but soil was excavated and removed; various debris throughout site, including possible asbestos containing material
733 S Market Street	DE-1502	Metals (arsenic & lead)	Metals (arsenic, iron, & manganese)	Free product; historic fill; BTEX, DRPH, & TPH detected around former UST locations
Hessler Property	DE-1169 and DE-1203	Metals (aluminum, arsenic, barium, calcium, chromium, chromium VI, cobalt, copper, lead, manganese, nickel, silver, & zinc), PCBs, SVOCs (PAHs)	Metals (arsenic, barium, chromium, iron, lead, manganese), SVOCs (PAHs), TCE, vinyl chloride	Fill; petroleum-like odor; asbestos containing materials found in TP06; isolated areas of hazardous lead
Shuster Auto Salvage	DE-1178	Bis(2-ethylhexyl)phthalate, metals (aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, vanadium, & zinc), SVOCs (PAHs), TPH, VOCs	Metals (arsenic, barium, iron, & manganese), SVOCs, VOCs, TPH	DRO detected; Metals (chromium, copper, mercury, nickel, & zinc), SVOCs (PAHs) in sediment

<b>Christina River Bridge Approaches Project Area</b>				
<b>Site</b>	<b>DNREC ID(s)</b>	<b>Known Soil Contaminants</b>	<b>Known Groundwater Contaminants</b>	<b>Other Possible Contaminants</b>
524 A & B S Walnut St	DE-1235	Metals (arsenic & lead), PCBs, SVOCs (benzo[a]pyrene, dibenz[a,h]anthracene, & PAHs)	Metals (arsenic, barium, iron, & manganese), PCBs, pesticides, SVOCs	Significant fill across the site
American Tank Cleaning Company	DE-1180	Metals (lead), PCBs, SVOCs (PAHs), TPH	Metals (iron & manganese)	Possible USTs
Lamplugh Property	DE-1319	Metals (arsenic, iron, & lead), PCBs, SVOCs (PAHs)	Arsenic, naphthalene	Metals, PCBs, & SVOCs (PAHs) in sediment
M&N Property	DE-1496	Metals (arsenic & lead) & SVOCs (PAHs) in subsurface; fairly clean surface soil	Metals (aluminum, antimony, arsenic, iron, & manganese)	
International Petroleum Corporation	DE-1278	Metals (notably arsenic, iron, lead, & mercury), PCBs, pesticides, SVOCs (benzo[a]pyrene), TPH-GRO, VOCs	Bis(2-ethylhexyl)phthalate, BTEX, metals (arsenic, iron, lead, & manganese), MTBE, 2-methyl naphthalene, naphthalene, SVOCs (PAHs)	BTEX & TPH-GRO detected around former USTs; possible free product; benzo[a]pyrene, metals (arsenic & lead), PAHs, & phenanthrene in sediment
Howard Street Property	DE-1401	Metals (arsenic & lead), PCBs, SVOCs (PAHs)	Metals (arsenic & lead), PCBs, SVOCs (PAHs)	Historic fill

**TABLE 2A**  
**Christina River Bridge Approaches**  
**Dust Action Levels - Wilmington Coal Gas Site - South**

Contaminant	Arsenic
Action Level (mg/m <sup>3</sup> )*	0.002
<b>Maximum Soil Concentration (mg/Kg)</b>	<b>4,700</b>
<b>Particulate Readings (mg/m<sup>3</sup>)</b>	<b>APPROXIMATE CONTAMINANT CONCENTRATION IN DUST (mg/m<sup>3</sup>)</b>
0.05	0.000235
0.075	0.0003525
0.1	0.00047
0.15	0.000705
0.2	0.00094
0.25	0.001175
0.5	0.00235
0.75	0.003525
0.8	0.00376
0.85	0.003995
0.9	0.00423
1	0.0047
1.5	0.00705
2	0.0094
2.5	0.01175
3	0.0141
3.5	0.01645
4	0.0188
4.5	0.02115
5.0	0.0235
7.5	0.03525
10	0.047
15	0.0705

\* Action Level shown is equal to OSHA PEL or NIOSH REL, whichever is lower

 Action Level Exceeded= 1/2 OSHA PEL or NIOSH REL, whichever is lower

 OSHA PEL or NIOSH REL Exceeded, whichever is lower

**5.0** - Nuisance Level Dust, Respirable

**15** - Total Nuisance Dust Level


The contaminant concentration shown is the contaminant that has the most conservative dust action level.




**TABLE 2B**  
**Christina River Bridge Approaches**  
**Dust Action Levels - Remaining Western Portion**

Contaminant	Arsenic
Action Level (mg/m <sup>3</sup> )*	0.002
<b>Maximum Soil Concentration (mg/Kg)</b>	<b>27</b>
<b>Particulate Readings (mg/m<sup>3</sup>)</b>	<b>APPROXIMATE CONTAMINANT CONCENTRATION IN DUST (mg/m<sup>3</sup>)</b>
0.05	0.00000135
0.075	0.000002025
0.1	0.0000027
0.15	0.00000405
0.2	0.0000054
0.25	0.00000675
0.5	0.0000135
0.75	0.00002025
0.8	0.0000216
0.85	0.00002295
0.9	0.0000243
1	0.000027
1.5	0.0000405
2	0.000054
2.5	0.0000675
3	0.000081
3.5	0.0000945
4	0.000108
4.5	0.0001215
<b>5.0</b>	<b>0.000135</b>
7.5	0.0002025
10	0.00027
15	0.000405

\* Action Level shown is equal to OSHA PEL or NIOSH REL, whichever is lower

 Action Level Exceeded= 1/2 OSHA PEL or NIOSH REL, whichever is lower

 OSHA PEL or NIOSH REL Exceeded, whichever is lower

**5.0** - Nuisance Level Dust, Respirable

**15** - Total Nuisance Dust Level

The contaminant concentration shown is the contaminant that has the most conservative dust action level.

**TABLE 2C  
Christina River Bridge Approaches  
Dust Action Level - East Side**

Contaminant	Lead
Action Level (mg/m <sup>3</sup> )*	0.05
<b>Maximum Soil Concentration (mg/Kg)</b>	<b>62,100</b>
<b>Particulate Readings (mg/m<sup>3</sup>)</b>	
0.05	0.003105
0.075	0.0046575
0.1	0.00621
0.15	0.009315
0.2	0.01242
0.25	0.015525
0.5	0.03105
0.75	0.046575
0.8	0.04968
0.85	0.052785
0.9	0.05589
1	0.0621
1.5	0.09315
2	0.1242
2.5	0.15525
3	0.1863
3.5	0.21735
4	0.2484
4.5	0.27945
5.0	0.3105
7.5	0.46575
10	0.621
15	0.9315

\* Action Level shown is equal to OSHA PEL or NIOSH REL, whichever is lower

Action Level Exceeded= 1/2 OSHA PEL or NIOSH REL, whichever lower

OSHA PEL or NIOSH REL Exceeded, whichever is lower

**5.0** - Nuisance Level Dust, Respirable

**15** - Total Nuisance Dust Level

The contaminant concentration shown is the contaminant that has the most conservative dust action level.

# ATTACHMENTS

# **ATTACHMENT A**

## **Safety Data Sheets**

# Asbestos

## Safety Data Sheet

### Section 1: Identification of the Substance/Mixture and of the Company/Undertaking

#### 1.1 Product identifier

- Product Name** • **Asbestos, Chrysotile**
- Synonyms** • Chrysotile Asbestos; Serpentine chrysotile; White asbestos
- Product Code** • 02107A-AB; 02701-AB; 02740A-AB; 02740-AB

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

- Relevant identified use(s)** • Laboratory standard in the microscopy laboratory

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

- Manufacturer** • SPI Supplies Division Structure Probe, Inc.  
206 Garfield Ave.  
West Chester, PA 19380  
United States  
<http://www.2spi.com>  
[SDS@2spi.com](mailto:SDS@2spi.com)
- Telephone (General)** • 1-(610)-436-5400

#### 1.4 Emergency telephone number

- Manufacturer** • 1-(800)-424-9300 - Chemtrec
- Manufacturer** • 1-(703)-741-5970 - Worldwide

### Section 2: Hazards Identification

#### EU/EEC

According to: Regulation (EC) No 1272/2008 (CLP)/REACH 1907/2006 [amended by 2015/830]

#### 2.1 Classification of the substance or mixture

- CLP** • Carcinogenicity 1A - H350  
Specific Target Organ Toxicity Repeated Exposure 1 - H372

#### 2.2 Label Elements

CLP

**DANGER**



- Hazard statements** • H350 - May cause cancer.  
H372 - Causes damage to organs through prolonged or repeated exposure.

#### Precautionary statements

- Prevention** • P201 - Obtain special instructions before use.  
P202 - Do not handle until all safety precautions have been read and understood.  
P260 - Do not breathe dust.  
P264 - Wash thoroughly after handling.

P270 - Do not eat, drink or smoke when using this product.

P281 - Use personal protective equipment as required.

**Response** • P308+P313 - IF exposed or concerned: Get medical advice/attention.  
P314 - Get medical advice/attention if you feel unwell.

**Storage/Disposal** • P405 - Store locked up.  
P501 - Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

## 2.3 Other Hazards

**CLP** • According to Regulation (EC) No. 1272/2008 (CLP) this material is considered hazardous.

## United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

### 2.1 Classification of the substance or mixture

**OSHA HCS 2012** • Carcinogenicity 1A  
Specific Target Organ Toxicity Repeated Exposure 1

### 2.2 Label elements

**OSHA HCS 2012**

#### DANGER



**Hazard statements** • May cause cancer.  
Causes damage to organs through prolonged or repeated exposure.

#### Precautionary statements

**Prevention** • Obtain special instructions before use.  
Do not handle until all safety precautions have been read and understood.  
Do not breathe dust.  
Wash thoroughly after handling.  
Do not eat, drink or smoke when using this product.  
Wear protective gloves/protective clothing/eye protection/face protection.

**Response** • IF exposed or concerned: Get medical advice/attention.  
Get medical advice/attention if you feel unwell.

**Storage/Disposal** • Store locked up.  
Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

### 2.3 Other hazards

**OSHA HCS 2012** • Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

## Section 3 - Composition/Information on Ingredients

### 3.1 Substances

Composition					
Chemical Name	Identifiers	%	LD50/LC50	Classifications According to Regulation/Directive	Comments
Asbestos, chrysotile	CAS:12001-29-5 EU Index:650-013-00-6	> 99.99%	NDA	EU CLP: Annex VI, Table 3.1: Carc. 1A, H350; STOT RE 1, H372 ** OSHA HCS 2012: Carc. 1A; STOT RE 1 (Lungs)	NDA

## 3.2 Mixtures

- Material does not meet the criteria of a mixture.

## Section 4 - First Aid Measures

### 4.1 Description of first aid measures

- |                   |   |
|-------------------|---|
| <b>Inhalation</b> | • Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. If signs/symptoms continue, get medical attention. |
| <b>Skin</b>       | • Wash skin with soap and water. Flush with copious amounts of water for 15 minutes.  |
| <b>Eye</b>        | • In case of contact with substance, immediately flush eyes with running water for at least 20 minutes. Get medical attention immediately.  |
| <b>Ingestion</b>  | • Obtain medical attention immediately if ingested.   |

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

- Refer to Section 11 - Toxicological Information.

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

- |                           |  |
|---------------------------|--|
| <b>Notes to Physician</b> | • All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred. |
|---------------------------|--|

## Section 5 - Firefighting Measures

### 5.1 Extinguishing media

- |                                     |                              |
|-------------------------------------|------------------------------|
| <b>Suitable Extinguishing Media</b> | • Water, Foam, Dry Chemical. |
|-------------------------------------|------------------------------|

- |                                       |                     |
|---------------------------------------|---------------------|
| <b>Unsuitable Extinguishing Media</b> | • No data available |
|---------------------------------------|---------------------|

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

- |   |   |
|---|---|
| <b>Unusual Fire and Explosion Hazards</b> | • Negligible fire and explosion hazard. Toxic gases and asbestos particulate may be released in a fire. |
| <b>Hazardous Combustion Products</b>      | • No data available   |

### 5.3 Advice for firefighters

- Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

## Section 6 - Accidental Release Measures

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

- |                             |   |
|-----------------------------|---|
| <b>Personal Precautions</b> | • Ventilate enclosed areas. Do not walk through spilled material. Wear appropriate personal protective equipment, avoid direct contact.                   |
| <b>Emergency Procedures</b> | • As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. Keep unauthorized personnel away. |

### 6.2 Environmental precautions

- Avoid run off to waterways and sewers.

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

- |                             |                          |
|-----------------------------|--------------------------|
| <b>Containment/Clean-up</b> | • Avoid generating dust. |
|-----------------------------|--------------------------|



**Measures**

Use HEPA vacuum wet methods when feasible.  
Carefully shovel or sweep up spilled material and place in suitable container.

**6.4 Reference to other sections**

- Refer to Section 8 - Exposure Controls/Personal Protection and Section 13 - Disposal Considerations.

**Section 7 - Handling and Storage****7.1 Precautions for safe handling****Handling**

- Use only with adequate ventilation. Minimize dust generation and accumulation. Wear appropriate personal protective equipment, avoid direct contact. Do not breathe dust. Avoid contact with skin, eyes, and clothing. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

**7.2 Conditions for safe storage, including any incompatibilities****Storage**

- Store in well-sealed container in cool, dry area in accordance with all current regulations and standards.

**7.3 Specific end use(s)**

- This item is not being offered for clinical or diagnostic applications, agricultural uses or for human or animal consumption. Refer to Section 1.2 - Relevant identified uses.

**Section 8 - Exposure Controls/Personal Protection****8.1 Control parameters**

Exposure Limits/Guidelines		
	Result	OSHA
Asbestos, chrysotile (12001-29-5)	TWAs	0.1 fiber/cm <sup>3</sup> TWA

**8.2 Exposure controls****Engineering Measures/Controls**

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Ensure that dust handling systems (such as exhaust ducts, dust collectors, vessels and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is not leakage from the equipment).

**Personal Protective Equipment****Respiratory**

- For limited exposure use an N95 dust mask. For prolonged exposure use an air-purifying respirator with high efficiency particulate air (HEPA) filters. Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.

**Eye/Face**

- Wear safety goggles.

**Skin/Body**

- Wear appropriate gloves. Wear long sleeves and/or protective coveralls.

**Environmental Exposure Controls**

- Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways. Follow best practice for site management and disposal of waste.

**Additional Protection Measures**

- An eyewash station and emergency shower must be available to the work station.

**Key to abbreviations**

NIOSH = National Institute of Occupational Safety and Health

OSHA = Occupational Safety and Health Administration

TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

## Section 9 - Physical and Chemical Properties

### 9.1 Information on Basic Physical and Chemical Properties

Material Description			
Physical Form	Solid	Appearance/Description	White, gray, greenish, or yellowish, odorless, fibrous solid.
Color	White, gray, greenish, or yellowish.	Odor	Odorless
Odor Threshold	Data lacking		
General Properties			
Boiling Point	Data lacking	Melting Point/Freezing Point	> 500 °C(> 932 °F)
Decomposition Temperature	1000 °C(1832 °F)	pH	Data lacking
Specific Gravity/Relative Density	2.2-2.6 g/cc	Water Solubility	Data lacking
Viscosity	Data lacking	Explosive Properties	Data lacking
Oxidizing Properties:	Data lacking		
Volatility			
Vapor Pressure	Data lacking	Vapor Density	Data lacking
Evaporation Rate	Data lacking		
Flammability			
Flash Point	Data lacking	UEL	Data lacking
LEL	Data lacking	Autoignition	Data lacking
Flammability (solid, gas)	Data lacking		
Environmental			
Octanol/Water Partition coefficient	Data lacking		

### 9.2 Other Information

- No additional physical and chemical parameters noted.

## Section 10: Stability and Reactivity

### 10.1 Reactivity

- No dangerous reaction known under conditions of normal use.

### 10.2 Chemical stability

- Stable under normal temperatures and pressures.

### 10.3 Possibility of hazardous reactions

- Hazardous polymerization will not occur.

### 10.4 Conditions to avoid

- Avoid generating dust.

### 10.5 Incompatible materials

- Strong oxidizers, strong acids, and bases.

### 10.6 Hazardous decomposition products

- None known.

## Section 11 - Toxicological Information

## 11.1 Information on toxicological effects

Components		
Asbestos, chrysotile (> 99.99%)	12001-29-5	<p><b>Multi-dose Toxicity:</b> Inhalation-Hamster TCLo • 30 mg/m<sup>3</sup> 6 Hour(s) 78 Week(s)-Intermittent; <i>Lungs, Thorax, or Respiration:Fibrosis (interstitial)</i>; <i>Lungs, Thorax, or Respiration:Changes in lung weight</i>; Inhalation-Rat TCLo • 8210 µg/m<sup>3</sup> 6 Hour(s) 20 Day(s)-Intermittent; <i>Lungs, Thorax, or Respiration:Fibrosis (interstitial)</i>;</p> <p><b>Tumorigen / Carcinogen:</b> Ingestion/Oral-Rat TDLo • 7100 mg/kg 39 Week(s)-Continuous; <i>Tumorigenic:Carcinogenic by RTECS criteria</i>; <i>Liver:Tumors</i>; <i>Kidney, Ureter, and Bladder:Kidney tumors</i>; Inhalation-Man TCLo • 400 mppcf 1 Year(s)-Continuous; <i>Tumorigenic:Carcinogenic by RTECS criteria</i>; <i>Lungs, Thorax, or Respiration:Fibrosis, focal (pneumoconiosis)</i>; <i>Lungs, Thorax, or Respiration:Tumors</i>; Inhalation-Rat TCLo • 11 mg/m<sup>3</sup> 26 Week(s)-Intermittent; <i>Tumorigenic:Carcinogenic by RTECS criteria</i>; <i>Lungs, Thorax, or Respiration:Tumors</i></p>

GHS Properties	Classification
Acute toxicity	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking
Skin corrosion/Irritation	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking
Serious eye damage/Irritation	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking
Skin sensitization	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking
Respiratory sensitization	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking
Aspiration Hazard	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking
Carcinogenicity	EU/CLP • Carcinogenicity 1A; May cause cancer OSHA HCS 2012 • Carcinogenicity 1A
Germ Cell Mutagenicity	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking
Toxicity for Reproduction	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking
STOT-SE	EU/CLP • Data lacking OSHA HCS 2012 • Data lacking
STOT-RE	EU/CLP • Specific Target Organ Toxicity Repeated Exposure 1 OSHA HCS 2012 • Specific Target Organ Toxicity Repeated Exposure 1

### Potential Health Effects

#### Inhalation

##### Acute (Immediate)

- Exposure to dust may cause irritation. Processes such as cutting, grinding, crushing, or impact may result in generation of excessive amounts of airborne dusts in the workplace. Nuisance dust may affect the lungs but reactions are typically reversible.

##### Chronic (Delayed)

- Overexposure to breathing asbestos may cause asbestosis, pulmonary fibrosis, mesothelioma, other lung disorders or cancer. All types of asbestos are known to cause inflammatory changes in lungs and pleurae. However, there is experimental and epidemiologic evidence that there may be differences in the potential of different asbestos types to produce disease. It has been suggested that crocidolite has greatest potential to produce disease; chrysotile, the smallest; with amosite occupying an intermediate position.

#### Skin

##### Acute (Immediate)

- Exposure to dust may cause mechanical irritation.

**Chronic (Delayed)** • No data available

## Eye

**Acute (Immediate)** • Exposure to dust may cause mechanical irritation. Excessive concentrations of nuisance dust in the workplace may reduce visibility and may cause unpleasant deposits in eyes.

**Chronic (Delayed)** • No data available

## Ingestion

**Acute (Immediate)** • Excessive concentrations of nuisance dust in the workplace may cause mechanical irritation to mucous membranes.

**Chronic (Delayed)** • No data available

## Carcinogenic Effects

• Repeated and prolonged exposure may cause cancer.

Carcinogenic Effects				
	CAS	OSHA	IARC	NTP
Asbestos, chrysotile	12001-29-5	Specifically Regulated Carcinogen	Group 1-Carcinogenic	Known Human Carcinogen

### Key to abbreviations

TC = Toxic Concentration

TD = Toxic Dose

## Section 12 - Ecological Information

### 12.1 Toxicity

• Material data lacking.

### 12.2 Persistence and degradability

• Material data lacking.

### 12.3 Bioaccumulative potential

• Material data lacking.

### 12.4 Mobility in Soil

• Material data lacking.

### 12.5 Results of PBT and vPvB assessment

• No PBT and vPvB assessment has been conducted.

### 12.6 Other adverse effects

• No studies have been found.

## Section 13 - Disposal Considerations

### 13.1 Waste treatment methods

#### Product waste

• Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

#### Packaging waste

• Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

## Section 14 - Transport Information

	14.1 UN number	14.2 UN proper shipping name	14.3 Transport hazard class(es)	14.4 Packing group	14.5 Environmental hazards
DOT	UN2590	Asbestos, chrysotile	9	III	NDA
IMO/IMDG	UN2590	ASBESTOS, CHRYSOTILE	9	III	NDA
IATA/ICAO	UN2590	White Asbestos (Chrysotile)	9	III	NDA

**14.6 Special precautions for user** • None specified.

**14.7 Transport in bulk according to Annex II of Marpol and the IBC Code** • Data lacking.

## Section 15 - Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

**SARA Hazard Classifications** • Chronic

Inventory						
Component	CAS	Canada DSL	Canada NDSL	EU EINECS	EU ELNICS	TSCA
Asbestos, chrysotile	12001-29-5	No	No	No	No	No

### Canada

Labor		
<b>Canada - WHMIS 1988 - Classifications of Substances</b>		
• Asbestos, chrysotile	12001-29-5	D2A
<b>Canada - WHMIS 1988 - Ingredient Disclosure List</b>		
• Asbestos, chrysotile	12001-29-5	0.1 %

Environment		
<b>Canada - CEPA - Priority Substances List</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed

### United States

Labor		
<b>U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - OSHA - Specifically Regulated Chemicals</b>		
• Asbestos, chrysotile	12001-29-5	1.0 fiber/cm <sup>3</sup> Excursion Limit (See 29 CFR 1910.1001, 30 min); 0.1 fiber/cm <sup>3</sup> TWA

Environment		
<b>U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities</b>		

• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - CERCLA/SARA - Section 313 - Emission Reporting</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed

## United States - California

### Environment

<b>U.S. - California - Proposition 65 - Carcinogens List</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - California - Proposition 65 - Developmental Toxicity</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - California - Proposition 65 - Reproductive Toxicity - Female</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed
<b>U.S. - California - Proposition 65 - Reproductive Toxicity - Male</b>		
• Asbestos, chrysotile	12001-29-5	Not Listed

## 15.2 Chemical Safety Assessment

- No Chemical Safety Assessment has been carried out.

## Section 16 - Other Information

<b>Revision Date</b>	• 19/December/2016
<b>Preparation Date</b>	• 14/January/2016
<b>Disclaimer/Statement of Liability</b>	• Caution! Do not use SPI Supplies products or materials in applications involving implantation within the body; direct or indirect contact with the blood pathway; contact with bone, tissue, tissue fluid, or blood; or prolonged contact with mucous membranes. Products offered by SPI Supplies are not designed or manufactured for use in implantation in the human body or in contact with internal body fluids or tissues. SPI Supplies will not provide to customers making devices for such applications any notice, certification, or information necessary for such medical device use required by US FDA (Food and Drug Administration) regulation or any other statute. SPI Supplies and Structure Probe, Inc. make no representation, promise, express warranty or implied warranty concerning the suitability of these materials for use in implantation in the human body or in contact with internal body tissues of fluids. The information and recommendations set forth above are taken from sources believed to be accurate as of the date hereof, however SPI Supplies and Structure Probe, Inc. make no warranty with respect to the accuracy of the information or the

suitability of the recommendations, and assume no liability to any user thereof. The information contained in this sheet does not constitute a hazard assessment and should not be used in place of the user's own assessment of work place risks as required by other health and safety legislation. Be aware of the Structure Probe, Inc. Copyright Policy. Structure Probe, Inc. grants a nonexclusive license to make unlimited copies of this safety sheet for internal use only. Quite obviously, this information would pertain only to this material when purchased from SPI Supplies as product from other sources, with other ingredients and impurity levels could have substantially different properties.

**Key to abbreviations**

NDA = No Data Available

# Aluminum



## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 11.18.2014

Page 1 of 7

### Aluminum Metal Strips

#### SECTION 1 : Identification of the substance/mixture and of the supplier

**Product name :** Aluminum Metal Strips

**Manufacturer/Supplier Trade name:**

**Manufacturer/Supplier Article number:** S25146

**Recommended uses of the product and uses restrictions on use:**

**Manufacturer Details:**

AquaPhoenix Scientific  
9 Barnhart Drive, Hanover, PA 17331

**Supplier Details:**

Fisher Science Education  
15 Jet View Drive, Rochester, NY 14624

**Emergency telephone number:**

Fisher Science Education Emergency Telephone No.: 800-535-5053

#### SECTION 2 : Hazards identification

**Classification of the substance or mixture:**

Not classified for physical or health hazards under GHS.

**Hazard statements:**

**Precautionary statements:**

If medical advice is needed, have product container or label at hand

Keep out of reach of children

Read label before use

Do not eat, drink or smoke when using this product

Wear protective gloves/protective clothing/eye protection/face protection

Protect from moisture

**Other Non-GHS Classification:**

WHMIS



NFPA/HMIS

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 11.18.2014

Page 2 of 7

## Aluminum Metal Strips



NFPA SCALE (0-4)

Health	0
Flammability	1
Physical Hazard	1
Personal Protection	X

HMIS RATINGS (0-4)

### SECTION 3 : Composition/information on ingredients

<b>Ingredients:</b>		
CAS 7429-90-5	Aluminum	100 %
Percentages are by weight		

### SECTION 4 : First aid measures

#### Description of first aid measures

**After inhalation:** Move exposed individual to fresh air. Loosen clothing as necessary and position individual in a comfortable position. Seek medical advice if discomfort or irritation persists. If breathing difficult, give oxygen.

**After skin contact:** Wash affected area with water for at least 15 minutes. Seek medical attention if irritation persists or if concerned.

**After eye contact:** Protect unexposed eye. Rinse/flush exposed eye(s) gently using water for 15-20 minutes. Remove contact lens(es) if able to do so during rinsing. Seek medical attention if irritation persists or if concerned.

**After swallowing:** Rinse mouth thoroughly. Do not induce vomiting. Seek medical attention immediately. Have exposed individual drink sips of water.

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

Irritation, Nausea, Headache, Shortness of breath.;

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

If seeking medical attention, provide SDS document to physician. Treat patient symptomatically.

### SECTION 5 : Firefighting measures

#### Extinguishing media

**Suitable extinguishing agents:** If in laboratory setting, follow laboratory fire suppression procedures. Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition. Smother with suitable dry powder for extinction. (Pressure from this media may cause severe dusting)

**For safety reasons unsuitable extinguishing agents:** Do not use water.

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

Combustion products may include metallic oxides or other toxic vapors. Combustible Solid, finely divided dust is easily ignited; may cause explosions.

#### Advice for firefighters:

**Protective equipment:** Use NIOSH-approved respiratory protection/breathing apparatus. Wear fire/flame resistant/retardant clothing.

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 11.18.2014

Page 3 of 7

### Aluminum Metal Strips

**Additional information (precautions):** Use spark-proof tools and explosion-proof equipment.

#### SECTION 6 : Accidental release measures

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

Wear protective equipment. Use respiratory protective device against the effects of fumes/dust/aerosol. Keep unprotected persons away. Ensure adequate ventilation. Keep away from ignition sources. Protect from heat. Stop the spill, if possible. Contain spilled material by diking or using inert absorbent. Transfer to a disposal or recovery container.

##### Environmental precautions:

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13

##### Methods and material for containment and cleaning up:

If in a laboratory setting, follow Chemical Hygiene Plan procedures. Place into properly labeled containers for recovery or disposal. If necessary, use trained response staff/contractor. Avoid contact with skin, eyes and clothing. Vacuum or sweep up material and place into a suitable, dry disposal container. Always obey local regulations.

##### Reference to other sections:

#### SECTION 7 : Handling and storage

##### Precautions for safe handling:

Follow good hygiene procedures when handling chemical materials. Wash thoroughly after handling. Do not eat, drink, smoke, or use personal products when handling chemical substances. If in a laboratory setting, follow Chemical Hygiene Plan. Use only in well ventilated areas. Avoid generation of dust or fine particulate. Dust may form flammable or explosive mixture with air, especially when damp. Wash thoroughly after handling. Avoid contact with skin and eyes. Avoid ingestion and inhalation.

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

Store in a cool location. Avoid storage near extreme heat, ignition sources or open flame. Store away from foodstuffs. Store away from oxidizing agents. Store in cool, dry conditions in well sealed containers. Keep container tightly sealed.

#### SECTION 8 : Exposure controls/personal protection



##### Control Parameters:

7429-90-5, Aluminum (as Al) (pyrophoric powder), ACGIH TLV TWA 5 mg/m<sup>3</sup>  
7429-90-5, Aluminum (as Al) (metal dust), ACGIH TLV TWA: 10 mg/m<sup>3</sup>  
7429-90-5, Aluminum (as Al) (respirable), OSHA PEL TWA: 5 mg/m<sup>3</sup>  
7429-90-5, Aluminum (as Al) (total), OSHA PEL TWA: 15 mg/m<sup>3</sup>  
7429-90-5, Aluminum (as Al) (respirable), NIOSH REL: TWA 5 mg/m<sup>3</sup>  
7429-90-5, Aluminum (as Al) (total), NIOSH REL: TWA 10 mg/m<sup>3</sup>

##### Appropriate Engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above.

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 11.18.2014

Page 4 of 7

## Aluminum Metal Strips

<b>Respiratory protection:</b>	Not required under normal conditions of use. Use suitable respiratory protective device when high concentrations are present. Use suitable respiratory protective device when aerosol or mist is formed. For spills, respiratory protection may be advisable.
<b>Protection of skin:</b>	The glove material has to be impermeable and resistant to the product/ the substance/ the preparation being used/handled. Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
<b>Eye protection:</b>	Safety glasses with side shields or goggles.
<b>General hygienic measures:</b>	The usual precautionary measures are to be adhered to when handling chemicals. Keep away from food, beverages and feed sources. Immediately remove all soiled and contaminated clothing. Wash hands before breaks and at the end of work. Do not inhale gases/fumes/dust/mist/vapor/aerosols. Avoid contact with the eyes and skin.

### SECTION 9 : Physical and chemical properties

<b>Appearance (physical state,color):</b>	Silver-gray solid	<b>Explosion limit lower:</b> <b>Explosion limit upper:</b>	Not determined Not determined
<b>Odor:</b>	Odorless	<b>Vapor pressure:</b>	Not determined
<b>Odor threshold:</b>	Not determined	<b>Vapor density:</b>	Not determined
<b>pH-value:</b>	Not Applicable	<b>Relative density:</b>	2.7 g/cm <sup>3</sup>
<b>Melting/Freezing point:</b>	660 °C, 1220°F	<b>Solubilities:</b>	Insoluble in water.
<b>Boiling point/Boiling range:</b>	2327 °C, 4221°F	<b>Partition coefficient (n-octanol/water):</b>	Not determined
<b>Flash point (closed cup):</b>	Not determined	<b>Auto/Self-ignition temperature:</b>	Not determined
<b>Evaporation rate:</b>	Not determined	<b>Decomposition temperature:</b>	Not determined
<b>Flammability (solid,gaseous):</b>	Not determined	<b>Viscosity:</b>	a. Kinematic: Not determined b. Dynamic: Not applicable
<b>Density:</b> Not Determined <b>Molecular Weight:</b> 26.98 <b>Specific Gravity:</b> 2.7020 g/cm <sup>3</sup>			

### SECTION 10 : Stability and reactivity

**Reactivity:** Corrodes in contact with acids & other metals.

**Chemical stability:** No decomposition if used and stored according to specifications. Stable under normal temps and pressures.

**Possible hazardous reactions:** Combustible Solid, finely divided dust is easily ignited; may cause explosions.

**Conditions to avoid:** Store away from oxidizing agents, strong acids or bases. Air and moisture sensitive.

**Incompatible materials:** Strong oxidizers & acids. Halogenated hydrocarbons.

**Hazardous decomposition products:** Aluminum Oxide.

### SECTION 11 : Toxicological information

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 11.18.2014

Page 5 of 7

### Aluminum Metal Strips

<b>Acute Toxicity:</b>	
<b>Oral:</b>	LD50 rat >15900 mg/kg bw
<b>Chronic Toxicity:</b> No additional information.	
<b>Corrosion Irritation:</b> No additional information.	
<b>Sensitization:</b>	No additional information.
<b>Single Target Organ (STOT):</b>	No additional information.
<b>Numerical Measures:</b>	No additional information.
<b>Carcinogenicity:</b>	No additional information.
<b>Mutagenicity:</b>	No additional information.
<b>Reproductive Toxicity:</b>	No additional information.

### SECTION 12 : Ecological information

#### Ecotoxicity

LC50 Fish: *Ctenopharyngodon idella* (Grass carp, white amur) [AI 7429-90-5]: 260 ug/L/96 hr

LC50 Crustacea: *Daphnia magna* (Water flea) [AI 7429-90-5]: 2.6 mg/L/24 hr

LC50 Fish: *Oncorhynchus mykiss* (Rainbow trout) [AI 7429-90-5]: 120 ug/L/96 hr; static

#### Persistence and degradability:

**Bioaccumulative potential:** Birds and mammals are most likely exposed through dietary ingestion of soil or AI-contaminated foods.

#### Mobility in soil:

#### Other adverse effects:

### SECTION 13 : Disposal considerations

#### Waste disposal recommendations:

Product/containers must not be disposed together with household garbage. Do not allow product to reach sewage system or open water. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Consult federal state/ provincial and local regulations regarding the proper disposal of waste material that may incorporate some amount of this product.

### SECTION 14 : Transport information

#### UN-Number

Not Regulated.

#### UN proper shipping name

Not Regulated.

#### Transport hazard class(es)

**Packing group:** Not Regulated

#### Environmental hazard:

#### Transport in bulk:

#### Special precautions for user:

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 11.18.2014

Page 6 of 7

### Aluminum Metal Strips

#### SECTION 15 : Regulatory information

##### United States (USA)

**SARA Section 311/312 (Specific toxic chemical listings):**

Reactive

**SARA Section 313 (Specific toxic chemical listings):**

7429-90-5 Aluminum (fume or dust)

**RCRA (hazardous waste code):**

None of the ingredients is listed

**TSCA (Toxic Substances Control Act):**

All ingredients are listed.

**CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):**

None of the ingredients is listed

##### Proposition 65 (California):

**Chemicals known to cause cancer:**

None of the ingredients is listed

**Chemicals known to cause reproductive toxicity for females:**

None of the ingredients is listed

**Chemicals known to cause reproductive toxicity for males:**

None of the ingredients is listed

**Chemicals known to cause developmental toxicity:**

None of the ingredients is listed

##### Canada

**Canadian Domestic Substances List (DSL):**

All ingredients are listed.

**Canadian NPRI Ingredient Disclosure list (limit 0.1%):**

None of the ingredients is listed

**Canadian NPRI Ingredient Disclosure list (limit 1%):**

7429-90-5 Aluminum, elemental

#### SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

**GHS Full Text Phrases:**

**Abbreviations and acronyms:**

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

**Effective date** : 11.18.2014

Page 7 of 7

### Aluminum Metal Strips

IMDG: International Maritime Code for Dangerous Goods

PNEC: Predicted No-Effect Concentration (REACH)

CFR: Code of Federal Regulations (USA)

SARA: Superfund Amendments and Reauthorization Act (USA)

RCRA: Resource Conservation and Recovery Act (USA)

TSCA: Toxic Substances Control Act (USA)

NPRI: National Pollutant Release Inventory (Canada)

DOT: US Department of Transportation

IATA: International Air Transport Association

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

CAS: Chemical Abstracts Service (division of the American Chemical Society)

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

DNEL: Derived No-Effect Level (REACH)

**Effective date** : 11.18.2014

**Last updated** : 03.19.2015

# **Antimony**



# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 1 of 6

## Antimony, Metal

### SECTION 1 : Identification of the substance/mixture and of the supplier

**Product name :** Antimony, Metal

**Manufacturer/Supplier Trade name:**

**Manufacturer/Supplier Article number:** S25182

**Recommended uses of the product and uses restrictions on use:**

**Manufacturer Details:**

AquaPhoenix Scientific  
9 Barnhart Drive, Hanover, PA 17331

**Supplier Details:**

Fisher Science Education  
15 Jet View Drive, Rochester, NY 14624

**Emergency telephone number:**

Fisher Science Education Emergency Telephone No.: 800-535-5053

### SECTION 2 : Hazards identification

**Classification of the substance or mixture:**

Not classified for physical or health hazards under GHS.

**Signal word :**Warning

**Hazard statements:**

**Precautionary statements:**

If medical advice is needed, have product container or label at hand

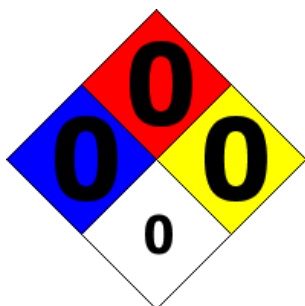
Keep out of reach of children

Read label before use

Do not eat, drink or smoke when using this product

**Other Non-GHS Classification:**

WHMIS  
NFPA/HMIS



NFPA SCALE (0-4)

Health	0
Flammability	0
Physical Hazard	0
Personal Protection	X

HMIS RATINGS (0-4)

### SECTION 3 : Composition/information on ingredients

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 2 of 6

## Antimony, Metal

### Ingredients:

Percentages are by weight

### SECTION 4 : First aid measures

#### Description of first aid measures

**After inhalation:** Loosen clothing as necessary and position individual in a comfortable position. Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen. Get medical assistance if cough or other symptoms appear.

**After skin contact:** Rinse/flush exposed skin gently using soap and water for 15-20 minutes. Seek medical advice if discomfort or irritation persists.

**After eye contact:** Protect unexposed eye. Rinse/flush exposed eye(s) gently using water for 15-20 minutes. Remove contact lens(es) if able to do so during rinsing. Seek medical attention if irritation persists or if concerned.

**After swallowing:** Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Seek medical attention if irritation, discomfort or vomiting persists. Never give anything by mouth to an unconscious person.

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

Irritation, Nausea, Headache, Shortness of breath.;

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

If seeking medical attention, provide SDS document to physician. Physician should treat symptomatically.

### SECTION 5 : Firefighting measures

#### Extinguishing media

**Suitable extinguishing agents:** Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition. Use water, dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam.

**For safety reasons unsuitable extinguishing agents:**

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

Combustion products may include carbon oxides or other toxic vapors. Thermal decomposition can lead to release of irritating gases and vapors.

#### Advice for firefighters:

**Protective equipment:** Use NIOSH-approved respiratory protection/breathing apparatus.

**Additional information (precautions):** Move product containers away from fire or keep cool with water spray as a protective measure, where feasible. Use spark-proof tools and explosion-proof equipment. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols. Avoid contact with skin, eyes, and clothing.

### SECTION 6 : Accidental release measures

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

Wear protective equipment. Ensure that air-handling systems are operational. Ensure adequate ventilation.

#### Environmental precautions:

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13. Should not be released into environment.

#### Methods and material for containment and cleaning up:

Keep in suitable closed containers for disposal. Wear protective eyewear, gloves, and clothing. Refer to Section

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 3 of 6

## Antimony, Metal

8. Always obey local regulations. Evacuate personnel to safe areas.

### Reference to other sections:

### SECTION 7 : Handling and storage

#### Precautions for safe handling:

Minimize dust generation and accumulation. Follow good hygiene procedures when handling chemical materials. Refer to Section 8. Do not eat, drink, smoke, or use personal products when handling chemical substances. Avoid contact with eyes, skin, and clothing.

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

Store away from incompatible materials. Protect from freezing and physical damage. Keep away from food and beverages. Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame. Store in cool, dry conditions in well sealed containers. Store with like hazards

### SECTION 8 : Exposure controls/personal protection



#### Control Parameters:

7440-36-0, Antimony, OSHA TWA 0.5 mg/m<sup>3</sup>  
7440-36-0, Antimony, ACGIH TLV TWA 0.5 mg/m<sup>3</sup>

#### Appropriate Engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Use under a fume hood

#### Respiratory protection:

Not required under normal conditions of use. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. When necessary use NIOSH approved breathing equipment.

#### Protection of skin:

Select glove material impermeable and resistant to the substance. Select glove material based on rates of diffusion and degradation. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves. Wear protective clothing.

#### Eye protection:

Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU). Safety glasses or goggles are appropriate eye protection.

#### General hygienic measures:

Perform routine housekeeping. Wash hands before breaks and at the end of work. Avoid contact with skin, eyes, and clothing. Before wearing wash contaminated clothing.

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 4 of 6

### Antimony, Metal

#### SECTION 9 : Physical and chemical properties

<b>Appearance (physical state,color):</b>	Silver white solid	<b>Explosion limit lower: Explosion limit upper:</b>	Not determined Not determined
<b>Odor:</b>	Not Determined	<b>Vapor pressure:</b>	Not determined
<b>Odor threshold:</b>	Not determined	<b>Vapor density:</b>	Not determined
<b>pH-value:</b>	Not Determined	<b>Relative density:</b>	Not determined
<b>Melting/Freezing point:</b>	630 C	<b>Solubilities:</b>	insoluble
<b>Boiling point/Boiling range:</b>	1635 C	<b>Partition coefficient (n-octanol/water):</b>	Not determined
<b>Flash point (closed cup):</b>	Not determined	<b>Auto/Self-ignition temperature:</b>	Not determined
<b>Evaporation rate:</b>	Not determined	<b>Decomposition temperature:</b>	Not determined
<b>Flammability (solid,gaseous):</b>	Not determined	<b>Viscosity:</b>	a. Kinematic:Not determined b. Dynamic: Not determined
<b>Density:</b> 6.684 g/cm <sup>3</sup>			

#### SECTION 10 : Stability and reactivity

**Reactivity:**Nonreactive under normal conditions.

**Chemical stability:**Stable under normal conditions.

**Possible hazardous reactions:**None under normal processing

**Conditions to avoid:**Incompatible Materials.

**Incompatible materials:**Strong acids.Strong bases.Oxidizing agents.

**Hazardous decomposition products:**

#### SECTION 11 : Toxicological information

<b>Acute Toxicity:</b>	
<b>Oral:</b>	LD50 - rat - 7,000 mg/kg
<b>Chronic Toxicity:</b> No additional information.	
<b>Corrosion Irritation:</b> No additional information.	
<b>Sensitization:</b>	No additional information.
<b>Single Target Organ (STOT):</b>	No additional information.
<b>Numerical Measures:</b>	No additional information.
<b>Carcinogenicity:</b>	No additional information.
<b>Mutagenicity:</b>	No additional information.
<b>Reproductive Toxicity:</b>	No additional information.

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 5 of 6

## Antimony, Metal

### SECTION 12 : Ecological information

**Ecotoxicity Persistence and degradability:**

**Bioaccumulative potential:**

**Mobility in soil:**

**Other adverse effects:**

### SECTION 13 : Disposal considerations

**Waste disposal recommendations:**

Contact a licensed professional waste disposal service to dispose of this material. Dispose of empty containers as unused product. Product or containers must not be disposed with household garbage. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations. Ensure complete and accurate classification.

### SECTION 14 : Transport information

**UN-Number**

Not Regulated.

**UN proper shipping name**

Not Regulated.

**Transport hazard class(es)**

**Packing group:** Not Regulated

**Environmental hazard:**

**Transport in bulk:**

**Special precautions for user:**

### SECTION 15 : Regulatory information

**United States (USA)**

**SARA Section 311/312 (Specific toxic chemical listings):**

None of the ingredients is listed

**SARA Section 313 (Specific toxic chemical listings):**

7440-36-0 Antimony

**RCRA (hazardous waste code):**

None of the ingredients is listed

**TSCA (Toxic Substances Control Act):**

All ingredients are listed.

**CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):**

7440-36-0 Antimony: RQ 5000 LB

**Proposition 65 (California):**

**Chemicals known to cause cancer:**

None of the ingredients is listed

**Chemicals known to cause reproductive toxicity for females:**

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 6 of 6

### Antimony, Metal

None of the ingredients is listed

#### Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

#### Chemicals known to cause developmental toxicity:

None of the ingredients is listed

#### Canada

##### Canadian Domestic Substances List (DSL):

All ingredients are listed.

##### Canadian NPRI Ingredient Disclosure list (limit 0.1%):

7440-36-0 Antimony

##### Canadian NPRI Ingredient Disclosure list (limit 1%):

None of the ingredients is listed

### SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

#### GHS Full Text Phrases:

#### Abbreviations and acronyms:

IMDG: International Maritime Code for Dangerous Goods

IATA: International Air Transport Association

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

CAS: Chemical Abstracts Service (division of the American Chemical Society)

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

DNEL: Derived No-Effect Level (REACH)

PNEC: Predicted No-Effect Concentration (REACH)

CFR: Code of Federal Regulations (USA)

SARA: Superfund Amendments and Reauthorization Act (USA)

RCRA: Resource Conservation and Recovery Act (USA)

TSCA: Toxic Substances Control Act (USA)

NPRI: National Pollutant Release Inventory (Canada)

DOT: US Department of Transportation

Effective date : 10.24.2014

Last updated : 03.19.2015

# Arsenic



# Fisher Scientific

Part of Thermo Fisher Scientific

## SAFETY DATA SHEET

Creation Date 22-Sep-2009

Revision Date 10-Dec-2015

Revision Number 2

### 1. Identification

**Product Name** Arsenic, reference standard solution 1000 ppm in 7% nitric acid

**Cat No. :** SA449-100, SA449-500

**Synonyms** None.

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

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

**Company**

Fisher Scientific  
One Reagent Lane  
Fair Lawn, NJ 07410  
Tel: (201) 796-7100

**Emergency Telephone Number**

CHEMTREC®, Inside the USA: 800-424-9300  
CHEMTREC®, Outside the USA: 001-703-527-3887

### 2. Hazard(s) identification

**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Corrosive to metals	Category 1
Skin Corrosion/Irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Carcinogenicity	Category 1A
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

**Label Elements**

**Signal Word**

Danger

**Hazard Statements**

May be corrosive to metals  
Causes severe skin burns and eye damage  
May cause respiratory irritation  
May cause cancer





**Precautionary Statements**

**Prevention**

Obtain special instructions before use  
Do not handle until all safety precautions have been read and understood  
Use personal protective equipment as required  
Do not breathe dust/fume/gas/mist/vapors/spray  
Wash face, hands and any exposed skin thoroughly after handling  
Use only outdoors or in a well-ventilated area  
Keep only in original container

**Response**

Immediately call a POISON CENTER or doctor/physician

**Inhalation**

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

**Skin**

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower  
Wash contaminated clothing before reuse

**Eyes**

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

**Ingestion**

IF SWALLOWED: Rinse mouth. DO NOT induce vomiting

**Spills**

Absorb spillage to prevent material damage

**Storage**

Store locked up  
Store in a well-ventilated place. Keep container tightly closed  
Store in corrosive resistant polypropylene container with a resistant inliner  
Store in a dry place

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

Harmful to aquatic life with long lasting effects

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

**Unknown Acute Toxicity**

.? percent of the mixture consists of ingredient(s) of unknown acute toxicity

**3. Composition / information on ingredients**

Component	CAS-No	Weight %
Water	7732-18-5	92 - 93
Nitric acid	7697-37-2	7
Arsenic trioxide	1327-53-3	< 0.5

**4. First-aid measures**

**General Advice**

Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

**Eye Contact**

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

	Immediate medical attention is required.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.
<b>Inhalation</b>	If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Remove from exposure, lie down. Call a physician immediately.
<b>Ingestion</b>	Do not induce vomiting. Never give anything by mouth to an unconscious person. Clean mouth with water. Call a physician immediately.
<b>Most important symptoms/effects</b>	Causes burns by all exposure routes. . Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
<b>Notes to Physician</b>	Treat symptomatically

### 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	CO <sub>2</sub> , dry chemical, dry sand, alcohol-resistant foam.
<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	Not applicable
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	No information available
<b>Explosion Limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

**Specific Hazards Arising from the Chemical**

Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes.

**Hazardous Combustion Products**

Nitrogen oxides (NO<sub>x</sub>) Thermal decomposition can lead to release of irritating gases and vapors

**Protective Equipment and Precautions for Firefighters**

Thermal decomposition can lead to release of irritating gases and vapors. As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

<b>Health</b>	<b>Flammability</b>	<b>Instability</b>	<b>Physical hazards</b>
4	0	0	N/A

### 6. Accidental release measures

<b>Personal Precautions</b>	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.
<b>Environmental Precautions</b>	Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.
<b>Methods for Containment and Clean Up</b>	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

## 7. Handling and storage

**Handling** Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not breathe vapors or spray mist. Do not ingest.

**Storage** Corrosives area. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep in properly labeled containers.

## 8. Exposure controls / personal protection

### Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitric acid	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m <sup>3</sup> (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m <sup>3</sup> TWA: 2 ppm TWA: 5 mg/m <sup>3</sup>	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m <sup>3</sup> STEL: 4 ppm STEL: 10 mg/m <sup>3</sup>
Arsenic trioxide	TWA: 0.01 mg/m <sup>3</sup>		IDLH: 5 mg/m <sup>3</sup> Ceiling: 0.002 mg/m <sup>3</sup>

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Nitric acid	TWA: 2 ppm TWA: 5.2 mg/m <sup>3</sup> STEL: 4 ppm STEL: 10 mg/m <sup>3</sup>	TWA: 2 ppm TWA: 5 mg/m <sup>3</sup> STEL: 4 ppm STEL: 10 mg/m <sup>3</sup>	TWA: 2 ppm STEL: 4 ppm
Arsenic trioxide	TWA: 0.1 mg/m <sup>3</sup>	TWA: 0.5 mg/m <sup>3</sup>	TWA: 0.01 mg/m <sup>3</sup> STEL: 0.05 mg/m <sup>3</sup>

### Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

**Engineering Measures** Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

### Personal Protective Equipment

**Eye/face Protection** Tightly fitting safety goggles. Face-shield.

**Skin and body protection** Long sleeved clothing.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Keep away from food, drink and animal feeding stuffs. When using, do not eat, drink or smoke. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. For environmental protection remove and wash all contaminated protective equipment before re-use. Wear suitable gloves and eye/face protection.

## 9. Physical and chemical properties

<b>Physical State</b>	Liquid
<b>Appearance</b>	Colorless
<b>Odor</b>	Odorless
<b>Odor Threshold</b>	No information available

<b>pH</b>	2.0
<b>Melting Point/Range</b>	0 °C / 32 °F
<b>Boiling Point/Range</b>	100 °C / 212 °F
<b>Flash Point</b>	Not applicable
<b>Evaporation Rate</b>	> 1 (ether = 1)
<b>Flammability (solid,gas)</b>	Not applicable
<b>Flammability or explosive limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Vapor Pressure</b>	14 mmHg @ 20 °C
<b>Vapor Density</b>	0.7 (Air = 1.0)
<b>Specific Gravity</b>	No information available
<b>Solubility</b>	miscible
<b>Partition coefficient; n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	No information available
<b>Decomposition Temperature</b>	No information available
<b>Viscosity</b>	No information available

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	Stable under normal conditions.
<b>Conditions to Avoid</b>	Excess heat. Exposure to air or moisture over prolonged periods.
<b>Incompatible Materials</b>	Strong bases, Amines, Strong reducing agents
<b>Hazardous Decomposition Products</b>	Nitrogen oxides (NOx), Thermal decomposition can lead to release of irritating gases and vapors
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### **Product Information**

<b>Oral LD50</b>	Category 4. ATE = 300 - 2000 mg/kg. Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
<b>Dermal LD50</b>	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
<b>Vapor LC50</b>	Category 2. ATE = 0.5 - 2 mg/l. Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

#### **Component Information**

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	-	Not listed	Not listed
Nitric acid	Not listed	Not listed	LC50 = 2500 ppm. (Rat) 1h
Arsenic trioxide	LD50 = 20 mg/kg ( Rat )	Not listed	Not listed

**Toxicologically Synergistic Products** No information available

#### **Delayed and immediate effects as well as chronic effects from short and long-term exposure**

<b>Irritation</b>	Causes burns by all exposure routes
<b>Sensitization</b>	No information available
<b>Carcinogenicity</b>	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed
Nitric acid	7697-37-2	Not listed	Not listed	Not listed	Not listed	Not listed
Arsenic trioxide	1327-53-3	Group 1	Known	A1	X	A1

*IARC: (International Agency for Research on Cancer)*

*IARC: (International Agency for Research on Cancer)*

*Group 1 - Carcinogenic to Humans*

*Group 2A - Probably Carcinogenic to Humans*

*Group 2B - Possibly Carcinogenic to Humans*

*NTP: (National Toxicity Program)*

*Known - Known Carcinogen*

*Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*

*A1 - Known Human Carcinogen*

*A2 - Suspected Human Carcinogen*

*A3 - Animal Carcinogen*

*ACGIH: (American Conference of Governmental Industrial Hygienists)*

*ACGIH: (American Conference of Governmental Industrial Hygienists)*

*Mexico - Occupational Exposure Limits - Carcinogens*

*Mexico - Occupational Exposure Limits - Carcinogens*

*A1 - Confirmed Human Carcinogen*

*A2 - Suspected Human Carcinogen*

*A3 - Confirmed Animal Carcinogen*

*A4 - Not Classifiable as a Human Carcinogen*

*A5 - Not Suspected as a Human Carcinogen*

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** Respiratory system

**STOT - repeated exposure** None known

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

**Endocrine Disruptor Information** No information available

**Other Adverse Effects** The toxicological properties have not been fully investigated.

## 12. Ecological information

### Ecotoxicity

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nitric acid	Not listed	LC50: = 72 mg/L, 96h (Gambusia affinis)	Not listed	Not listed
Arsenic trioxide	Not listed	LC50: > 1000 mg/L, 96h static (Oncorhynchus mykiss) LC50: 18.8 - 21.4 mg/L, 96h flow-through (Oncorhynchus mykiss) LC50: = 135 mg/L, 96h (Pimephales promelas)	EC50 = 31.43 mg/L 60 min EC50 = 33.39 mg/L 30 min EC50 = 43.56 mg/L 15 min EC50 = 73.73 mg/L 5 min	EC50 = 0.038 mg/L 24h EC50 = 0.96 mg/L 96h EC50 = 0.038 mg/L 24h

**Persistence and Degradability** Miscible with water Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation** No information available.

**Mobility** Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Nitric acid	-2.3
Arsenic trioxide	18.1

### 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

### 14. Transport information

**DOT**

UN-No UN2031  
 Proper Shipping Name NITRIC ACID  
 Hazard Class 8  
 Subsidiary Hazard Class 5.1  
 Packing Group II

**TDG**

UN-No UN2031  
 Proper Shipping Name NITRIC ACID  
 Hazard Class 8  
 Packing Group II

**IATA**

UN-No UN2031  
 Proper Shipping Name NITRIC ACID  
 Hazard Class 8  
 Packing Group II

**IMDG/IMO**

UN-No UN2031  
 Proper Shipping Name NITRIC ACID  
 Hazard Class 8  
 Packing Group II

### 15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

**International Inventories**

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Water	X	X	-	231-791-2	-		X	-	X	X	X
Nitric acid	X	X	-	231-714-2	-		X	X	X	X	X
Arsenic trioxide	X	X	-	215-481-4	-		X	X	X	X	X

**Legend:**

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants

that comprises one of the eligibility criteria for the exemption rule.

**U.S. Federal Regulations**

**TSCA 12(b)** Not applicable

**SARA 313**

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Nitric acid	7697-37-2	7	1.0
Arsenic trioxide	1327-53-3	< 0.5	0.1

**SARA 311/312 Hazard Categories**

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

**CWA (Clean Water Act)**

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Nitric acid	X	1000 lb	-	-
Arsenic trioxide	X	1 lb	X	-

**Clean Air Act**

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Arsenic trioxide	X		-

**OSHA Occupational Safety and Health Administration**  
Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid	-	TQ: 500 lb
Arsenic trioxide	10 µg/m <sup>3</sup> TWA 5 µg/m <sup>3</sup> Action Level	-

**CERCLA**

Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Nitric acid	1000 lb	1000 lb
Arsenic trioxide	1 lb	1 lb

**California Proposition 65** This product does not contain any Proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Arsenic trioxide	1327-53-3	Carcinogen Developmental	0.06 µg/day 10 µg/day	Developmental Carcinogen

**U.S. State Right-to-Know Regulations**

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Water	-	-	X	-	-
Nitric acid	X	X	X	X	X
Arsenic trioxide	X	X	X	X	X

**U.S. Department of Transportation**

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

**U.S. Department of Homeland Security**

This product does not contain any DHS chemicals.

Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid	2000 lb STQ

**Other International Regulations**

**Mexico - Grade** No information available

**Canada**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

**WHMIS Hazard Class** E Corrosive material  
D2A Very toxic materials  
D1A Very toxic materials



**16. Other information**

**Prepared By** Regulatory Affairs  
Thermo Fisher Scientific  
Email: EMSDS.RA@thermofisher.com

**Creation Date** 22-Sep-2009  
**Revision Date** 10-Dec-2015  
**Print Date** 10-Dec-2015  
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

**End of SDS**



# Barium

# Barium



## SAFETY DATA SHEET

### 1 PRODUCT AND SUPPLIER IDENTIFICATION

**Product Name:** Barium Solid

**Formula:** Ba

**Supplier:** ESPI Metals  
1050 Benson Way  
Ashland, OR 97520

**Telephone:** 800-638-2581

**Fax:** 541-488-8313

**Email:** [sales@espimetals.com](mailto:sales@espimetals.com)

**Emergency:** Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

**Recommended Uses:** Scientific Research

### 2 HAZARDS IDENTIFICATION

**GHS Classification (29 CFR 1910.1200):** Substances and mixtures which, in contact with water, emit flammable gases, category 2, Skin corrosion/irritation, category 2, Eye damage/irritation, category 2A.

**GHS Label Elements:**



**Signal Word:** Danger

**Hazard Statements:** H261 In contact with water releases flammable gas, H315 Causes skin irritation, H319 Causes serious eye irritation, H335 May cause respiratory irritation.

**Precautionary Statements:** P223 Keep away from any possible contact with water, because of violent reaction and possible flash fire, P231+P232 Handle under inert gas. Protect from moisture, P261 Avoid breathing dust or fume, P264 Wash skin thoroughly after handling, P280 Wear protective gloves/protective clothing/eye protection/face protection, P302+P352 IF ON SKIN: wash with plenty of soap and water, P332+P313 IF SKIN irritation occurs: Get medical advice/attention, P305+P351+P338 IF IN EYES: rinse cautiously with water for several minutes. Remove contact lenses,

if present and easy to do. Continue rinsing, P337+P313 IF eye irritation persists: Get medical advice/attention, P362 Take off contaminated clothing and wash before reuse, P370+P378 In case of fire: Use Class D dry powder for extinction, P402+P404 Store in a dry place. Store in a closed container, P501 Dispose of contents/container in accordance with local, state or federal regulations.

### **3 COMPOSITION/INFORMATION ON INGREDIENTS**

<b>Ingredient:</b>	Barium
<b>CAS#:</b>	7440-39-3
<b>%:</b>	100
<b>EC#:</b>	231-149-1

### **4 FIRST AID MEASURES**

**General Measures:** Remove patient from area of exposure.

**INHALATION:** Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek immediate medical attention.

**INGESTION:** Quickly wipe material from mouth and rinse with water. Do not induce vomiting. Seek medical attention immediately.

**SKIN:** Remove contaminated clothing if necessary. Brush off any visible solids. Wash the affected area with water for at least 15 minutes. Seek medical attention.

**EYES:** Immediately flush eyes with copious amounts of water, including under eyelids for at least 10-15 minutes. A victim may need assistance in keeping their eyelids open. Seek immediate medical attention.

**Most Important Symptoms/Effects, Acute and Delayed:** May cause severe irritation in contact with mucous membranes and moist skin. See section 11 for more information.

**Indication of Immediate Medical Attention and Special Treatment:** No other relevant information available.

### **5 FIREFIGHTING MEASURES**

**Extinguishing Media:** Use Class D dry powder extinguishing agent.

**Unsuitable Extinguishing Media:** Do not use water, carbon dioxide or halogenated extinguishers.

**Specific Hazards Arising from the Material:** Material readily reacts with water generating flammable hydrogen gas. May emit fumes of barium oxide under fire conditions.

**Special Protective Equipment and Precautions for Firefighters:** Full face, self-contained breathing apparatus and full protective clothing to prevent contact with skin and eyes. Barium metal can reignite after fire is initially extinguished. Never leave extinguished fire unattended.

## **6 ACCIDENTAL RELEASE MEASURES**

**Personal Precautions, Protective Equipment, and Emergency Procedures:** Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

**Methods and Materials for Containment and Cleaning Up:** Sweep or scoop spilled product and place in a closed container for further handling and disposal. Do not use water for spill clean-up. Cover very small quantities in the open with powdered limestone and let decompose. Use only non-sparking tools and natural bristle brushes.

**Environmental Precautions:** Do not flush to sewer, stream, or other bodies of water. Do not allow to enter drains or to be released to the environment.

## **7 HANDLING AND STORAGE**

**Precautions for Safe Handling:** Handle in an enclosed, controlled process under dry protective gas such as argon. Use non-sparking tools. Protect from sources of ignition. Do not allow contact with water. Avoid breathing dust or fumes. Provide adequate ventilation if dusts are created. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

**Conditions for Safe Storage, Including Any Incompatibilities:** Store material tightly sealed in properly labeled containers under argon or mineral oil. Storage area should be free of combustibles and ignition sources. Do not store together with acids, oxidizers, halogens. Protect from water/moisture. See section 10 for more information on incompatible materials.

## **8 EXPOSURE CONTROLS AND PERSONAL PROTECTION**

**Exposure Limits:** Barium

**OSHA/PEL:** 0.5 mg/m<sup>3</sup>

**ACGIH/TLV:** 0.5 mg/m<sup>3</sup>

**Appropriate Engineering Controls:** Handle in an enclosed, controlled process under dry argon. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air. Prepare for the possibility of a fire. Keep extinguishing agents, tools for handling and protective clothing readily available.

**Individual Protection Measures, Such as Personal Protective Equipment:**

**Respiratory Protection:** Wear a NIOSH/MSHA approved respirator when high concentrations are present.

**Eye Protection:** Always wear approved chemical splash proof goggles.

**Skin Protection:** Rubber gloves, flame retardant protective work clothing.

## **9 PHYSICAL AND CHEMICAL PROPERTIES**

**Appearance:**

**Form:** Solid in various forms

<b>Color:</b>	Silver-gray metallic
<b>Odor:</b>	Not determined
<b>Odor Threshold:</b>	Not determined
<b>pH:</b>	N/A
<b>Melting Point:</b>	725 °C
<b>Boiling Point:</b>	1640 °C
<b>Flash Point:</b>	N/A
<b>Evaporation Rate:</b>	N/A
<b>Flammability:</b>	Flammable solid
<b>Upper Flammable Limit:</b>	No data
<b>Lower Flammable Limit:</b>	No data
<b>Vapor Pressure:</b>	10 mm at 1049 °C
<b>Vapor Density:</b>	N/A
<b>Relative Density (Specific Gravity):</b>	3.51 g/cc at 20 °C
<b>Solubility in H<sub>2</sub>O:</b>	Decomposes
<b>Partition Coefficient (n-octanol/water):</b>	Not determined
<b>Autoignition Temperature:</b>	No data
<b>Decomposition Temperature:</b>	No data
<b>Viscosity:</b>	N/A

## **10 STABILITY AND REACTIVITY**

**Reactivity:** No data

**Chemical Stability:** Stable under recommended storage conditions.

**Possibility of Hazardous Reactions:** Barium reacts readily with water releasing flammable hydrogen gas.

**Conditions to Avoid:** Heat, sparks, flame. Exposure to water or moist air.

**Incompatible Materials:** Water or moisture, oxidizing agents, oxygen, acids, alcohols, halocarbons, carbon dioxide, ammonia.

**Hazardous Decomposition Products:** Barium oxides, hydrogen gas.

## **11 TOXICOLOGICAL INFORMATION**

**Likely Routes of Exposure:** Inhalation, skin, eyes.

**Symptoms of Exposure:** May cause severe irritation to the nose, throat, and upper respiratory tract, mouth, throat, and

esophagus. Contact with skin can cause mild to moderate irritation. May cause chemical burns in eyes or on skin as it reacts with moisture on living tissue.

**Acute and Chronic Effects:** Barium compounds may cause severe gastroenteritis, including abdominal pain, vomiting and diarrhea, tremors, faintness, paralysis of the arms and legs, and slow or irregular heartbeat. Severe cases may produce collapse and death due to respiratory failure. Soluble barium compounds are more likely to cause these effects than insoluble compounds. Inhalation of fumes may cause sore throat, coughing, labored breathing, and irritation of the respiratory tract as well as the above symptoms. Chronic exposure to barium may cause sensitization, chronic barium poisoning, dermatitis, corneal opacity and blindness.

**Acute Toxicity:** No data

**Carcinogenicity:** **NTP:** Not identified as carcinogenic **IARC:** Not identified as carcinogenic

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

## **12 ECOLOGICAL INFORMATION**

**Ecotoxicity:** No data

**Persistence and Degradability:** No data

**Bioaccumulative Potential:** No data

**Mobility in Soil:** No data

**Other Adverse Effects:** Do not allow material to be released to the environment. No further relevant information available.

## **13 DISPOSAL CONSIDERATIONS**

**Waste Disposal Method:**

**Product:** Dispose of in accordance with Federal, State and Local regulations.

**Packaging:** Dispose of in accordance with Federal, State and Local regulations.

## **14 TRANSPORT INFORMATION**

**UN Number:** UN1400

**UN Proper Shipping Name:** Barium

**Transport Hazard Class:** 4.3

**Packing Group:** II

**Marine Pollutant:** No

**Special Precautions:** Warning, substances which, in contact with water, emit flammable gases.

## **15 REGULATORY INFORMATION**

**TSCA Listed:** All components are listed.

**Regulation (EC) No 1272/2008 (CLP):** Substances and mixtures which, in contact with water, emit flammable gases, category 2, Skin corrosion/irritation, category 2, Eye damage/irritation, category 2A.

**Canada WHMIS Classification (CPR, SOR/88-66):** Substances and mixtures which, in contact with water, emit flammable gases, Skin corrosion/irritation, Eye damage/irritation.

**HMIS Ratings: Health: 2    Flammability: 3    Physical: 1**

**NFPA Ratings: Health: 2    Flammability: 3    Instability: 1    Special Hazard: W**

**Chemical Safety Assessment:** A chemical safety assessment has not been carried out.

## **16 OTHER INFORMATION**

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

**Prepared by:** ESPI Metals

**Revised/Reviewed:** July 2015

# Cadmium



## 1. Identification

<b>Product identifier</b>	<b>CADMIUM, POWDER, -60 MESH</b>	
<b>Other means of identification</b>		
<b>Product code</b>	3787	
<b>Recommended use</b>	professional, scientific and technical activities: other professional, scientific and technical activities manufacture of other chemical products	
<b>Recommended restrictions</b>	None known.	
<b>Manufacturer/Importer/Supplier/Distributor information</b>		
<b>Manufacturer</b>		
<b>Company name</b>	GFS Chemicals, Inc.	
<b>Address</b>	P.O. Box 245 Powell, OH 43065 United States	
<b>Telephone</b>	Phone	740-881-5501
	Toll Free	800-858-9682
	Fax	740-881-5989
<b>Website</b>	www.gfschemicals.com	
<b>E-mail</b>	service@gfschemicals.com	
<b>Emergency phone number</b>	Emergency Assistance	Chemtrec 800-424-9300

## 2. Hazard(s) identification

<b>Physical hazards</b>	Not classified.	
<b>Health hazards</b>	Acute toxicity, oral	Category 3
	Acute toxicity, inhalation	Category 1
	Germ cell mutagenicity	Category 2
	Carcinogenicity	Category 1
	Reproductive toxicity (fertility, the unborn child)	Category 2
	Specific target organ toxicity, repeated exposure	Category 1
<b>Environmental hazards</b>	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 1
<b>OSHA defined hazards</b>	Not classified.	
<b>Label elements</b>		



<b>Signal word</b>	Danger
<b>Hazard statement</b>	Toxic if swallowed. Fatal if inhaled. Suspected of causing genetic defects. May cause cancer. Suspected of damaging fertility. Suspected of damaging the unborn child. Causes damage to organs through prolonged or repeated exposure. Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.
<b>Precautionary statement</b>	
<b>Prevention</b>	Wash thoroughly after handling. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust/fume. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. Wear respiratory protection.

<b>Response</b>	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor/physician. Rinse mouth. Collect spillage.
<b>Storage</b>	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
<b>Disposal</b>	Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.
<b>Hazard(s) not otherwise classified (HNOC)</b>	None known.
<b>Supplemental information</b>	None.

### 3. Composition/information on ingredients

#### Substances

Chemical name	Common name and synonyms	CAS number	%
CADMIUM		7440-43-9	100

\*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

### 4. First-aid measures

<b>Inhalation</b>	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a physician or poison control center immediately.
<b>Skin contact</b>	Wash off with soap and water. Get medical attention if irritation develops and persists.
<b>Eye contact</b>	Do not rub eyes. Rinse with water. Get medical attention if irritation develops and persists.
<b>Ingestion</b>	Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
<b>Most important symptoms/effects, acute and delayed</b>	Diarrhea. Headache. Nausea, vomiting. Coughing. Prolonged exposure may cause chronic effects.
<b>Indication of immediate medical attention and special treatment needed</b>	Provide general supportive measures and treat symptomatically. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
<b>General information</b>	IF exposed or concerned: Get medical advice/attention. If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

### 5. Fire-fighting measures

<b>Suitable extinguishing media</b>	Water fog. Foam. Dry chemical powder. Dry sand. Carbon dioxide (CO2).
<b>Unsuitable extinguishing media</b>	Do not use water jet as an extinguisher, as this will spread the fire.
<b>Specific hazards arising from the chemical</b>	None known.
<b>Special protective equipment and precautions for firefighters</b>	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
<b>Fire fighting equipment/instructions</b>	Use water spray to cool unopened containers.
<b>Specific methods</b>	Use standard firefighting procedures and consider the hazards of other involved materials.
<b>General fire hazards</b>	No unusual fire or explosion hazards noted.

### 6. Accidental release measures

<b>Personal precautions, protective equipment and emergency procedures</b>	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Do not breathe dust. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
--	--

**Methods and materials for containment and cleaning up**

Refer to attached safety data sheets and/or instructions for use. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). The product is immiscible with water and will sediment in water systems. This material is classified as a water pollutant under the Clean Water Act and should be prevented from contaminating soil or from entering sewage and drainage systems which lead to waterways. Should not be released into the environment. Stop the flow of material, if this is without risk.

Large Spills: Wet down with water and dike for later disposal. Sweep up or gather material and place in appropriate container for disposal. Avoid dust formation. Clean up in accordance with all applicable regulations. Following product recovery, flush area with water.

Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal. This material and its container must be disposed of as hazardous waste.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS. Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

**Environmental precautions**

Avoid release to the environment. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground. Inform appropriate managerial or supervisory personnel of all environmental releases.

**7. Handling and storage****Precautions for safe handling**

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation. Do not breathe dust. Avoid prolonged exposure. Do not taste or swallow. When using, do not eat, drink or smoke. Pregnant or breastfeeding women must not handle this product. Should be handled in closed systems, if possible. Use only outdoors or in a well-ventilated area. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Observe good industrial hygiene practices.

**Conditions for safe storage, including any incompatibilities**

Store locked up. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

**8. Exposure controls/personal protection****Occupational exposure limits****US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

Material	Type	Value
CADMIUM (CAS 7440-43-9)	TWA	0.005 mg/m <sup>3</sup>

**US. OSHA Table Z-2 (29 CFR 1910.1000)**

Material	Type	Value	Form
CADMIUM (CAS 7440-43-9)	Ceiling	0.6 mg/m <sup>3</sup>	Dust.
		0.3 mg/m <sup>3</sup>	Fume.
	TWA	0.2 mg/m <sup>3</sup>	Dust.
		0.1 mg/m <sup>3</sup>	Fume.

**US. ACGIH Threshold Limit Values**

Material	Type	Value	Form
CADMIUM (CAS 7440-43-9)	TWA	0.01 mg/m <sup>3</sup>	
		0.002 mg/m <sup>3</sup>	Respirable fraction.

**Biological limit values****US. ACGIH. BEIs. Biological Exposure Indices**

Material	Value	Determinant	Specimen	Sampling Time
CADMIUM (CAS 7440-43-9)	5 µg/g	Cadmium	Creatinine in urine	*
	5 µg/l	Cadmium	Blood	*

\* - For sampling details, please see the source document.

**Appropriate engineering controls**

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

**Individual protection measures, such as personal protective equipment****Eye/face protection**

Wear chemical goggles.

**Skin protection****Hand protection**

Wear appropriate chemical resistant gloves.

<b>Other</b>	Wear suitable protective clothing. Use of an impervious apron is recommended.
<b>Respiratory protection</b>	Respirator must be worn if exposed to dust.
<b>Thermal hazards</b>	Wear appropriate thermal protective clothing, when necessary.
<b>General hygiene considerations</b>	When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

## 9. Physical and chemical properties

<b>Appearance</b>	Granular.
<b>Physical state</b>	Solid.
<b>Form</b>	Solid.
<b>Color</b>	metallic silver.
<b>Odor</b>	Odorless.
<b>Odor threshold</b>	Not available.
<b>pH</b>	Not available.
<b>Melting point/freezing point</b>	609.8 °F (321 °C)
<b>Initial boiling point and boiling range</b>	1409 °F (765 °C)
<b>Flash point</b>	Not available.
<b>Evaporation rate</b>	Not available.
<b>Flammability (solid, gas)</b>	Not available.
<b>Upper/lower flammability or explosive limits</b>	
<b>Flammability limit - lower (%)</b>	Not available.
<b>Flammability limit - upper (%)</b>	Not available.
<b>Explosive limit - lower (%)</b>	Not available.
<b>Explosive limit - upper (%)</b>	Not available.
<b>Vapor pressure</b>	Not available.
<b>Vapor density</b>	Not available.
<b>Relative density</b>	Not available.
<b>Solubility(ies)</b>	
<b>Solubility (water)</b>	Insoluble
<b>Partition coefficient (n-octanol/water)</b>	Not available.
<b>Auto-ignition temperature</b>	482 °F (250 °C)
<b>Decomposition temperature</b>	Not available.
<b>Viscosity</b>	Not available.
<b>Other information</b>	
<b>Density</b>	8.65 g/cm <sup>3</sup> at 25 °C
<b>Molecular formula</b>	Cd
<b>Molecular weight</b>	112.41 g/mol
<b>Particle size</b>	< 250 µm
<b>Specific gravity</b>	8.65

## 10. Stability and reactivity

<b>Reactivity</b>	The product is stable and non-reactive under normal conditions of use, storage and transport.
<b>Chemical stability</b>	Material is stable under normal conditions.
<b>Possibility of hazardous reactions</b>	Hazardous polymerization does not occur.
<b>Conditions to avoid</b>	Moisture. Contact with incompatible materials.
<b>Incompatible materials</b>	Acids. Strong oxidizing agents.
<b>Hazardous decomposition products</b>	Hydrogen gas.

## 11. Toxicological information

### Information on likely routes of exposure

<b>Inhalation</b>	Fatal if inhaled.
<b>Skin contact</b>	No adverse effects due to skin contact are expected.
<b>Eye contact</b>	Direct contact with eyes may cause temporary irritation.
<b>Ingestion</b>	Toxic if swallowed.

**Symptoms related to the physical, chemical and toxicological characteristics** Diarrhea. Headache. Nausea, vomiting. Coughing.

### Information on toxicological effects

**Acute toxicity** Fatal if inhaled. Toxic if swallowed.

Product	Species	Test Results
CADMIUM (CAS 7440-43-9)		
<b>Acute</b>		
<i>Inhalation</i>		
LC50	Rat	0.025 mg/l, 900 Days
<i>Oral</i>		
LD50	Mouse	890 mg/kg
	Rat	225 mg/kg
<i>Other</i>		
LD50	Mouse	5.7 mg/kg

\* Estimates for product may be based on additional component data not shown.

**Skin corrosion/irritation** Prolonged skin contact may cause temporary irritation.

**Serious eye damage/eye irritation** Direct contact with eyes may cause temporary irritation.

### Respiratory or skin sensitization

**Respiratory sensitization** Not available.

**Skin sensitization** This product is not expected to cause skin sensitization.

**Germ cell mutagenicity** Suspected of causing genetic defects.

**Carcinogenicity** May cause cancer.

### IARC Monographs. Overall Evaluation of Carcinogenicity

CADMIUM (CAS 7440-43-9) 1 Carcinogenic to humans.

### US OSHA Hazard Categories (1)

CADMIUM (CAS 7440-43-9) Cancer

### US. National Toxicology Program (NTP) Report on Carcinogens

CADMIUM (CAS 7440-43-9) Known To Be Human Carcinogen.

**Reproductive toxicity** Suspected of damaging the unborn child. Suspected of damaging fertility.

**Specific target organ toxicity - single exposure** Not classified.

**Specific target organ toxicity - repeated exposure** Causes damage to organs through prolonged or repeated exposure.

**Aspiration hazard** Not available.

**Chronic effects** Prolonged inhalation may be harmful. Prolonged exposure may cause chronic effects. Causes damage to organs through prolonged or repeated exposure.

## 12. Ecological information

**Ecotoxicity** Very toxic to aquatic life with long lasting effects.

Product	Species	Test Results
CADMIUM (CAS 7440-43-9)		
<b>Aquatic</b>		
Crustacea	EC50 Water flea (Daphnia magna)	0.0491 mg/l, 48 hours

Product	Species	Test Results
Fish	LC50 Rainbow trout,donaldson trout (Oncorhynchus mykiss)	0.0024 - 0.0029 mg/l, 96 hours

\* Estimates for product may be based on additional component data not shown.

<b>Persistence and degradability</b>	None known.
<b>Bioaccumulative potential</b>	No data available.
<b>Mobility in soil</b>	No data available.
<b>Other adverse effects</b>	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

### 13. Disposal considerations

<b>Disposal instructions</b>	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.
<b>Local disposal regulations</b>	Dispose in accordance with all applicable regulations.
<b>Hazardous waste code</b>	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

### 14. Transport information

#### DOT

<b>UN number</b>	UN2570
<b>UN proper shipping name</b>	Cadmium compounds (CADMIUM), MARINE POLLUTANT
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGI, II)
<b>Subsidiary risk</b>	-
<b>Label(s)</b>	6.1
<b>Packing group</b>	II
<b>Environmental hazards</b>	
<b>Marine pollutant</b>	Yes
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.
<b>Special provisions</b>	IB8, IP2, IP4, T3, TP33
<b>Packaging exceptions</b>	153
<b>Packaging non bulk</b>	212
<b>Packaging bulk</b>	242

#### IATA

<b>UN number</b>	UN2570
<b>UN proper shipping name</b>	Cadmium compound (CADMIUM)
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGI, II)
<b>Subsidiary risk</b>	-
<b>Packing group</b>	II
<b>Environmental hazards</b>	No.
<b>ERG Code</b>	6L
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.
<b>Other information</b>	
<b>Passenger and cargo aircraft</b>	Allowed.
<b>Cargo aircraft only</b>	Allowed.

#### IMDG

<b>UN number</b>	UN2570
<b>UN proper shipping name</b>	CADMIUM COMPOUND (CADMIUM), MARINE POLLUTANT
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGI, II)

**Subsidiary risk** -  
**Packing group** II  
**Environmental hazards**  
**Marine pollutant** Yes  
**EmS** F-A, S-A  
**Special precautions for user** Read safety instructions, SDS and emergency procedures before handling.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** Not applicable.

**DOT**



**IATA; IMDG**



**Marine pollutant**



## 15. Regulatory information

**US federal regulations** This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.  
 All components are on the U.S. EPA TSCA Inventory List.

### **TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**

Not regulated.

### **CERCLA Hazardous Substance List (40 CFR 302.4)**

CADMIUM (CAS 7440-43-9) Listed.

### **SARA 304 Emergency release notification**

Not regulated.

### **US OSHA Hazard Categories (1)**

CADMIUM (CAS 7440-43-9) Cancer

### **US OSHA Hazard Categories (2)**

CADMIUM (CAS 7440-43-9) Lung

### **US OSHA Hazard Categories (3)**

CADMIUM (CAS 7440-43-9) Kidney

### **US OSHA Hazard Categories (4)**

CADMIUM (CAS 7440-43-9) Acute toxicity

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

**Hazard categories**  
 Immediate Hazard - Yes  
 Delayed Hazard - Yes  
 Fire Hazard - No  
 Pressure Hazard - No  
 Reactivity Hazard - No

**SARA 302 Extremely hazardous substance**

Not listed.

**SARA 311/312** Yes  
**Hazardous chemical**

**SARA 313 (TRI reporting)**

Chemical name	CAS number	% by wt.
CADMIUM	7440-43-9	100

**Other federal regulations****Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List**

CADMIUM (CAS 7440-43-9)

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)**

Not regulated.

**Clean Water Act (CWA)** Priority pollutant  
**Section 112(r) (40 CFR 68.130)** Toxic pollutant

**Safe Drinking Water Act (SDWA)** 0.005 mg/l  
 0.005 mg/l

**US state regulations****US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)**

Not listed.

**US. Massachusetts RTK - Substance List**

CADMIUM (CAS 7440-43-9)

**US. New Jersey Worker and Community Right-to-Know Act**

CADMIUM (CAS 7440-43-9)

**US. Pennsylvania Worker and Community Right-to-Know Law**

CADMIUM (CAS 7440-43-9)

**US. Rhode Island RTK**

CADMIUM (CAS 7440-43-9)

**US. California Proposition 65**

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

**US - California Proposition 65 - CRT: Listed date/Carcinogenic substance**

CADMIUM (CAS 7440-43-9) Listed: October 1, 1987

**US - California Proposition 65 - CRT: Listed date/Developmental toxin**

CADMIUM (CAS 7440-43-9) Listed: May 1, 1997

**US - California Proposition 65 - CRT: Listed date/Male reproductive toxin**

CADMIUM (CAS 7440-43-9) Listed: May 1, 1997

**International Inventories**

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes



<b>Country(s) or region</b>	<b>Inventory name</b>	<b>On inventory (yes/no)*</b>
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

\*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

## 16. Other information, including date of preparation or last revision

**Issue date** June-11-2015

**Version #** 01

**Disclaimer** GFS Chemicals cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

**Revision Information** Product and Company Identification: Product Codes  
Composition / Information on Ingredients: Disclosure Overrides  
Physical & Chemical Properties: Multiple Properties  
Transport Information: Proper Shipping Name/Packing Group

# Chromium



# Fisher Scientific

Part of Thermo Fisher Scientific

## SAFETY DATA SHEET

Creation Date 13-Sep-2013

Revision Date 21-Jul-2015

Revision Number 2

### 1. Identification

**Product Name** Chromium

**Cat No. :** C318-500

**Synonyms** Chrome

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

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

**Company**

Fisher Scientific  
One Reagent Lane  
Fair Lawn, NJ 07410  
Tel: (201) 796-7100

**Emergency Telephone Number**

CHEMTREC®, Inside the USA: 800-424-9300  
CHEMTREC®, Outside the USA: 001-703-527-3887

### 2. Hazard(s) identification

**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Specific target organ toxicity (single exposure) Category 3  
Target Organs - Respiratory system.

**Label Elements**

**Signal Word**

Warning

**Hazard Statements**

May cause respiratory irritation



**Precautionary Statements**

**Prevention**

Avoid breathing dust/fume/gas/mist/vapors/spray  
Use only outdoors or in a well-ventilated area

**Inhalation**

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing  
Call a POISON CENTER or doctor/physician if you feel unwell

**Storage**

Store in a well-ventilated place. Keep container tightly closed  
Store locked up

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

Very toxic to aquatic life

### 3. Composition / information on ingredients

Component	CAS-No	Weight %
Chromium	7440-47-3	>95

### 4. First-aid measures

<b>General Advice</b>	If symptoms persist, call a physician.
<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.
<b>Inhalation</b>	Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.
<b>Ingestion</b>	Do not induce vomiting. Obtain medical attention.
<b>Most important symptoms/effects Notes to Physician</b>	None reasonably foreseeable. Treat symptomatically

### 5. Fire-fighting measures

<b>Unsuitable Extinguishing Media</b>	Carbon dioxide (CO <sub>2</sub> )
<b>Flash Point</b>	Not applicable
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	Not applicable
<b>Explosion Limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

**Specific Hazards Arising from the Chemical**

Dust can form an explosive mixture in air. Do not allow run-off from fire fighting to enter drains or water courses.

**Hazardous Combustion Products**

Chromium oxide

**Protective Equipment and Precautions for Firefighters**

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

<b>Health</b> 2	<b>Flammability</b> 1	<b>Instability</b> 1	<b>Physical hazards</b> N/A
--------------------	--------------------------	-------------------------	--------------------------------

## 6. Accidental release measures

<b>Personal Precautions</b>	Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation.
<b>Environmental Precautions</b>	Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.
<b>Methods for Containment and Clean Up</b>	Avoid dust formation. Sweep up or vacuum up spillage and collect in suitable container for disposal. Keep in suitable, closed containers for disposal.

## 7. Handling and storage

<b>Handling</b>	Avoid dust formation. Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.
<b>Storage</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere.

## 8. Exposure controls / personal protection

### Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Chromium	TWA: 0.5 mg/m <sup>3</sup>	(Vacated) TWA: 1 mg/m <sup>3</sup> TWA: 1 mg/m <sup>3</sup>	IDLH: 250 mg/m <sup>3</sup> TWA: 0.5 mg/m <sup>3</sup>

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Chromium	TWA: 0.5 mg/m <sup>3</sup>	TWA: 0.5 mg/m <sup>3</sup>	TWA: 0.5 mg/m <sup>3</sup>

### Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

<b>Engineering Measures</b>	Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.
-----------------------------	---

### Personal Protective Equipment

<b>Eye/face Protection</b>	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
<b>Skin and body protection</b>	Wear appropriate protective gloves and clothing to prevent skin exposure.
<b>Respiratory Protection</b>	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
<b>Hygiene Measures</b>	Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Powder
<b>Appearance</b>	Silver
<b>Odor</b>	Odorless
<b>Odor Threshold</b>	No information available
<b>pH</b>	No information available
<b>Melting Point/Range</b>	1857.2 °C / 3375 °F

<b>Boiling Point/Range</b>	2640 °C / 4784 °F
<b>Flash Point</b>	Not applicable
<b>Evaporation Rate</b>	Not applicable
<b>Flammability (solid,gas)</b>	No information available
<b>Flammability or explosive limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Vapor Pressure</b>	No information available
<b>Vapor Density</b>	Not applicable
<b>Relative Density</b>	7.2
<b>Solubility</b>	Insoluble in water
<b>Partition coefficient; n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	Not applicable
<b>Decomposition Temperature</b>	No information available
<b>Viscosity</b>	Not applicable
<b>Molecular Formula</b>	Cr
<b>Molecular Weight</b>	51.996

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	Sensitive to air.
<b>Conditions to Avoid</b>	Incompatible products. Excess heat. Avoid dust formation.
<b>Incompatible Materials</b>	Strong oxidizing agents, Strong acids
<b>Hazardous Decomposition Products</b>	Chromium oxide
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### **Component Information** **Toxicologically Synergistic** **Products**

No information available

#### **Delayed and immediate effects as well as chronic effects from short and long-term exposure**

<b>Irritation</b>	May cause irritation of respiratory tract
<b>Sensitization</b>	No information available
<b>Carcinogenicity</b>	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Chromium	7440-47-3	Not listed	Not listed	Not listed	Not listed	Not listed

<b>Mutagenic Effects</b>	No information available
<b>Reproductive Effects</b>	No information available.
<b>Developmental Effects</b>	No information available.
<b>Teratogenicity</b>	No information available.
<b>STOT - single exposure</b>	Respiratory system
<b>STOT - repeated exposure</b>	None known

**Aspiration hazard** No information available

**Symptoms / effects, both acute and delayed** No information available

**Endocrine Disruptor Information** No information available

**Other Adverse Effects** The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

## 12. Ecological information

### Ecotoxicity

The product contains following substances which are hazardous for the environment. Very toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Chromium	Not listed	LC50: 14.3 mg/l/96 H (Pimephales promelas)	Not listed	EC50: 0.07 mg/l/48 H

**Persistence and Degradability** Insoluble in water  
**Bioaccumulation/ Accumulation** No information available.

**Mobility** Is not likely mobile in the environment due its low water solubility.

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

### DOT

**UN-No** UN3077  
**Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.  
**Proper technical name** Chromium  
**Hazard Class** 9  
**Packing Group** III

### TDG

**UN-No** UN3077  
**Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.  
**Hazard Class** 9  
**Packing Group** III

### IATA

**UN-No** UN3077  
**Proper Shipping Name** Environmentally hazardous substance, solid, n.o.s  
**Hazard Class** 9  
**Packing Group** III

### IMDG/IMO

**UN-No** UN3077  
**Proper Shipping Name** Environmentally hazardous substance, solid, n.o.s  
**Hazard Class** 9  
**Packing Group** III

## 15. Regulatory information

### International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Chromium	X	X	-	231-157-5	-		X	-	X	X	X

#### Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

### U.S. Federal Regulations

TSCA 12(b) Not applicable

### SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Chromium	7440-47-3	>95	1.0

### SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

### Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Chromium	-	-	X	X

### Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Chromium	X		-

OSHA Occupational Safety and Health Administration

Not applicable

### CERCLA

Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Chromium	5000 lb 10 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

### State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Chromium	X	X	X	X	X

### U.S. Department of Transportation

Reportable Quantity (RQ): N

DOT Marine Pollutant N

DOT Severe Marine Pollutant N

### U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

### Other International Regulations



Mexico - Grade No information available

**Canada**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class D2B Toxic materials



## 16. Other information

**Prepared By** Regulatory Affairs  
Thermo Fisher Scientific  
Email: EMSDS.RA@thermofisher.com

**Creation Date** 13-Sep-2013

**Revision Date** 21-Jul-2015

**Print Date** 21-Jul-2015

**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

**End of SDS**

# Copper

## SAFETY DATA SHEET

Version 4.6  
 Revision Date 02/27/2015  
 Print Date 05/01/2016

### 1. PRODUCT AND COMPANY IDENTIFICATION

#### 1.1 Product identifiers

Product name : Copper

Product Number : 326445  
 Brand : Aldrich

CAS-No. : 7440-50-8

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

Identified uses : Laboratory chemicals, Manufacture of substances

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

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

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

#### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

### 2. HAZARDS IDENTIFICATION

#### 2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

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

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

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1 Substances

Synonyms : Environmental hazard is applicable to copper powders, with particle size > 10µm and <1 mm.  
 COPPER - non flammable forms

Formula : Cu  
 Molecular weight : 63.55 g/mol  
 CAS-No. : 7440-50-8  
 EC-No. : 231-159-6

#### Hazardous components

Component	Classification	Concentration
<b>Copper</b>		<= 100 %

---

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### **If inhaled**

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

#### **In case of skin contact**

Wash off with soap and plenty of water.

#### **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.

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

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

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

No data available

---

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

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

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

Copper oxides

### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information

No data available

---

## 6. ACCIDENTAL RELEASE MEASURES

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

Avoid dust formation. Avoid breathing vapours, mist or gas.

For personal protection see section 8.

### 6.2 Environmental precautions

No special environmental precautions required.

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

Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

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

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

Store under inert gas. Air sensitive.

Storage class (TRGS 510): Non Combustible Solids

### 7.3 Specific end use(s)

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

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Copper	7440-50-8	TWA	1.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Irritation Gastrointestinal metal fume fever		
		TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Irritation Gastrointestinal metal fume fever		
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.100000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants

### 8.2 Exposure controls

#### Appropriate engineering controls

General industrial hygiene practice.

#### Personal protective equipment

##### Eye/face protection

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

##### Skin protection

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

##### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

##### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

### Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

### Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

### Control of environmental exposure

No special environmental precautions required.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

a) Appearance	Form: Bars Colour: light red
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 1,083.4 °C (1,982.1 °F) - lit.
f) Initial boiling point and boiling range	2,567 °C (4,653 °F) - lit.
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	8.94 g/mL at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

### 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

- 10.2 Chemical stability**  
Stable under recommended storage conditions.
- 10.3 Possibility of hazardous reactions**  
No data available
- 10.4 Conditions to avoid**  
No data available
- 10.5 Incompatible materials**  
Strong acids, Strong oxidizing agents, Acid chlorides, Halogens
- 10.6 Hazardous decomposition products**  
Other decomposition products - No data available  
In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

**Acute toxicity**

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - 3.5 mg/kg

**Skin corrosion/irritation**

No data available

**Serious eye damage/eye irritation**

No data available

**Respiratory or skin sensitisation**

No data available

**Germ cell mutagenicity**

No data available

**Carcinogenicity**

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

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

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

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

**Reproductive toxicity**

No data available

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: GL5325000

Symptoms of systemic copper poisoning may include: capillary damage, headache, cold sweat, weak pulse, and kidney and liver damage, central nervous system excitation followed by depression, jaundice, convulsions, paralysis, and coma. Death may occur from shock or renal failure. Chronic copper poisoning is typified by hepatic cirrhosis, brain damage and demyelination, kidney defects, and copper deposition in the cornea as exemplified by humans with Wilson's disease. It has also been reported that copper poisoning has lead to hemolytic anemia and accelerates arteriosclerosis.

---

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

No data available

### 12.2 Persistence and degradability

### 12.3 Bioaccumulative potential

No data available

### 12.4 Mobility in soil

No data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

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

#### Contaminated packaging

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

Not dangerous goods

### IMDG

Not dangerous goods

### IATA

Not dangerous goods

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

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

### SARA 313 Components

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

### SARA 311/312 Hazards

No SARA Hazards

### Massachusetts Right To Know Components

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

### Pennsylvania Right To Know Components

Copper	CAS-No. 7440-50-8	Revision Date 1989-08-11
--------	----------------------	-----------------------------

### New Jersey Right To Know Components

Copper	CAS-No. 7440-50-8	Revision Date 1989-08-11
--------	----------------------	-----------------------------



**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****HMIS Rating**

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

**NFPA Rating**

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

**Further information**

Copyright 2015 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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 Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

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

Version: 4.6

Revision Date: 02/27/2015

Print Date: 05/01/2016

# Cyanide

# SAFETY DATA SHEET



## CYANCO® SODIUM CYANIDE, BRICKS 98% ± 1%

Doc. No. COR-UNI-EHSS-SDS-002  
Version 2.0 US

Revision Date: 1/18/2013  
Print Date: 4/2/2013

This SDS adheres to the standards and regulatory requirements of the United States and may not meet the regulatory requirements of other countries.

### SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Tradename/Synonym : Cyanco® Sodium Cyanide, Bricks 98% ± 1%  
Product Use : For Industrial Use  
Function : Electroplating Agent  
Gold Mining  
Company : Cyanco  
9450 Double R Blvd.  
Suite 2  
Reno, NV 89521  
USA

#### Medical Emergency

**US: Poison Control Center** : 800.222.1222

#### Transport Emergency

**US: CHEMTREC** : 800.424.9300

**Canada: CANUTEC** : 613.996.6666

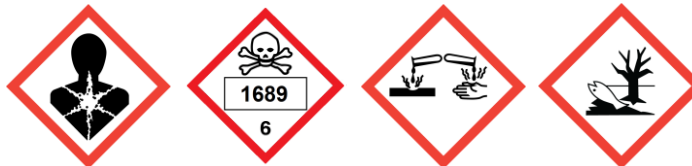
Product Information : 832.590.3644

Telefax : 713.436.5202

Contact Person : SDS Coordinator, 832.590.3644

### SECTION 2. HAZARDS IDENTIFICATION

#### Emergency Overview



- Very toxic by inhalation, in contact with skin and if swallowed.
- Contact with acids liberates very toxic gas.
- Irritating to eyes and skin.
- Very toxic to aquatic organisms.
- May cause long-term adverse effects in the aquatic environment.
- Causes severe eye burns.
- Under the action of acids (as well as carbon dioxide) hydrocyanic acid is released which is combustible and may react with air to form explosive gas mixtures.
- Hydrocyanic acid may cause all degrees of poisoning.

#### Precautions

Eye Contact : Corrosive. May cause burns resulting in permanent damage.  
Skin Contact : Very toxic. May be fatal if absorbed through the skin.  
Inhalation : Very toxic. May be fatal if inhaled.  
Ingestion : Very toxic. May be fatal if swallowed.  
Repeated Exposure : Adverse effects from long-term exposure may include: thyroid dysfunction, central nervous system effects.  
Target Organs : Central Nervous System, Respiratory System, Thyroid  
Carcinogenicity : None of the components in this material ≥ 0.1% are listed by OSHA, NTP or IARC as a carcinogen.  
Potential Environmental Effect : Very toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

# SAFETY DATA SHEET



## CYANCO® SODIUM CYANIDE, BRICKS 98% ± 1%

Doc. No. COR-UNI-EHSS-SDS-002  
Version 2.0 US

Revision Date: 1/18/2013  
Print Date: 4/2/2013

### SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

#### Information on Ingredients / Hazardous Components

Sodium Cyanide	CAS No.	143-33-9	Percent (Wt. / Wt.)	97 – 99%
	EC No.	205-599-4		

Other Information : This material is classified as hazardous under OSHA regulations.

### SECTION 4. FIRST AID MEASURES

#### General Advice

**WARNING!** If exposed to sodium cyanide, seek qualified medical attention immediately!  
Rescuers or medical responders should first of all protect themselves from exposure!  
Decontaminate the victim to prevent further absorption and exposure to rescuers and monitor vital signs.

- Skin Contact** • No cases of cyanide intoxication have been observed to date following contact with dry sodium cyanide on dry skin free of injuries. However, if the dry sodium cyanide comes in contact with moisture or acids, then hydrogen cyanide may be released, causing cyanide intoxication. • May cause caustic burns to skin upon contact due to high pH. • Wash off immediately using large amounts of water (and soap if available) while removing all contaminated clothes and shoes. • Immediately contact or summon an emergency physician in case of intoxication symptoms.
- Eye Contact** • In case of contact with the eyes, immediately flush eyes with copious amounts of water for a minimum of 15 minutes while removing clothes. • It is important to seek medical attention for all eye exposures due to potential caustic burns to the eyes. • Immediately contact or summon an emergency physician in case of intoxication symptoms. • An ophthalmologist should also be consulted for evaluation of caustic burns to the eyes.  
**Note:** Eye burns may not be apparent for up to 48 hours post exposure due to the caustic properties of sodium cyanide.
- Inhalation** • Inhalation is possible if cyanide is in the form of aerosols, mists, dusts, or smoke. • Never perform direct mouth-to-mouth or mouth-to-nose artificial respiration. • Use artificial respiration bag or respirator due to the potential danger of poisoning the rescuers! • Maintain an open airway. • In case of breathing difficulties immediately apply oxygen. • Immediately contact an emergency physician and notify of cyanide / hydrocyanic acid poisoning.
- Ingestion** • Thoroughly rinse mouth with water. • Seek professional medical care immediately. • Do not induce vomiting. • Call emergency physician immediately and notify of cyanide / hydro-cyanic acid poisoning. • Immediately transport to a medical facility.

#### Notes to Physician

**IMPORTANT:** Specific antidote and treatment may vary by region. If you are not familiar with current treatment recommendations, you should contact the Poison Control Center for your region or country for specific recommendations and guidelines (by matt redmond).

**Possible Signs of Poisoning** Intoxication is classified by 2 categories: • Mild poisoning • Severe poisoning

The following symptoms are not sufficient to ensure a correct diagnosis:

Symptoms of the Central Nervous System **Early Stage:** • headache • dizziness • drowsiness • nausea  
**Advanced Stage:** • seizures • coma

Pulmonary Symptoms **Early Stage:** • dyspnea • tachypnea  
**Advanced Stage:** • hyperventilation • Cheyne-Stokes respiration • apnea

# SAFETY DATA SHEET



## CYANCO® SODIUM CYANIDE, BRICKS 98% ± 1%

Doc. No. COR-UNI-EHSS-SDS-002  
Version 2.0 US

Revision Date: 1/18/2013  
Print Date: 4/2/2013

### Cardiovascular Symptoms

**Early Stage:** • hypertension • sinus arrhythmia • atrioventricular arrhythmia  
• bradycardia  
**Advanced Stage:** • tachycardia • complex arrhythmia • cardiac arrest

### Skin Symptoms

**Early Stage:** • rosy skin color  
**Advanced Stage:** • cyanosis

### Effect on the Metabolism

Lactate acidosis: pH 7.1 and lactate level of 17 mmol/l are described.

### **Treatment**

The treatment advice may vary by region. Contact a regional poison control center for appropriate antidote treatment used in your region.

**CAUTION:** This is an outline of antidotes available for informational purposes. It is important for the treating physician to be familiar with the administration of cyanide antidotes available in the country where the chemical is being used! Rapid treatment with appropriate antidote therapy is essential to saving lives during a high dose acute exposure to cyanide.

**NOTE:** Removal of toxic substance has equal importance to implementation of antidote therapy.

### Mild Poisoning

- Treatment is dependent on clinical presentation with symptoms and history of exposure (related to dose).
- 100% oxygen (medical grade) and artificial respiration if indicated.
- Closely monitor patient and their vital signs (blood pressure, pulse and respirations).
- Monitor the patient for onset of symptoms or deterioration of status.
- Depending on the pathology and clinical findings, based on strictly monitored controls of the clinical findings, it may be necessary for the physician to implement symptom-oriented treatment for pulmonary edema prophylaxis.
- X-rays of the lungs may be necessary for pulmonary edema diagnosis.

### Severe Poisoning

- Specific antidote treatment can be indicated for moderate to severe cyanide intoxication.
- It is important to know that there are several different types of antidotes available for treatment of cyanide intoxication in different countries.

### For All Cyanide Exposure

- All cyanide exposed persons should undergo continued monitoring for several hours, even if patient feels well to ensure there are no residual or recurrent poisoning symptoms.
- Artificial respiration with 100% oxygen (medical grade).
- Immediate antidote administration with the legal antidote for the country of the exposure.

## **Commonly Used Antidotes**

### Met hemoglobin-Forming Agent

Nitrite Therapy: amyl nitrite, sodium nitrite, sodium thiosulfate.

For Moderate to Severe Exposures (patient still conscious)

Amyl Nitrite Spirols: 1-3 spirols administered as an inhalant, held 1-2 inches under the nose for 15 seconds, and then remove for 15 seconds. Read medication information insert prior to administering.

Sodium nitrite 300-600 mg administered intravenously over a period of 5 to 15 minutes.  
Sodium thiosulfate (12.5 g - 100-500 mg/kg weight) intravenously over a period of 15-20 minutes. If patient is conscious, then Sodium thiosulfate may be administered as an antidote by itself: (See antidote package information insert).

Sodium thiosulfate (12.5 g - 100-500 mg/kg weight) IV may be administered depending on the clinical presentation and symptoms.

### Complexing Antidote Agent

Hydroxocobalamin - commonly known as the Cyanokit®.

Treatment as Follows:

Administer hydroxocobalamin (Cyanokit®) 5 g i.v. (70 mg/kg b.w. in adults) by infusion over a period of 20-30 minutes. Administration of this dose can be repeated as required depending on the severity of poisoning. Infusion time for repeated dose: 30 minutes to 2 hours.

The only permissible route of administration for hydroxocobalamin is intravenously. The

# SAFETY DATA SHEET



## CYANCO® SODIUM CYANIDE, BRICKS 98% ± 1%

Doc. No. COR-UNI-EHSS-SDS-002  
Version 2.0 US

Revision Date: 1/18/2013  
Print Date: 4/2/2013

physician should read the medication package information carefully to ensure proper reconstitution to liquid state and administration of antidote!

### SECTION 5. FIRE-FIGHTING MEASURES

#### Flammable Properties

Flash Point	Not Combustible
Lower Explosion Limit	Not Applicable
Upper Explosion Limit	Not Applicable
Autoignition Temperature	Not Applicable
Suitable Extinguishing Media	Quenching Powder In case of fire in the surroundings: alkali powder quenching agent.
Unsuitable Extinguishing Media	Carbon dioxide (CO <sub>2</sub> ) <u>must not</u> be used for safety reasons.
Exposure Hazards During Fire Fighting	Hydrocyanic acid (hydrogen cyanide) may be released in case of fire.
Personal Protective Equipment for Fire Fighters	As in any fire, wear self-contained positive-pressure breathing apparatus, (MSHA/NIOSH approved or equivalent) and full protective gear.

#### Further Information

- Standard procedure for chemical fires. Ensure there are sufficient retaining facilities for water used to extinguish fire.
- Water used to extinguish fire should not enter drainage systems, soil or stretches of water.
- Contaminated fire-extinguishing water must be disposed of in accordance with the regulations issued by the appropriate local authorities.
- Fire residues should be disposed of in accordance with local, state and federal regulations.

### SECTION 6. ACCIDENTAL RELEASE MEASURES

<b>Personnel Precautions</b>	• Wear personal protective equipment. • Keep out unprotected persons. • Keep unauthorized persons away. • Ensure sufficient ventilation. • Avoid skin contact because of the danger of skin absorption. • Make safe or remove all sources of ignition.
<b>Environmental Precautions</b>	• Do not allow entrance in soil, stretches of water, groundwater, drainage systems or surface water. • Cyanide-containing sewage water and solutions must be decontaminated before entering a public canal, network or stretch of water. • Do not use a neutralizing agent if runoff can enter nearby streams, rivers or other surface waterways. • On contact with acid, hydrogen cyanide is produced.
<b>Methods for Cleanup in the Event of a Spill</b>	• Pick up mechanically if in solid form. • Absorb with liquid-binding material e.g., inert absorbent if in solution. • Collect in suitable containers. • Dispose of material in accordance with local, state and federal regulations. • Waste to be packed like clean product and to be properly labeled. • Identification label on packages not to be removed until recycled.

### SECTION 7. HANDLING & STORAGE

**NOTE:** Always have on hand a cyanide antidote kit and trained medical responders who can administer first aid before beginning work with this product.

#### Handling

Safe Handling Advice	• Container may be opened only under exhaust ventilation hood. • Seal container hermetically immediately after use. • Store under lock and key or in a way that qualified persons have access to it. • Use caution when opening the package, since toxic and caustic gases and vapors may escape.
----------------------	--

# SAFETY DATA SHEET



## CYANCO® SODIUM CYANIDE, BRICKS 98% ± 1%

Doc. No. COR-UNI-EHSS-SDS-002  
Version 2.0 US

Revision Date: 1/18/2013  
Print Date: 4/2/2013

Advice on Protection Against Fire and Explosion

- The product is not combustible. • See Section 5.

### Storage

Requirements for Storage Areas and Containers

- Keep container tightly sealed and store in a dry, well-ventilated place. • Ensure there are sufficient retaining facilities for water used to extinguish fire.

Unsuitable Materials

- Aluminum • Brass • Copper

Advice on Common Storage

- Do not store together with acid and acidic salts. • Keep away from food, drink and animal feedstuffs.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### Product Occupational Exposure Guidelines

Sodium Cyanide	CAS-No. 143-33-9	EC No. 205-599-4
PEL (OSHA)	5mg/m <sup>3</sup> as CN 8-hr Time-Weighted Avg	Skin Designation
TLV (ACGIH)	5 mg/m <sup>3</sup> as CN Ceiling Limit	Skin Designation

### Component Occupational Exposure Guidelines

Hydrogen Cyanide	CAS-No. 74-90-8	EC No. 200-821-6
PEL (OSHA)	10 ppm as CN 8-hr Time-Weighted Avg	Skin Designation
	11mg/m <sup>3</sup> as CN 8-hr Time-Weighted Avg	Skin Designation
TLV (ACGIH)	4.7 ppm as CN Ceiling Limit	Skin Designation
	5 mg/m <sup>3</sup> as CN Ceiling Limit	Skin Designation

### Engineering controls

- Engineer out the risk of exposure if feasible. • Ensure suitable ventilation at the work place and with operational machinery.

### Personal Protective Equipment

Respiratory Protection

- A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2 or applicable state/federal requirements must be followed whenever workplace conditions warrant respirator use. • NIOSH's "Respirator Decision Logic" may be useful in determining the suitability of various types of respirators.

Hand Protection

- Natural Rubber • Nitrile • Polychloroprene w/ natural latex rubber • PVC

**Note:** The above mentioned hand protection is based on knowledge of the chemistry and anticipated uses of this product but it may not be appropriate for all workplaces. A hazard assessment should be conducted prior to use to ensure suitability of gloves for specific work environments and processes prior to use.

Eye Protection

- Impact resistant chemical protective goggles • Face-shield with brow guard

# SAFETY DATA SHEET



## CYANCO® SODIUM CYANIDE, BRICKS 98% ± 1%

Doc. No. COR-UNI-EHSS-SDS-002  
Version 2.0 US

Revision Date: 1/18/2013  
Print Date: 4/2/2013

### Skin and Body Protection

- Wear chemical protective suit.
- During cleaning work wear rubber or plastic boots.
- To identify additional Personal Protective Equipment (PPE) requirements, it is recommended that a hazard assessment in accordance with the OSHA PPE Standard (29CFR1910.132) be conducted before using this product.
- A safety shower and eye wash fountain must be readily available.
- Wash contaminated clothing before re-use.

### Hygiene Measures

- Avoid contact with skin.
- After contact with skin, wash immediately with plenty of water.
- No eating, drinking, smoking, chewing gum or snuffing tobacco at work.
- Wash face and/or hands before break and end of work.

### Protective Measures

- All precautionary measures indicated have to be observed.
- The workplace related airborne concentrations have to be kept below the indicated exposure limits.
- If the limits at the workplace are exceeded and/or larger amounts are released (leakage, spilling, dust) the indicated respiratory protection should be used. (see above)

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

### Physical

Form : Solid  
Color : White  
Odor : Odorless

**Note:** Can have bitter almond-like odor if hydrogen cyanide is present. Some people are unable to smell cyanide. Others can smell it at first, but then can be desensitized to the odor.

### Chemical

pH : Approx 12.0  
Aqueous Solution  
Melting point/range : 562 °C  
Boiling point/range : 1497 °C  
Flash Point : Not Combustible  
Flammability : Not Flammable  
Autoignition Temperature : Not Applicable  
Lower Explosion Limit : Not Applicable  
Upper Explosion Limit : Not Applicable  
Vapor Pressure : 100 Pa at 800 °C  
Density : Approx 1.6 g/cm<sup>3</sup> at 20 °C  
Bulk Density : Aporox. 750 – 950 kg/m<sup>3</sup>  
Powder, Granulate, Pellets  
Water Solubility : Approx. 379 g/l at 20 °C  
Approx. 450 g/l at > 35 °C  
Partition Coefficient (N-octanol/water) : log Pow: -0.44  
(calculated)

### Further Information

Miscibility in Water : Completely Miscible

## SECTION 10. STABILITY AND REACTIVITY

### Materials to Avoid

- Under the action of acids (as well as carbon dioxide) hydrocyanic acid is released which is combustible and may react with air to form explosive gas mixtures.
- Keep away from acidic salts.



# SAFETY DATA SHEET



## CYANCO® SODIUM CYANIDE, BRICKS 98% ± 1%

Doc. No. COR-UNI-EHSS-SDS-002  
Version 2.0 US

Revision Date: 1/18/2013  
Print Date: 4/2/2013

Hazardous Decomposition Products • HCN: Hydrogen cyanide (hydrocyanic acid) forms if heated above 300 °C.

### SECTION 11. TOXICOLOGICAL INFORMATION

#### Sodium Cyanide

- Acute Oral Toxicity : LD50 Rat: 5 mg/kg  
Method: Literature
- Acute Dermal Toxicity : LD50 Rabbit(female): 11.8 mg/kg  
Method: Literature
- Skin Irritation : Due to acute dermal toxicity, the irritative effect on the skin cannot be determined.
- Eye Irritation : Rabbit  
Irritating
- Repeated Dose Toxicity : Oral Rat  
Testing Period: 11½ months  
NOAEL: 75 mg/kg  
Target Organ/effect: thyroid, brain  
Feeding experiments  
Chronic  
Oral Rat  
Testing Period: 90 days  
NOAEL: approx. 0.3 mg/kg  
Target Organ/effect: reproductive system  
Drinking Water Analysis  
Subchronic toxicity  
Oral Mouse  
NOAEL: approx. 16.2 mg/kg  
Drinking Water Analysis  
Subchronic toxicity
- Human Toxicity • Inhalation is possible if cyanide is in the form of aerosols, mists, dusts, or smoke. • Very toxic by inhalation and if swallowed. • Inhaling of HCN (at already approx. 200 ppm HCN in the air breathed) or swallowing (approx. 200 - 300 mg NaCN) can result in immediate unconsciousness and death. • Can be absorbed through the skin. • Poisoning has an effect on the central nervous system. • Irritating to eyes, respiratory system and skin. • Following long-term exposure individual cases of thyroid dysfunction have been described with electroplaters and silver polishers.

### SECTION 12. ECOLOGICAL INFORMATION

#### Elimination Information (Persistence and Degradability)

- Biodegradability : Potentially biodegradable  
Abiotic degradation  
Hydrolysis
- Bioaccumulation : Low
- Mobility : In Air: High as HCN

#### Ecotoxicity Effects

- Fish : LC50 *Leuciscus idus melanotus*: 0.07 mg/l
- Daphnia : EC50 *Daphnia magna*: 0.3 mg/l
- Bacteria : EC50 *Escherichia coli*: 0.004 mg/l

# SAFETY DATA SHEET



## CYANCO® SODIUM CYANIDE, BRICKS 98% ± 1%

Doc. No. COR-UNI-EHSS-SDS-002  
Version 2.0 US

Revision Date: 1/18/2013  
Print Date: 4/2/2013

### SECTION 13. DISPOSAL CONSIDERATIONS

#### Waste Disposal

- Waste must be disposed of in accordance with local, state, provincial and federal laws and regulations.
- Empty containers must be handled with care due to product residue.

### SECTION 14. TRANSPORT INFORMATION

#### DOT / AAR / Sea Transport IMDG-Code

Class : 6.1  
UN Number : 1689  
Packing Group : 1  
Proper Shipping Name : SODIUM CYANIDE, SOLID

#### GHS Shipping Labels



Marine Pollutant : Yes

#### Air Transport ICAO-TI/IATA-DGR

Class : 6.1  
UN Number : 1689  
Packing Group : 1  
Proper Shipping Name : SODIUM CYANIDE, SOLID

#### GHS Shipping Labels



#### Loading Instructions/Remarks

IATA\_C : ERG-Code 6L  
IATA\_P : ERG-Code 6L  
IMDG : Do not stow in external container rows

#### Transport/Further Information

Do not store together with acids (danger of toxic gases) or with foodstuffs, consumables and feedstuffs.

**NOTE:** Sodium cyanide is NOT a DOT TIH or PIH.

### SECTION 15. REGULATORY INFORMATION

#### US Federal Regulations

##### OSHA

If listed below, chemical specific standards apply to the product or components:

- None Listed

##### CAA Section 112

If listed below, components present at or above the de minimus level are hazardous air pollutants:

- Sodium Cyanide CAS No. 143-33-9

##### CERCLA Reportable Quantities

If listed below, a reportable quantity (RQ) applies to the product based on the percent of the named component:

- Sodium Cyanide CAS No. 143-33-9 Reportable Quantity: 10 lbs

##### SARA Title III Section 311/312 Hazard Categories

The product meets the criteria only for the listed hazard classes:

- Acute Health Hazard

# SAFETY DATA SHEET



## CYANCO® SODIUM CYANIDE, BRICKS 98% ± 1%

Doc. No. COR-UNI-EHSS-SDS-002  
Version 2.0 US

Revision Date: 1/18/2013  
Print Date: 4/2/2013

### SARA Title III Section 313 Reportable Substances

If listed below, components are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

- Sodium Cyanide CAS No. 143-33-9 Reportable Quantity: 10 lbs

### Toxic Substance Control Act (TSCA)

If listed below, non-proprietary substances are subject to export notification under Section 12 (b) of TSCA:

- None Listed

### **State Regulations**

#### California Prop 65

A warning under the California Drinking Water Act is required only if listed below:

- None Listed

### **Canadian Regulations**

This SDS has been prepared in compliance with the Controlled Product Regulations except for use of the 16 headings.

#### WHMIS Classification

- D1 A • E

### **International Chemical Inventory Status**

Unless otherwise noted, this product is in compliance with the inventory listing of the countries listed below.

#### Listed/registered:

- Europe (EINECS/ELINCS) • USA (TSCA) • Canada (DSL) • Australia (AICS) • Japan (MITI) • Korea (TCCL) • Philippines (PICCS) • China

### **European Union Risk and Safety Phrases**

Risk Sodium cyanide is classified as toxic.

- R25 • R26 • R27 • R28 - Very toxic by inhalation, in contact with skin and if swallowed.
- R32 - Contact with acids liberates very toxic gas.
- R36 • R37 • R38 - Irritating to eyes, respiratory system and skin.
- R41 - Risk of serious damage to the eyes.
- R50 • R53 - Very toxic to aquatic organisms may cause long-term adverse effects in the aquatic environment.
- R55 • R56 • R57 - Toxic to fauna, soil organisms and bees.
- R67 - Vapors may cause drowsiness and dizziness.

Safety Sodium cyanide is a hazardous substance.

- S1 • S2 • S4 - Keep locked up, out of the reach of children and away from living quarters.
- S7 • S9 - Keep container tightly closed and in a well ventilated place.
- S13 • S14 - Keep away from food, drink and animal feeding stuffs, acids, acid salts and carbon dioxide fire extinguishers.
- S18 - Handle and open container with care.
- S20 • S21 - When using do not eat, drink or smoke.
- S22 - Do not breathe dust.
- S24 • S25 - Avoid contact with skin and eyes.
- S26 - In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S27 - Take off immediately all contaminated clothing.
- S28 - After contact with skin, wash immediately with plenty of water.
- S29 - Do not empty into drains.
- S36 • S37 • S39 - Wear suitable protective clothing, gloves and eye/face protection.
- S38 - In case of insufficient ventilation, wear suitable respiratory equipment.
- S40 - To clean the floor and all objects contaminated by this material use sodium or calcium hypochlorite solution.
- S41 • S43 - In case of fire and/or explosion do not breathe fumes, use water, chemical powder or foam. Never use carbon dioxide.
- S45 - In case of accident or if you feel unwell seek medical attention immediately (show the label where possible).
- S46 • S64 - If swallowed, rinse mouth with water (only if the person is conscious), seek medical advice immediately and show this label.
- S50 - Do not mix with carbon dioxide, acids or acid salts

# SAFETY DATA SHEET



## CYANCO® SODIUM CYANIDE, BRICKS 98% ± 1%

Doc. No. COR-UNI-EHSS-SDS-002  
Version 2.0 US

Revision Date: 1/18/2013  
Print Date: 4/2/2013

- S51 - Use only in well-ventilated areas.
- S53 - Avoid exposure – Obtain special instruction before use.
- S56 - Dispose of this material and its container to hazardous or special waste collection point
- S59 - Refer to manufacturer for information on recovery/recycling.
- S57 - Use appropriate containment to avoid environmental contamination.
- S61 - Avoid releases to the environment. Refer to special instructions/Safety data sheet.
- S63 - In case of accident by inhalation: remove casualty to fresh air and keep at rest.

### SECTION 16. OTHER INFORMATION

**HMIS Ratings**                      Health: 3              Flammability: 0              Physical Hazard: 1

#### Further Information

This version replaces all previous versions.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Significant changes since the last version are highlighted in the margin with a double bar.

# Iron

## SAFETY DATA SHEET

Version 4.4  
Revision Date 07/02/2014  
Print Date 04/30/2016

---

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

Product name : Iron

Product Number : 267953  
Brand : Aldrich

CAS-No. : 7439-89-6

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

Identified uses : Laboratory chemicals, Manufacture of substances

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

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

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

**1.4 Emergency telephone number**

Emergency Phone # : (314) 776-6555

---

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

Flammable solids (Category 1), H228

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

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

Pictogram



Signal word : Danger

Hazard statement(s)  
H228 : Flammable solid.

Precautionary statement(s)  
P210 : Keep away from heat/sparks/open flames/hot surfaces. - No smoking.  
P240 : Ground/bond container and receiving equipment.  
P241 : Use explosion-proof electrical/ ventilating/ lighting/ equipment.  
P280 : Wear protective gloves/ protective clothing/ eye protection/ face protection.  
P370 + P378 : In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.

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

---

**3. COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substances**

Aldrich - 267953

Formula : Fe  
Molecular Weight : 55.85 g/mol  
CAS-No. : 7439-89-6  
EC-No. : 231-096-4

#### Hazardous components

Component	Classification	Concentration
<b>Iron, Powder</b>	Flam. Sol. 1; H228	90 - 100 %

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

---

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice

Move out of dangerous area. 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

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

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

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

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

no data available

---

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

#### Suitable extinguishing media

Special powder against metal fire

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

Iron oxides

### 5.3 Advice for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

### 5.4 Further information

Use water spray to cool unopened containers.

---

## 6. ACCIDENTAL RELEASE MEASURES

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

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas.  
For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

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

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

## 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

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

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

Store under inert gas. Moisture sensitive. Keep in a dry place.

### 7.3 Specific end use(s)

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

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

#### Appropriate engineering controls

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

#### Personal protective equipment

##### Eye/face protection

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

##### Skin protection

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

##### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

##### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

##### Body Protection

Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.



### Respiratory protection

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

### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

- |   |  |
|---|--|
| a) Appearance                                   | Form: powder   |
| b) Odour  | no data available  |
| c) Odour Threshold                              | no data available  |
| d) pH   | no data available  |
| e) Melting point/freezing point                 | Melting point/range: 1,535 °C (2,795 °F) - lit.                    |
| f) Initial boiling point and boiling range      | 2,750 °C (4,982 °F) - lit.   |
| g) Flash point                                  | no data available  |
| h) Evaporation rate                             | no data available  |
| i) Flammability (solid, gas)                    | The substance or mixture is a flammable solid with the category 1. |
| j) Upper/lower flammability or explosive limits | no data available  |
| k) Vapour pressure                              | no data available  |
| l) Vapour density                               | no data available  |
| m) Relative density                             | 7.86 g/cm <sup>3</sup> at 25 °C (77 °F)                            |
| n) Water solubility                             | insoluble  |
| o) Partition coefficient: n-octanol/water       | no data available  |
| p) Auto-ignition temperature                    | no data available  |
| q) Decomposition temperature                    | no data available  |
| r) Viscosity                                    | no data available  |
| s) Explosive properties                         | no data available  |
| t) Oxidizing properties                         | no data available  |

### 9.2 Other safety information

- |              |                                     |
|--------------|-------------------------------------|
| Bulk density | 2,500.0 - 3,500.0 kg/m <sup>3</sup> |
|--------------|-------------------------------------|

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

no data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

no data available

#### 10.4 Conditions to avoid

Heat, flames and sparks. Extremes of temperature and direct sunlight.

#### 10.5 Incompatible materials

Acids, Oxygen, Strong oxidizing agents, Halogens, Phosphorus

#### 10.6 Hazardous decomposition products

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

---

### 11. TOXICOLOGICAL INFORMATION

#### 11.1 Information on toxicological effects

##### Acute toxicity

LD50 Oral - rat - 30,000 mg/kg

Remarks: Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

Inhalation: no data available

Dermal: no data available

no data available

##### Skin corrosion/irritation

no data available

##### Serious eye damage/eye irritation

no data available

##### Respiratory or skin sensitisation

no data available

##### Germ cell mutagenicity

no data available

##### Carcinogenicity

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

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

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

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

##### Reproductive toxicity

no data available

no data available

##### Specific target organ toxicity - single exposure

no data available

##### Specific target organ toxicity - repeated exposure

no data available

##### Aspiration hazard

no data available

##### Additional Information

RTECS: NO4565500

Overdose of iron compounds may have a corrosive effect on the gastrointestinal mucosa and be followed by necrosis, perforation, and stricture formation. Several hours may elapse before symptoms that can include epigastric pain, diarrhea, vomiting, nausea, and hematemesis occur. After apparent recovery a person may experience metabolic acidosis, convulsions, and coma hours or days later. Further complications may develop leading to acute liver necrosis that can result in death due to hepatic coma., Long term inhalation exposure to iron (oxide fume or dust) can cause

siderosis. Siderosis is considered to be a benign pneumoconiosis and does not normally cause significant physiologic impairment. Siderosis can be observed on x-rays with the lungs having a mottled appearance.

---

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

no data available

### 12.2 Persistence and degradability

no data available

### 12.3 Bioaccumulative potential

no data available

### 12.4 Mobility in soil

no data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

no data available

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. 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: 3089      Class: 4.1      Packing group: III

Proper shipping name: Metal powders, flammable, n.o.s.

Reportable Quantity (RQ):

Marine pollutant: No

Poison Inhalation Hazard: No

### IMDG

UN number: 3089      Class: 4.1      Packing group: III      EMS-No: F-G, S-G

Proper shipping name: METAL POWDER, FLAMMABLE, N.O.S.

Marine pollutant: No

### IATA

UN number: 3089      Class: 4.1      Packing group: III

Proper shipping name: Metal powder, flammable, n.o.s.

---

## 15. REGULATORY INFORMATION

### 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

Fire Hazard

### Massachusetts Right To Know Components

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

## Pennsylvania Right To Know Components

Iron, Powder

CAS-No.  
7439-89-6

Revision Date

## New Jersey Right To Know Components

Iron, Powder

CAS-No.  
7439-89-6

Revision Date

## California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

---

## 16. OTHER INFORMATION

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

Flam. Sol.                      Flammable solids  
H228                              Flammable solid.

### HMIS Rating

Health hazard:                      0  
Chronic Health Hazard:  
Flammability:                      2  
Physical Hazard                      2

### NFPA Rating

Health hazard:                      0  
Fire Hazard:  
Reactivity Hazard:                      2

### Further information

Copyright 2014 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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 Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

### Preparation Information

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

Version: 4.4

Revision Date: 07/02/2014

Print Date: 04/30/2016

# Lead

# LEAD METAL SAFETY DATA SHEET

## SECTION 1. IDENTIFICATION

**Product Identity:** Lead Metal

**Trade Names and Synonyms:** Lead; Pb; Plumbum; Metallic Lead; Inorganic Lead; ASTM B29; TADANAC Lead, Low-Alpha Lead.

**Manufacturer:**

Teck Metals Ltd.  
Trail Operations  
Trail, British Columbia  
V1R 4L8  
Emergency Telephone: 250-364-4214

**Supplier:**

In U.S.:  
Teck American Metal Sales  
Incorporated  
501 North Riverpoint Blvd, Suite 300  
Spokane, WA  
USA, 99202

**Preparer:**

Teck Metals Ltd.  
Suite 3300 – 550 Burrard Street  
Vancouver, British Columbia  
V6C 0B3

Other than U.S.:

Teck Metals Ltd.  
#1700 – 11 King Street West  
Toronto, Ontario  
M5H 4C7

**Date of Last Review:** June 29, 2015.

**Date of Last Edit:** June 29, 2015.


**Product Use:** Used as a construction material for tank linings, piping, and equipment used in the manufacture of sulphuric acid and the refining and processing of petroleum; used in x-ray and atomic radiation shielding; used in the manufacture of paint pigments, organic and inorganic lead compounds, lead shot, lead wire for bullets, ballast, and lead solders; used as a bearing metal or alloy; used in the manufacture of storage batteries, ceramics, plastics, and electronic devices; used in the metallurgy of steel and other metals; and used in the form of lead oxide for batteries.

## SECTION 2. HAZARDS IDENTIFICATION

### CLASSIFICATION:

Health	Physical	Environmental
Acute Toxicity (Oral, Inhalation) – Does not meet criteria Skin Corrosion/Irritation – Does not meet criteria Eye Damage/Eye Irritation – Does not meet criteria Respiratory or Skin Sensitization – Does not meet criteria Mutagenicity – Does not meet criteria Carcinogenicity – <b>Category 2</b> Reproductive Toxicity – <b>Category 1A</b> Specific Target Organ Toxicity Chronic Exposure – <b>Category 1</b>	Does not meet criteria for any Physical Hazard	<b>Aquatic Toxicity – Short Term (Acute) Category 3</b>

### LABEL:

<b>Symbols:</b> 	<b>Signal Word:</b>  <b>DANGER</b>
<b>Hazard Statements</b> <b>DANGER!</b> Causes damage to kidneys, blood-forming systems, central nervous system and digestive tract through prolonged or repeated exposure. May damage the unborn child. May cause harm to breast-fed children. Suspected of damaging fertility. Suspected of causing cancer. Harmful to aquatic life.	<b>Precautionary Statements:</b> Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection. Do not breathe dust or fumes. Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product. If exposed or concerned or you feel unwell: Get medical advice/attention. Avoid release to the environment.

**Emergency Overview:** A bluish-white to silvery-grey, heavy, soft metal that does not burn in bulk. Finely-divided lead dust clouds are a moderate fire and explosion hazard, however. When heated strongly in air, highly toxic lead oxide fumes can be generated. Inhalation or ingestion of lead may produce both acute and chronic health effects. Possible cancer and reproductive hazard. SCBA and full protective clothing are required for fire emergency response personnel.

**Potential Health Effects:** Inhalation or ingestion of lead may result in headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm, and joint pain. Prolonged exposure may also cause central nervous system damage, hypertension, gastrointestinal disturbances, anemia, kidney dysfunction and possible reproductive effects. Pregnant women should be protected from excessive exposure in order to prevent lead crossing the placental barrier and causing infant neurological disorders. Lead and inorganic lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)* while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP lists lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU does not currently list lead as a human carcinogen (see Toxicological Information, Section 11).

**Potential Environmental Effects:** Lead metal has relatively low bioavailability; however, compounds which it forms with other elements can be toxic to both aquatic and terrestrial organisms at low concentrations. These compounds can be particularly toxic in the aquatic environment. Lead bioaccumulates in plants and animals in both aquatic and terrestrial environments (see Ecological Information, Section 12).

## SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENT	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Lead	7439-92-1	99+%

Note: See Section 8 for Occupational Exposure Guidelines.

## SECTION 4. FIRST AID MEASURES

**Eye Contact:** *Symptoms:* Eye irritation, redness. Gently brush product off face if necessary. Do not rub eye(s). Let the eye(s) water naturally for a few minutes. Look right and left, then up and down. If particle/dust does not dislodge, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, get medical advice/attention. DO NOT attempt to manually remove anything stuck to the eye.

**Skin Contact:** *Symptoms:* Skin soiling, mild irritation. Gently brush away excess dust. Wash gently and thoroughly with lukewarm, gently flowing water and non-abrasive soap for 5 minutes, or until product is removed. If skin irritation occurs or you feel unwell, get medical advice/attention. *Molten Metal:* Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

**Inhalation:** *Symptoms:* Respiratory irritation. Remove source of exposure or move person to fresh air and keep comfortable for breathing. Seek medical attention if you feel unwell.

**Ingestion:** *Symptoms:* Stomach upset. If you feel unwell or are concerned, get medical advice/attention.

## SECTION 5. FIRE FIGHTING MEASURES

**Fire and Explosion Hazards:** Massive metal is not flammable or combustible. Finely-divided lead dust or powder is a moderate fire hazard and moderate explosion hazard when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Explosions may also occur upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

**Extinguishing Media:** Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

**Fire Fighting:** Do not use direct water streams on fires where molten metal is present, due to the risk of a steam explosion that could potentially eject molten metal uncontrollably. Use a fine water mist on the front-running edge of the spill and on the top of the molten metal to cool and solidify it. If possible, move solid material from fire area or cool material exposed to flame to prevent melting of the metal ingots. Highly toxic lead oxide fumes may evolve in fires. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

## SECTION 6. ACCIDENTAL RELEASE MEASURES

**Procedures for Cleanup:** Control source of spillage if possible to do so safely. Restrict access to the area until completion of clean-up. Clean up spilled material immediately, observing precautions outlined below. Molten metal should be allowed to solidify before cleanup. If solid metal, wear gloves, pick up and return to process. If dust, wear recommended personal protective equipment (see below) and use methods which will minimize dust generation (e.g., vacuum solids). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labelled containers for later recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

**Personal Precautions:** Persons responding to an accidental release should wear protective clothing, gloves and a respirator (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash as well as a respirator to protect against inhalation of lead fume. Workers should wash and change clothing following cleanup of a lead spill to prevent personal contamination with lead dust.

**Environmental Precautions:** Lead metal has low bioavailability; however, compounds which it forms with other elements can be toxic to aquatic and terrestrial organisms. Releases of the product to water and soil should be prevented.

## SECTION 7. HANDLING AND STORAGE

Store in a DRY, covered area, separate from strong acids, other incompatible materials, active metals and food or feedstuffs. Solid metal suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Otherwise, entrained moisture could expand explosively and spatter molten metal out of the bath. No special packaging materials are required. Lead metal, in contact with wood or other surfaces, may leave traces of lead particulate that can accumulate over time. Cleaning or disposal of these surfaces requires review to ensure that any effluent or solid waste disposal meets the requirements of regulations in the applicable jurisdiction.



## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### Occupational Exposure Guidelines:

<u>Component</u>	<u>ACGIH TLV</u>	<u>OSHA PEL</u>	<u>NIOSH REL</u>
Lead	0.05 mg/m <sup>3</sup>	0.05 mg/m <sup>3</sup>	0.05 mg/m <sup>3</sup>

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

*NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:*

**Ventilation:** Use adequate local or general ventilation to maintain the concentration of lead fumes in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Local exhaust is recommended for melting, casting, welding, grinding, flame cutting or burning, and use of lead powders.

**Protective Clothing:** Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when lead is processed. Appropriate eye protection should be worn where fume or dust is generated. Where hot or molten metal is handled, heat resistant gloves, goggles or face shield, and clothing to protect from radiant heat and hot metal splash should be worn. Safety type boots are recommended.

**Respirators:** Where lead dust or fumes are generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-100 particulate filter cartridge). When exposure levels are obviously high but the actual concentration is unknown, a self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask should be worn.

**General Hygiene Considerations:** Do not eat, drink or smoke in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas as well as at the end of the workday. A double locker-shower system with separate clean and dirty sides is usually required for lead handling operations to avoid cross-contamination of street clothes. Contaminated clothing should be changed frequently and laundered before each reuse. Inform laundry personnel of contaminants' hazards. Workers should not take dirty work clothes home and launder them with other personal clothing.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance:</b> Malleable, bluish-white to silvery-grey solid metal	<b>Odour:</b> None	<b>Odour Threshold:</b> Not Applicable	<b>pH:</b> Not Applicable
<b>Vapour Pressure:</b> (negligible @ 20°C)	<b>Vapour Density:</b> Not Applicable	<b>Melting Point/Range:</b> 328°C	<b>Boiling Point/Range:</b> 1,740°C
<b>Relative Density</b> (Water = 1): 11.34	<b>Evaporation Rate:</b> Not Applicable	<b>Coefficient of Water/Oil Distribution:</b> Not Applicable	<b>Solubility:</b> Insoluble in water
<b>Flash Point:</b> None	<b>Flammable Limits</b> (LEL/UEL): Not Flammable	<b>Auto-ignition Temperature:</b> None	<b>Decomposition Temperature:</b> None

## SECTION 10. STABILITY AND REACTIVITY

**Stability & Reactivity:** Massive metal is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Freshly cut or cast lead surfaces tarnish rapidly due to the formation of an insoluble protective layer of basic lead carbonate.

**Incompatibilities:** Lead reacts vigorously with strong acids (e.g., hot concentrated nitric acid, boiling concentrated hydrochloric acid, etc.), strong oxidizers such as peroxides, chlorates, nitrates and halogen or interhalogen compounds such as chlorine trifluoride. Powdered lead metal in contact with disodium acetylide, chlorine trifluoride, sodium carbide or fused ammonium nitrate poses a risk of explosion. Solutions of sodium azide in contact with lead metal can form lead azide, which is a detonating compound. Vigorous reactions can also occur between molten lead and active metals, such as sodium, potassium, lithium and calcium. A lead-zirconium alloy (10-70% Zr) will ignite when struck with a hammer.

**Hazardous Decomposition Products:** High temperature operations such as oxy-acetylene cutting or burning, electric arc welding or overheating a molten bath will generate highly toxic lead oxide fume. Lead oxide is highly soluble in body fluids and the particle size of the metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body.

**SECTION 11. TOXICOLOGICAL INFORMATION**

**General:** Lead accumulates in bone and body organs once it enters the body. Elimination from the body is slow. Initial and periodic medical examinations are advised for persons repeatedly exposed to levels at or above the exposure limits of lead dust or fumes. Once lead enters the body, it can affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and gastrointestinal system. The primary routes of exposure to lead are inhalation or ingestion of dust and fumes.

**Acute:**

**Skin/Eye:** Contact with dust or fume may cause local irritation but would not cause tissue damage.

**Inhalation:** Exposure to lead dust or fume may cause headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia, and pain in legs, arms, and joints. An intense, short-term exposure to lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are unlikely in industry today. Kidney damage, as well as anemia, can occur from acute exposure.

**Ingestion:** Symptoms due to ingestion of lead dust or fume would be similar to those from inhalation. Other health effects such as metallic taste in the mouth and constipation or bloody diarrhea might also occur.

**Chronic:**

Prolonged exposure to lead dust and fume may produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, anemia, and, rarely, wrist drop. Reduced hemoglobin production has been associated with low lead exposures. Symptoms of central nervous system damage due to moderate lead exposure include fatigue, headaches, tremors and hypertension. Very high lead exposure can result in lead encephalopathy with symptoms of hallucinations, convulsions, and delirium. Kidney dysfunction and possible injury has also been associated with chronic lead poisoning. Chronic over-exposure to lead has been implicated as a causative agent for the impairment of male and female reproductive capacity. Pregnant women should be protected from excessive exposure as lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems due to excessive lead exposure. Teratogenic and mutagenic effects from exposure to lead have been reported in some studies but not in others. The literature is inconsistent and no firm conclusions can be drawn at this time. Lead and lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)* while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP lists lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU do not currently list lead as a human carcinogen.

**Animal Toxicity:**

<u>Hazardous Ingredient:</u>	<u>Acute Oral Toxicity:</u>	<u>Acute Dermal Toxicity:</u>	<u>Acute Inhalation Toxicity:</u>
Lead	No Data	No Data	No Data

**SECTION 12. ECOLOGICAL INFORMATION**

While lead metal is relatively insoluble, its processing or extended exposure in aquatic and terrestrial environments may lead to the release of lead compounds in more bioavailable forms. While lead compounds are not particularly mobile in the aquatic environment, they can be toxic to aquatic organisms, especially fish, at low concentrations. Water hardness, pH and dissolved organic carbon content are three major factors which regulate the degree of lead toxicity. Lead in soil is generally neither very mobile nor bioavailable, as it can become strongly sorbed onto soil particles, increasingly so over time, to a degree related to physical properties of the soil. Lead bioaccumulates in plants and animals in both aquatic and terrestrial environments.

**SECTION 13. DISPOSAL CONSIDERATIONS**

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

**SECTION 14. TRANSPORT INFORMATION**

PROPER SHIPPING NAME ..... Not a regulated product in ingot form.  
 TRANSPORT CANADA AND U.S. DOT CLASSIFICATION ..... Not Applicable

TRANSPORT CANADA AND U.S. DOT PIN ..... Not Applicable  
MARINE POLLUTANT ..... No  
IMO CLASSIFICATION ..... Not Regulated

## SECTION 15. REGULATORY INFORMATION

### U.S.

Ingredient Listed on TSCA Inventory ..... Yes

Hazardous Under Hazard Communication Standard ..... Yes

CERCLA Section 103 Hazardous Substances ..... Lead ..... RQ: 10 lbs. (4.54 kg.)\*  
\*reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

EPCRA Section 302 Extremely Hazardous Substance ..... No

EPCRA Section 311/312 Hazard Categories ..... Delayed (chronic) health hazard - Carcinogen  
Delayed (chronic) health hazard – Reproductive toxin

EPCRA Section 313 Toxic Release Inventory ..... Lead CAS No. 7439-92-1  
Percent by Weight - At least 99%

## SECTION 16. OTHER INFORMATION

**Date of Original Issue:** July 23, 1997 **Version:** 01 (*First edition*)

**Date of Latest Revision:** June 29, 2015 **Version:** 13

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, Guide to Occupational Exposure Values – 2015.
- Bretherick's Handbook of Reactive Chemical Hazards, 20<sup>th</sup> Anniversary Edition. (P. G. Urban, Ed), 1995.
- Canadian Centre for Occupational Health and Safety, Hamilton, ON, CHEMINFO Record No. 608 - Lead (Rev. 2009-05).
- European Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 30 January 2015.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0052 - Lead.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (online version).
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- U.S. Dept. of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 13<sup>th</sup> Report on Carcinogens, October 2014.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards, on-line edition.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Lead, September 2005.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

### **Notice to Reader**

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck American Metal Sales Incorporated and Teck Metals Ltd. extend no warranty and assume no responsibility for the accuracy of the content and expressly disclaim all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

# Manganese

# Manganese



## **SAFETY DATA SHEET**

### **1 PRODUCT AND SUPPLIER IDENTIFICATION**

**Product Name:** Manganese - flake, pieces, rod, target

**Formula:** Mn

**Supplier:** ESPI Metals  
1050 Benson Way  
Ashland, OR 97520

**Telephone:** 800-638-2581

**Fax:** 541-488-8313

**Email:** [sales@espimetals.com](mailto:sales@espimetals.com)

**Emergency:** Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

**Recommended Uses:** Scientific Research

### **2 HAZARDS IDENTIFICATION**

**GHS Classification (29 CFR 1910.1200):** Not classified as hazardous

**GHS Label Elements:**

**Signal Word:** N/A

**Hazard Statements:** N/A

**Precautionary Statements:** N/A

### **3 COMPOSITION/INFORMATION ON INGREDIENTS**

**Ingredient:** Manganese

**CAS#:** 7439-96-5

**%:** 100

**EC#:** 231-105-1

#### **4 FIRST AID MEASURES**

**General Measures:** No special requirements.

**INHALATION:** Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek medical attention.

**INGESTION:** Rinse mouth with water. Do not induce vomiting. Seek medical attention. Never induce vomiting or give anything by mouth to an unconscious person.

**SKIN:** Remove contaminated clothing, brush material off skin, wash affected area with soap and water. Seek medical attention if symptoms develop or persist.

**EYES:** Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention if symptoms develop or persist.

**Most Important Symptoms/Effects, Acute and Delayed:** May cause irritation. See section 11 for more information.

**Indication of Immediate Medical Attention and Special Treatment:** No other relevant information available.

#### **5 FIREFIGHTING MEASURES**

**Extinguishing Media:** Use Class D dry powder extinguishing agent.

**Unsuitable Extinguishing Media:** Do not use water, foam, halogenated gas or carbon dioxide.

**Specific Hazards Arising from the Material:** This product does not present fire or explosion hazards as shipped. Dust from processing may be flammable when exposed to heat, sparks or flame. May emit toxic metal oxide fumes under fire conditions.

**Special Protective Equipment and Precautions for Firefighters:** Full face, self-contained breathing apparatus and full protective clothing when necessary.

#### **6 ACCIDENTAL RELEASE MEASURES**

**Personal Precautions, Protective Equipment, and Emergency Procedures:** Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

**Methods and Materials for Containment and Cleaning Up:** Avoid dust formation. Sweep or scoop up and place in a closed container for further handling and disposal.

**Environmental Precautions:** Do not allow to be released to the environment.

#### **7 HANDLING AND STORAGE**

**Precautions for Safe Handling:** Avoid creating dust. Avoid breathing dust or fumes. Provide adequate ventilation if dusts are created. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

**Conditions for Safe Storage:** Store in a cool, dry area. Store in a closed container. Protect from moisture. Do not store together with oxidizers, acids or halogens. See section 10 for more information on incompatible materials.

## **8 EXPOSURE CONTROLS AND PERSONAL PROTECTION**

**Exposure Limits:** Manganese

**OSHA/PEL:** 5 mg/m<sup>3</sup>

**ACGIH/TLV:** 0.2 mg/m<sup>3</sup>

**Engineering Controls:** Ensure adequate ventilation to maintain exposures below occupational limits. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not allow dusts to accumulate as they may present a fire hazard. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air.

**Respiratory Protection:** If permissible levels are exceeded, use NIOSH approved dust respirator.

**Eye Protection:** Safety glasses

**Skin Protection:** Wear impermeable gloves, protective work clothing as necessary.

## **9 PHYSICAL AND CHEMICAL PROPERTIES**

**Appearance:**

**Form:** Solid in various forms

**Color:** Gray metallic

**Odor:** Odorless

**Odor Threshold:** Not determined

**pH:** N/A

**Melting Point:** 1244±3 °C

**Boiling Point:** 1962 °C

**Flash Point:** N/A

**Evaporation Rate:** N/A

**Flammability:** No data

**Upper Flammable Limit:** No data

**Lower Flammable Limit:** N/A

**Vapor Pressure:** 1 mm Hg @ 1292 °C

**Vapor Density:** N/A

**Relative Density (Specific Gravity):** 7.20 g/cc

**Solubility in H<sub>2</sub>O:** Decomposes

**Partition Coefficient (n-octanol/water):** Not determined

**Autoignition Temperature:** No data

**Decomposition Temperature:** No data

**Viscosity:** N/A

## **10 STABILITY AND REACTIVITY**

**Reactivity:** No data

**Chemical Stability:** Stable under recommended storage conditions.

**Possibility of Hazardous Reactions:** Manganese dusts dispersed in air in sufficient concentrations, and in the presence of an ignition source, may be flammable in open spaces or explosive in confined spaces.

**Conditions to Avoid:** Avoid creating or accumulating fines or dusts.

**Incompatible Materials:** Acids, water or steam, halogens, hydrogen peroxide, nitrous oxide, phosphorous vapor, sulfur dioxide, all alkalis.

**Hazardous Decomposition Products:** Manganese oxide fume, hydrogen gas.

## **11 TOXICOLOGICAL INFORMATION**

**Likely Routes of Exposure:** Inhalation, skin, eyes.

**Symptoms of Exposure:** May cause irritation if dusts or fumes are inhaled or swallowed. Fines/dusts may irritate skin and eyes.

**Acute and Chronic Effects:** Chronic inhalation exposure of humans to high levels of manganese may result in a syndrome called manganism which typically begins with feelings of weakness and lethargy and progresses to other symptoms such as gait disturbances, clumsiness, tremors, speech disturbances, a mask-like facial expression and psychological disturbances. Manganese is an essential micronutrient in humans.

**Acute Toxicity:** No data

**Carcinogenicity:** **NTP:** Not identified as carcinogenic **IARC:** Not identified as carcinogenic

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

## **12 ECOLOGICAL INFORMATION**

**Ecotoxicity:** No data

**Persistence and Degradability:** No data

**Bioaccumulative Potential:** No data

**Mobility in Soil:** No data



**Other Adverse Effects:** Possibly harmful to aquatic life. Do not allow material to be released to the environment without proper governmental permits. No further relevant information available.

### **13 DISPOSAL CONSIDERATIONS**

**Waste Disposal Method:**

**Product:** Dispose of in accordance with Federal, State and Local regulations.

**Packaging:** Dispose of in accordance with Federal, State and Local regulations.

### **14 TRANSPORT INFORMATION**

**Shipping Regulations:** Not regulated

**UN Number:** N/A

**UN Proper Shipping Name:** N/A

**Transport Hazard Class:** N/A

**Packing Group:** N/A

**Marine Pollutant:** No

### **15 REGULATORY INFORMATION**

**TSCA Listed:** All components are listed.

**Regulation (EC) No 1272/2008 (CLP):** N/A

**Canada WHMIS Classification (CPR, SOR/88-66):** N/A

**HMIS Ratings: Health: 0 Flammability: 0 Physical: 0**

**NFPA Ratings: Health: 0 Flammability: 0 Instability: 0**

**Chemical Safety Assessment:** A chemical safety assessment has not been carried out.

### **16 OTHER INFORMATION**

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

**Prepared by:** ESPI Metals

**Revised/Reviewed:** July 2015

# Mercury

# MERCURY

## Safety Data Sheet

according to the federal final rule of hazard communication revised on 2012 (HazCom 2012)

Date of issue: 11/19/2013

### SECTION 1: Identification of the substance/mixture and of the company/undertaking

#### 1.1. Product identifier

Trade name : MERCURY  
CAS No : 7439-97-6  
Other means of identification : Colloidal Mercury, Quick Silver, Liquid Silver, NCI-C60399, Hydrargyrum

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

Use of the substance/mixture : Variety of industrial, analytical and research applications.

#### 1.3. Details of the supplier of the safety data sheet

Bethlehem Apparatus Company

809 Front Street  
Hellertown, Pa 18055

Phone: 610-838-7034

#### 1.4. Emergency telephone number

Emergency number : 1-800-424-9300

### SECTION 2: Hazards identification

#### 2.1. Classification of the substance or mixture

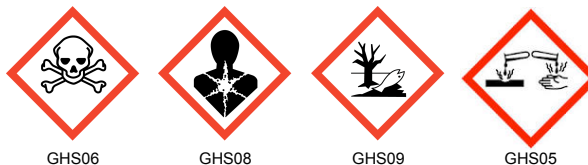
##### GHS-US classification

Acute Tox. 1 (Inhalation:dust,mist) H330  
Repr. 1B H360  
STOT RE 1 H372  
Aquatic Acute 1 H400  
Aquatic Chronic 1 H410

#### 2.2. Label elements

##### GHS-US labelling

Hazard pictograms (GHS-US) :



Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H330 - Fatal if inhaled  
H360 - May damage fertility or the unborn child  
H372 - Causes damage to organs through prolonged or repeated exposure  
H400 - Very toxic to aquatic life  
H410 - Very toxic to aquatic life with long lasting effects

Precautionary statements (GHS-US) : P201 - Obtain special instructions before use  
P202 - Do not handle until all safety precautions have been read and understood  
P260 - Do not breathe vapors, gas  
P264 - Wash skin, hands thoroughly after handling  
P270 - Do not eat, drink or smoke when using this product  
P271 - Use only outdoors or in a well-ventilated area  
P273 - Avoid release to the environment  
P280 - Wear eye protection, protective clothing, protective gloves, Face mask  
P284 - [In case of inadequate ventilation] wear respiratory protection  
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing  
P308+P313 - IF exposed or concerned: Get medical advice/attention  
P310 - Immediately call a POISON CENTER/doctor/...  
P314 - Get medical advice and attention if you feel unwell  
P320 - Specific treatment is urgent (see First aid measures on this label)  
P391 - Collect spillage  
P403+P233 - Store in a well-ventilated place. Keep container tightly closed  
P405 - Store locked up  
P501 - Dispose of contents/container to comply with applicable local, national and international regulation.

#### 2.3. Other hazards

other hazards which do not result in classification : When inhaled, Mercury will be rapidly distributed throughout the body. During this time, Mercury will cross the blood-brain barrier, and become oxidized to the Hg (II) oxidation state. The oxidized species of Mercury cannot cross the blood-brain barrier and thus accumulates in the

# MERCURY

## Safety Data Sheet

according to the federal final rule of hazard communication revised on 2012 (HazCom 2012)

brain. Mercury in other organs is removed slowly from the body via the kidneys. The average half-time for clearance of Mercury for different parts of the human body is as follows: lung: 1.7 days; head: 21 days; kidney region: 64 days; chest: 43 days; whole body: 58 days. Mercury can be irritating to contaminated skin and eye. Prolonged contact may lead to ulceration of the skin. Allergic reactions (i.e. rashes, welts) may occur in sensitive individuals. Mercury can be irritating to contaminated skin and eyes. Short-term over-exposures to high concentrations of mercury vapors can lead to breathing difficulty, coughing, acute, and potentially fatal lung disorders. Depending on the concentration of inhalation over-exposure, heart problems, damage to the kidney, liver or nerves and effects on the brain may occur.

### 2.4. Unknown acute toxicity (GHS-US)

No data available

## SECTION 3: Composition/information on ingredients

### 3.1. Substance

Not applicable

Full text of H-phrases: see section 16

### 3.2. Mixture

Name	Product identifier	%	GHS-US classification
Mercury	(CAS No) 7439-97-6	100	Acute Tox. 2 (Inhalation), H330 Repr. 1B, H360 STOT RE 1, H372 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

## SECTION 4: First aid measures

### 4.1. Description of first aid measures

First-aid measures general	: Never give anything by mouth to an unconscious person. If exposed or concerned: Get medical advice/attention.
First-aid measures after inhalation	: Remove to fresh air and keep at rest in a position comfortable for breathing. Assure fresh air breathing. Allow the victim to rest. Immediately call a POISON CENTER or doctor/physician. In case of irregular breathing or respiratory arrest provide artificial respiration.
First-aid measures after skin contact	: Wash immediately with lots of water (15 minutes)/shower. Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse. Seek immediate medical advice.
First-aid measures after eye contact	: Rinse immediately and thoroughly, pulling the eyelids well away from the eye (15 minutes minimum). Keep eye wide open while rinsing. Seek medical attention immediately.
First-aid measures after ingestion	: Immediately call a POISON CENTER or doctor/physician. Rinse mouth. If conscious, give large amounts of water and induce vomiting. Give water or milk if the person is fully conscious. Obtain emergency medical attention.

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

Symptoms/injuries after inhalation	: Short-term over-exposures to high concentrations of mercury vapors can lead to breathing difficulty, coughing, acute, chemical pneumonia, and pulmonary edema (a potentially fatal accumulation of fluid in the lungs) . Depending on the concentration of over-exposure, cardiac abnormalities, damage to the kidney, liver or nerves and effects on the brain may occur. Long-term inhalation over-exposures can lead to the development of a wide variety of symptoms, including the following: excessive salivation, gingivitis, anorexia, chills, fever, cardiac abnormalities, anemia, digestive problems, abdominal pains, frequent urination, an inability to urinate, diarrhea, peripheral neuropathy (numbness, weakness, or burning sensations in the hands or feet), tremors (especially in the hands, fingers, eyelids, lips, cheeks, tongue, or legs), alteration of tendon reflexes, slurred speech, visual disturbances, and deafness. Allergic reactions (i.e. breathing difficulty) may also occur in sensitive individuals.
Symptoms/injuries after skin contact	: Symptoms of skin exposure can include redness, dry skin, and pain. Prolonged contact may lead to ulceration of the skin. Allergic reactions (i.e. rashes, welts) may occur in sensitive individuals. Dermatitis (redness and inflammation of the skin) may occur after repeated skin exposures.
Symptoms/injuries after eye contact	: Symptoms of eye exposure can include redness, pain, and watery eyes. A symptom of Mercury exposure is discoloration of the lens of the eyes.
Symptoms/injuries after ingestion	: If Mercury is swallowed, symptoms of such over-exposure can include metallic taste in mouth, nausea, vomiting, central nervous system effects, and damage to the kidneys. Metallic mercury is not usually absorbed sufficiently from the gastrointestinal tract to induce an acute, toxic response. Damage to the tissues of the mouth, throat, esophagus, and other tissues of the digestive system may occur. Ingestion may be fatal, due to effects on gastrointestinal system and kidneys.
Chronic symptoms	: Long-term over-exposure can lead to a wide range of adverse health effects. Anyone using Mercury must pay attention to personality changes, weight loss, skin or gum discolorations, stomach pains, and other signs of Mercury over-exposure. Gradually developing syndromes ("Erethism" and "Acrodynia") are indicative of potentially severe health problems. Mercury can cause the development of allergic reactions (i.e. dermatitis, rashes, breathing difficulty) upon prolonged or repeated exposures. Refer to Section 11 (Toxicology Information) for additional data.

# MERCURY

## Safety Data Sheet

according to the federal final rule of hazard communication revised on 2012 (HazCom 2012)

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

Treatment for Mercury over-exposure must be given. The following treatment protocol for ingestion of Mercury is from Clinical Toxicology of Commercial Products (5th Edition, 1984).

## SECTION 5: Firefighting measures

### 5.1. Extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.  
Unsuitable extinguishing media : Do not use a heavy water stream.

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

Fire hazard : Not flammable. Mercury vapors and oxides generated during fires involving this product are toxic.  
Reactivity : Stable. Reacts with (some) metals. Mercury can react with metals to form amalgams.

### 5.3. Advice for firefighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment. Do not allow run-off from fire fighting to enter drains or water courses.  
Protective equipment for firefighters : Do not enter fire area without proper protective equipment, including respiratory protection.  
Other information : Decontaminate all equipment thoroughly after the conclusion of fire-fighting activities.

## SECTION 6: Accidental release measures

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

General measures : Uncontrolled release should be responded to by trained personnel using pre-planned procedures. Evacuate area. Evacuate personnel to a safe area.

#### 6.1.1. For non-emergency personnel

Emergency procedures : Evacuate unnecessary personnel.

#### 6.1.2. For emergency responders

Protective equipment : Equip cleanup crew with proper protection. In the event of a release under 1 pound: the minimum level "C" Personal Protective Equipment is needed. Triple-gloves (rubber gloves and nitril gloves over latex gloves), chemical resistant suit and boots, hard-hat, and Air-Purifying Respirator with Cartridge appropriate for Mercury.  
In the event of a release over 1 pound or when concentration of oxygen in atmosphere is less than 19.5% or unknown, the level "B" Personal Protective Equipments which includes Self-Contained Breathing Apparatus must be worn.  
Emergency procedures : Ventilate area.

### 6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters. Avoid release to the environment.

### 6.3. Methods and material for containment and cleaning up

For containment : For larger spills, dike area and pump into waste containers. Put into a labelled container and provide safe disposal.  
Methods for cleaning up : There are a variety of methods which can be used to clean-up Mercury spills. Use a commercially available Mercury Spill Kit for small spills. A suction pump with aspirator can also be used during clean-up operations. For larger release, a Mercury vacuum can be used. Calcium polysulfide or excess sulfur can be also used for clean-up. Mercury can migrate into cracks and other difficult-to-clean areas; calcium polysulfide and sulfur can be sprinkled effectively into these areas. Decontaminate the area thoroughly. The area should be inspected visually and with colorimetric tubes for Mercury to ensure all traces have been removed prior to re-occupation by non-emergency personnel. Decontaminate all equipment used in response thoroughly. If such equipments cannot be adequately decontaminated, it must be discarded with other spill residue. Place all spill residues in an appropriate container, seal immediately, and label appropriately. Dispose of in accordance with federal, state, and local hazardous waste disposal requirements. (Refer to Section 13 of this SDS).

### 6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

## SECTION 7: Handling and storage

### 7.1. Precautions for safe handling

Additional hazards when processed : Supervisors and responsible personnel must be aware of personality changes, weight loss, or other sign of Mercury over-exposure in employees using this product; These symptoms can develop gradually and are indicative of potentially severe health effects related to Mercury contamination.

# MERCURY

## Safety Data Sheet

according to the federal final rule of hazard communication revised on 2012 (HazCom 2012)

- Precautions for safe handling : As with all chemicals, avoid getting Mercury ON YOU or IN YOU. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor. Report all Mercury releases promptly. Open container slowly on a stable surface. Drums, flasks and bottles of this product must be properly labeled. Empty containers may contain residual amounts of Mercury and should be handled with care.
- Hygiene measures : Do not eat, drink or smoke when using this product. Always wash hands and face immediately after handling this product, and once again before leaving the workplace. Remove contaminated clothing immediately.

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

- Technical measures : Follow practice indicated in Section 6. Make certain that application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment thoroughly before maintenance begins.
- Storage conditions : Keep container tightly closed. Store drums, flasks and bottles in a cool, dry location, away from direct sunlight, source of intense heat, or where freezing is possible. Store away from incompatible materials. Material should be stored in secondary container or in a diked area, as appropriate.
- Incompatible materials : Acetylene and acetylene derivatives, amines, ammonia, 3-bromopropyne, boron diiodophosphide, methyl azide, sodium carbide, heated sulfuric acid, methylsilane/oxygen mixtures, nitric acid/alcohol mixtures, tetracarbonylnickel/oxygen mixtures, alkyne/silver perchlorate mixtures, halogens and strong oxidizers. Mercury can attack copper alloys. Mercury can react with many metals (i.e. calcium, lithium, potassium, sodium, rubidium, aluminum) to form amalgams.
- Prohibitions on mixed storage : Mercury can attack copper alloys. Mercury can react with many metals (i.e. calcium, lithium, potassium, sodium, rubidium, aluminum) to form amalgams.
- Storage area : Storage area should be made of fire-resistant materials.
- Special rules on packaging : Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged.

### 7.3. Specific end use(s)

No additional information available

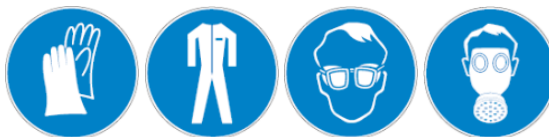
## SECTION 8: Exposure controls/personal protection

### 8.1. Control parameters

Mercury (7439-97-6)		
USA ACGIH	ACGIH TWA (mg/m <sup>3</sup> )	0.025 mg/m <sup>3</sup>
USA OSHA	OSHA PEL (Ceiling) (mg/m <sup>3</sup> )	0.1 mg/m <sup>3</sup>

### 8.2. Exposure controls

- Appropriate engineering controls : Ensure adequate ventilation. Ensure exposure is below occupational exposure limits (where available). Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
- Personal protective equipment : Avoid all unnecessary exposure. Gloves. Protective clothing. Safety glasses. Mist formation: aerosol mask.



- Hand protection : Wear neoprene gloves for routine industrial use. Use triple gloves for spill response, as stated in Section 6 of this SDS.
- Eye protection : Splash goggles or safety glasses. For operation involving the use of more than 1 pound of Mercury, or if the operation may generate a spray of Mercury, the use of a faceshield is recommended.
- Skin and body protection : Wear suitable protective clothing.
- Respiratory protection : Maintain airborne contaminants concentration below provided exposure limits. If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134 or applicable state regulations. Use supplied air respiration protection if oxygen levels are below 19.5% or are unknown.
- Other information : Do not eat, drink or smoke during use.

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

- Physical state : Liquid
- Colour : Silver white.

# MERCURY

## Safety Data Sheet

according to the federal final rule of hazard communication revised on 2012 (HazCom 2012)

Odor	: Odorless.
Odor threshold	: Not applicable
pH	: Not applicable
Relative evaporation rate (butylacetate=1)	: No data available
Melting point	: No data available
Freezing point	: -38,87 °C (-37.97 F)
Boiling point	: No data available
Flash point	: Not applicable
Self ignition temperature	: Not applicable
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapour pressure	: 0,002 mm Hg at 25°C
Relative vapor density at 20 °C	: 6,9 (Air = 1)
Relative density	: No data available
Relative density of saturated gas/air mixture	: 13,6
Solubility	: No data available
Log Pow	: No data available
Log Kow	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available
Explosive properties	: No data available
Oxidizing properties	: No data available
Explosive limits	: Not applicable

### 9.2. Other information

No additional information available

## SECTION 10: Stability and reactivity

### 10.1. Reactivity

Stable. Reacts with (some) metals. Mercury can react with metals to form amalgams.

### 10.2. Chemical stability

Not established.

### 10.3. Possibility of hazardous reactions

Not established. Hazardous polymerization will not occur.

### 10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

### 10.5. Incompatible materials

Acetylene and acetylene derivatives, amines, ammonia, 3-bromopropyne, boron diiodophosphide, methyl azide, sodium carbide, heated sulfuric acid, methylsilane/oxygen mixtures, nitric acid/alcohol mixtures, tetracarbonylnickel/oxygen mixtures, alkyne/silver perchlorate mixtures, halogens and strong oxidizers. Mercury can attack copper alloys. Mercury can react with many metals (i.e. calcium, lithium, potassium, sodium, rubidium, aluminum) to form amalgams.

### 10.6. Hazardous decomposition products

If this product is exposed to extremely high temperature in the presence of oxygen or air, toxic vapor of mercury and mercury oxides will be generated.

## SECTION 11: Toxicological information

### 11.1. Information on toxicological effects

Acute toxicity	: Fatal if inhaled.
Skin corrosion/irritation	: Not classified pH: Not applicable
Serious eye damage/irritation	: Not classified pH: Not applicable
Respiratory or skin sensitisation	: Not classified
Germ cell mutagenicity	: Not classified Based on available data, the classification criteria are not met
Carcinogenicity	: Not classified



# MERCURY

## Safety Data Sheet

according to the federal final rule of hazard communication revised on 2012 (HazCom 2012)

<b>Mercury (7439-97-6)</b>	
IARC group	3
Reproductive toxicity	: May damage fertility or the unborn child. Based on available data, the classification criteria are not met
Specific target organ toxicity (single exposure)	: Not classified
Specific target organ toxicity (repeated exposure)	: Causes damage to organs through prolonged or repeated exposure. Based on available data, the classification criteria are not met Causes damage to organs through prolonged or repeated exposure
Aspiration hazard	: Not classified Based on available data, the classification criteria are not met
Potential adverse human health effects and symptoms	: Based on available data, the classification criteria are not met. Fatal if inhaled.
Symptoms/injuries after inhalation	: Short-term over-exposures to high concentrations of mercury vapors can lead to breathing difficulty, coughing, acute, chemical pneumonia, and pulmonary edema (a potentially fatal accumulation of fluid in the lungs) . Depending on the concentration of over-exposure, cardiac abnormalities, damage to the kidney, liver or nerves and effects on the brain may occur. Long-term inhalation over-exposures can lead to the development of a wide variety of symptoms, including the following: excessive salivation, gingivitis, anorexia, chills, fever, cardiac abnormalities, anemia, digestive problems, abdominal pains, frequent urination, an inability to urinate, diarrhea, peripheral neuropathy (numbness, weakness, or burning sensations in the hands or feet), tremors (especially in the hands, fingers, eyelids, lips, cheeks, tongue, or legs), alteration of tendon reflexes, slurred speech, visual disturbances, and deafness. Allergic reactions (i.e. breathing difficulty) may also occur in sensitive individuals.
Symptoms/injuries after skin contact	: Symptoms of skin exposure can include redness, dry skin, and pain. Prolonged contact may lead to ulceration of the skin. Allergic reactions (i.e. rashes, welts) may occur in sensitive individuals. Dermatitis (redness and inflammation of the skin) may occur after repeated skin exposures.
Symptoms/injuries after eye contact	: Symptoms of eye exposure can include redness, pain, and watery eyes. A symptom of Mercury exposure is discoloration of the lens of the eyes.
Symptoms/injuries after ingestion	: If Mercury is swallowed, symptoms of such over-exposure can include metallic taste in mouth, nausea, vomiting, central nervous system effects, and damage to the kidneys. Metallic mercury is not usually absorbed sufficiently from the gastrointestinal tract to induce an acute, toxic response. Damage to the tissues of the mouth, throat, esophagus, and other tissues of the digestive system may occur. Ingestion may be fatal, due to effects on gastrointestinal system and kidneys.
Chronic symptoms	: Long-term over-exposure can lead to a wide range of adverse health effects. Anyone using Mercury must pay attention to personality changes, weight loss, skin or gum discolorations, stomach pains, and other signs of Mercury over-exposure. Gradually developing syndromes ("Erethism" and "Acrodynia") are indicative of potentially severe health problems. Mercury can cause the development of allergic reactions (i.e. dermatitis, rashes, breathing difficulty) upon prolonged or repeated exposures. Refer to Section 11 (Toxicology Information) for additional data.

## SECTION 12: Ecological information

### 12.1. Toxicity

Ecology - water : Very toxic to aquatic life. Toxic to aquatic life with long lasting effects.

<b>Mercury (7439-97-6)</b>	
LC50 fishes 1	0,5 mg/l (Exposure time: 96 h - Species: Cyprinus carpio)
EC50 Daphnia 1	5,0 µg/l (Exposure time: 96 h - Species: water flea)
LC50 fish 2	0,16 mg/l (Exposure time: 96 h - Species: Cyprinus carpio [semi-static])

### 12.2. Persistence and degradability

<b>MERCURY (7439-97-6)</b>	
Persistence and degradability	May cause long-term adverse effects in the environment.

### 12.3. Bioaccumulative potential

<b>MERCURY (7439-97-6)</b>	
Bioaccumulative potential	Not established.

### 12.4. Mobility in soil

No additional information available

### 12.5. Other adverse effects

Other information : Avoid release to the environment.

# MERCURY

## Safety Data Sheet

according to the federal final rule of hazard communication revised on 2012 (HazCom 2012)

### SECTION 13: Disposal considerations

#### 13.1. Waste treatment methods

- Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Waste disposal must be in accordance with appropriate federal, state, and local regulations. This product, if unaltered by use, should be recycled. If altered by use, recycling may be possible. Consult Bethlehem Apparatus Company for information. If Mercury must be disposed of as hazardous waste, it must be handled at a permitted facility or as advised by your local hazardous waste regulatory authority.
- Ecology - waste materials : Hazardous waste due to toxicity. Avoid release to the environment.

### SECTION 14: Transport information

In accordance with DOT

#### 14.1. UN number

- UN-No.(DOT) : 2809  
DOT NA no. UN2809

#### 14.2. UN proper shipping name

- DOT Proper Shipping Name : Mercury  
Department of Transportation (DOT) Hazard Classes : 8 - Class 8 - Corrosive material 49 CFR 173.136  
Hazard labels (DOT) : 8 - Corrosive substances  
6.1 - Toxic substances



- DOT Symbols : A - Material is regulated as a hazardous material only when transported by air, W - Material is regulated as a hazardous material only when transported by water
- Packing group (DOT) : III - Minor Danger
- DOT Packaging Exceptions (49 CFR 173.xxx) : 164
- DOT Packaging Non Bulk (49 CFR 173.xxx) : 164
- DOT Packaging Bulk (49 CFR 173.xxx) : 240

#### 14.3. Additional information

- Other information : No supplementary information available.

#### Overland transport

No additional information available

#### Transport by sea

- DOT Vessel Stowage Location : B - (i) The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) "On deck only" on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.
- DOT Vessel Stowage Other : 40 - Stow "clear of living quarters", 97 - Stow "away from" azides

#### Air transport

- DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 35 kg
- DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 35 kg

### SECTION 15: Regulatory information

#### 15.1. US Federal regulations

Mercury (7439-97-6)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings)	
EPA TSCA Regulatory Flag	S - S - indicates a substance that is identified in a proposed or final Significant New Uses Rule.
SARA Section 313 - Emission Reporting	1,0 %

#### 15.2. International regulations

##### CANADA

# MERCURY

## Safety Data Sheet

according to the federal final rule of hazard communication revised on 2012 (HazCom 2012)

### Mercury (7439-97-6)

Listed on the Canadian DSL (Domestic Substances List) inventory.

#### WHMIS Classification

Class D Division 1 Subdivision A - Very toxic material causing immediate and serious toxic effects  
Class D Division 2 Subdivision A - Very toxic material causing other toxic effects  
Class E - Corrosive Material

### EU-Regulations

### Mercury (7439-97-6)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances) substances.

### Classification according to Regulation (EC) No. 1272/2008 [CLP]

### Classification according to Directive 67/548/EEC or 1999/45/EC

Not classified

#### 15.2.2. National regulations

### Mercury (7439-97-6)

Listed on the AICS (the Australian Inventory of Chemical Substances)  
Listed on Inventory of Existing Chemical Substances (IECSC)  
Listed on the Korean ECL (Existing Chemical List) inventory.  
Listed on New Zealand - Inventory of Chemicals (NZIoC)  
Listed on Inventory of Chemicals and Chemical Substances (PICCS)  
Poisonous and Deleterious Substances Control Law  
Pollutant Release and Transfer Register Law (PRTR Law)  
Listed on the Canadian Ingredient Disclosure List

#### 15.3. US State regulations

### Mercury (7439-97-6)

U.S. - California - Proposition 65 - Carcinogens List	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No significance risk level (NSRL)
	Yes			

## SECTION 16: Other information

Other information : None.

Full text of H-phrases: see section 16:

Acute Tox. 1 (Inhalation:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 1
Acute Tox. 2 (Inhalation)	Acute toxicity (inhalation) Category 2
Aquatic Acute 1	Hazardous to the aquatic environment — AcuteHazard, Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment — Chronic Hazard, Category 1
Repr. 1B	Reproductive toxicity Category 1B
STOT RE 1	Specific target organ toxicity (repeated exposure) Category 1
H330	Fatal if inhaled
H360	May damage fertility or the unborn child
H372	Causes damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects

NFPA health hazard

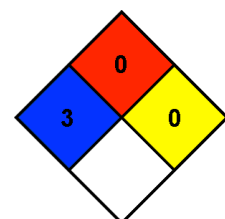
: 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard

: 0 - Materials that will not burn.

NFPA reactivity

: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



# MERCURY

## Safety Data Sheet

according to the federal final rule of hazard communication revised on 2012 (HazCom 2012)

---

SDS US (GHS HazCom 2012)

*This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product*

*THIS SDS PURCHASED FROM INTERTEK CHEMICALS & PHARMACEUTICALS, 2 RIVERWAY, SUITE 500, HOUSTON, TX 77056.*

# Zinc

## ZINC METAL SAFETY DATA SHEET

### SECTION 1. IDENTIFICATION

**Product Identity:** Zinc Metal

**Trade Names and Synonyms:** High Grade Zinc; Special High Grade Zinc; Zinc, Zn, CGG Alloy <1% Aluminum.

**Manufacturer:**

Teck Metals Ltd.  
Trail Operations  
Trail, British Columbia  
V1R 4L8  
Emergency Telephone: 250-364-4214

**Supplier:**

In U.S.:  
Teck American Metal Sales  
Incorporated  
501 North Riverpoint Blvd, Suite 300  
Spokane, WA  
USA, 99202

**Preparer:**

Teck Metals Ltd.  
Suite 3300 – 550 Burrard Street  
Vancouver, British Columbia  
V6C 0B3

Other than U.S.:

Teck Metals Ltd.  
#1700 – 11 King Street West  
Toronto, Ontario  
M5H 4C7

**Date of Last Review:** July 15, 2015.

**Date of Last Edit:** July 15, 2015.

**Product Use:** Zinc metal is used to coat steel for corrosion protection (galvanizing, electroplating, electrogalvanizing), as an alloying element in bronze, brass, aluminum and other metal alloys, for zinc die casting alloys, for zinc dry cell and zinc/air batteries, for the production of zinc sheet for architectural and coinage applications, as a reducing agent in organic chemistry and for other chemical applications.

### SECTION 2. HAZARDS IDENTIFICATION

**CLASSIFICATION:**

*NOTE: In the form in which it is sold this product is not regulated as a Hazardous Product in the U.S. or Canada. This Safety Data Sheet is provided for information purposes only.*

Health	Physical	Environmental
Acute Toxicity (Oral, Inhalation) – Does not meet criteria	Does not meet criteria for any Physical Hazard	Aquatic Toxicity – (Short Term/Long Term) Does not meet any criteria
Skin Corrosion/Irritation – Does not meet criteria		
Eye Damage/Eye Irritation – Does not meet criteria		
Respiratory or Skin Sensitization – Does not meet criteria		
Mutagenicity – Does not meet criteria		
Carcinogenicity – Does not meet criteria		
Reproductive Toxicity – Does not meet criteria		
Specific Target Organ Toxicity:		
Acute Exposure – Does not meet criteria		
Chronic Exposure – Does not meet criteria		

**LABEL:**

<b>Symbols:</b> None required	<b>Signal Word:</b> None required
<b>Hazard Statements</b>	<b>Precautionary Statements:</b>
None required	None required

**Emergency Overview:** A lustrous bluish-silver metal that does not burn in bulk but may form explosive mixtures if dispersed in air as a fine powder. Zinc oxide fume is formed when zinc metal is heated to or near the boiling point, or is burned. Contact with acids or alkalis generates flammable hydrogen gas which can accumulate in poorly ventilated areas. Do NOT use water or foam on burning zinc metal. Apply dry chemical, sand or special powder extinguishing media. Zinc is relatively non-toxic and poses little immediate hazard to the health of emergency response personnel or to the environment in an emergency situation.

**Potential Health Effects:** Zinc is essentially non-toxic to humans. However, zinc oxide fumes may cause mild local irritation to eyes, nose, throat and upper airways. Acute over-exposure to zinc oxide fume may cause metal fume fever, characterized by flu-like symptoms such as chills, fever, nausea, and vomiting which may be delayed 3 – 10 hours in onset. In most cases, dermal exposure to zinc or zinc compounds does not result in any noticeable toxic effects. Zinc is not listed as a carcinogen by OSHA, NTP, IARC, ACGIH or the EU (see Toxicological Information, Section 11).

**Potential Environmental Effects:** Zinc metal has relatively low bioavailability and poses no immediate ecological risks. Depending on physico-chemical characteristics (e.g., pH, water hardness), compounds of zinc metal can be toxic, particularly in the aquatic environment. Zinc also has the potential to bioaccumulate in plants and animals in both aquatic and terrestrial environments (see Ecological Information, Section 12).

### SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENTS	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Zinc	7440-66-6	99+%

Note: See Section 8 for Occupational Exposure Guidelines.

### SECTION 4. FIRST AID MEASURES

**Eye Contact:** *Symptoms:* Mild eye irritation, redness. Do not rub eye(s). Let the eye(s) water naturally for a few minutes. Look right and left, then up and down. If particle/dust does not come out, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If eye irritation persists, get medical advice/attention. DO NOT attempt to manually remove anything from the eye.

**Skin Contact:** *Symptoms:* Soiling of skin. No health effects expected. If irritation does occur, rinse with lukewarm, gently flowing water for 5 minutes or until the product is removed. If skin irritation occurs or you feel unwell, get medical advice/attention.

*Molten Metal:* Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

**Inhalation:** *Symptoms:* Coughing and irritation in heavy dust clouds. If symptoms are experienced remove source of contamination or move victim from exposure area to fresh air immediately and obtain medical advice. NOTE: Metal fume fever may develop 3-10 hours after exposure to zinc oxide fumes. If symptoms of metal fume fever (flu-like symptoms) develop, obtain medical attention.

**Ingestion:** *Symptoms:* Stomach upset, nausea, diarrhea. If swallowed, no specific intervention is indicated as this material is not likely to be hazardous by ingestion. However, if you are concerned or you feel unwell, obtain medical advice.

### SECTION 5. FIRE FIGHTING MEASURES

**Fire and Explosion Hazards:** Massive metal is difficult to ignite and is not considered a serious fire hazard. However, finely-divided metallic dust may form flammable or explosive dust clouds when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Bulk dust in a damp state may heat spontaneously and ignite on exposure to air. Contact with acids and alkali hydroxides results in evolution of hydrogen gas which is potentially explosive. Mixtures with potassium chlorate or fused ammonium nitrate may explode on impact.

**Extinguishing Media:** Apply dry chemical, dry sand, or special powder extinguishing (Class D) media. Do NOT use water, carbon dioxide or foam on molten metals. Water may be ineffective for extinguishing a fire but should be used to keep fire-exposed billets, ingots and castings cool.

**Fire Fighting:** If possible, move material not yet involved in the fire from the fire area. If this is not possible, cool fire-exposed zinc by applying hose streams or fogs. Apply only dry chemical, sand, or special powder extinguishing media to any molten or burning zinc metal. Take extreme caution to prevent contact of water with molten or burning zinc. Zinc foil in particular may ignite in the presence of water. Zinc oxide fumes may evolve in fires. Fire fighters should be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

### SECTION 6. ACCIDENTAL RELEASE MEASURES

**Procedures for Cleanup:** Control source of release if possible to do so safely. Clean up spilled material immediately observing precautions in Section 8, Personal Protection. Molten metal should be allowed to cool and harden before cleanup. Once solidified wear gloves, pick up and return to process. Powder or dust should be cleaned up by sweeping/shoveling, etc. Solid metal is recyclable. Return uncontaminated spilled material to the process if possible. Place contaminated material in clean, dry,

suitably labelled containers for later recovery or disposal. Treat or dispose of waste material in accordance with all local, state/provincial, and national requirements.

**Personal Precautions:** Protective clothing, gloves, and a respirator are recommended for persons responding to an accidental release (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with zinc dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash.

**Environmental Precautions:** Zinc metal has relatively low bioavailability and poses no immediate ecological risks. Depending on physico-chemical characteristics (e.g., pH, water hardness), compounds of zinc metal can be toxic, particularly in the aquatic environment. Zinc also has the potential to bioaccumulate in plants and animals in both aquatic and terrestrial environments. Releases of the product to water and soil should be prevented.

## SECTION 7. HANDLING AND STORAGE

Store zinc in a DRY covered area, separate from incompatible materials. Zinc ingots suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Ingots may contain cavities that collect moisture. Entrained moisture will expand explosively when immersed in a molten bath.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Occupational Exposure Guidelines:** (*Time-Weighted Average (TWA) concentration over 8 hr unless otherwise indicated*)

<u>Component</u>	<u>ACGIH TLV</u>	<u>OSHA PEL</u>	<u>NIOSH REL</u>
Zinc	None established†	None established†	None established†

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

† NOTE: While there is no established OEL for zinc as such, there are OELs for zinc oxide which may be formed during burning, welding or other fuming processes.

The OSHA PEL final rule limits for zinc oxide dust are 10 mg/m<sup>3</sup> (total) and 5 mg/m<sup>3</sup> (respirable); the OSHA PEL final rule limit for zinc oxide fume is 5 mg/m<sup>3</sup>. Note that the OSHA PEL final rule limits are currently non-enforceable due to a court decision. The OSHA PEL transitional limits therefore remain in force at present. They are 15 mg/m<sup>3</sup> (total) and 5 mg/m<sup>3</sup> (respirable) while the transitional PEL for zinc oxide fume is 5 mg/m<sup>3</sup>. The ACGIH TLV for zinc oxide is 2 mg/m<sup>3</sup> (respirable fraction) with a Short Term Exposure Limit (STEL) of 10 mg/m<sup>3</sup> (respirable fraction). The NIOSH REL for zinc oxide (dust or fume) is 5 mg/m<sup>3</sup> 10 hr TWA with a 15 mg/m<sup>3</sup> ceiling limit (15 minute sample) for zinc oxide dust and a 10 mg/m<sup>3</sup> STEL for zinc oxide fume (15 minute sample).

*NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:*

**Ventilation:** Use adequate local or general ventilation to maintain the concentration of zinc oxide fumes in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Where metallic particles of zinc are being collected and transported by a ventilation system, use a non-sparking, grounded ventilation system separate from other exhaust ventilation systems. Locate dust collectors and fans outdoors if possible and provide dust collectors with explosion vents or blow out panels. Refer to appropriate NFPA Standards 484, 654, and/or 68 for specific guidance.

**Protective Clothing:** Gloves and coveralls, shop coat or other work clothing are recommended to prevent prolonged or repeated direct skin contact when zinc is processed. Eye protection should be worn where fume or dust is generated. Respiratory protection may be required where zinc oxide fume is generated. Where hot or molten metal is handled, heat-resistant gloves, face shield, and clothing to protect from hot metal splash should be worn. Safety type boots are recommended.

**Respirators:** Where zinc oxide dust or fumes are generated and cannot be controlled to within acceptable levels, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-95 particulate filter cartridge).

**General Hygiene Considerations:** Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate designated areas. No special packaging materials are required.



## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance:</b> Bluish-silver lustrous metal	<b>Odour:</b> None	<b>Odour Threshold:</b> None	<b>pH:</b> Not Applicable
<b>Vapour Pressure:</b> 1 mm at 487°C Negligible at 20°C	<b>Vapour Density:</b> Not Applicable	<b>Melting Point/Range:</b> 420° C	<b>Boiling Point/Range:</b> 908° C
<b>Relative Density</b> (Water = 1): 7.1	<b>Evaporation Rate:</b> Not Applicable	<b>Coefficient of Water/Oil Distribution:</b> Log P (oct) = -0.47 (estimated)	<b>Solubility:</b> Insoluble in Water (0.2 mg/l @ pH 7)
<b>Flash Point:</b> Not Applicable.	<b>Flammable Limits (LEL/UEL):</b> LEL (Zinc Dust): 500 g/m <sup>3</sup> ; UEL Not Determined.	<b>Auto-ignition Temperature:</b> Approx 680°C (dust cloud in air), Approx 460°C (dust layer).	<b>Decomposition Temperature:</b> Oxidation starts approx 450°C

## SECTION 10. STABILITY AND REACTIVITY

**Stability & Reactivity:** Massive metal is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Zinc metal slowly becomes covered with a white coating of a hydrated basic zinc carbonate on exposure to moist air. Fine, condensed zinc dust or powder may heat spontaneously and ignite on exposure to air when damp. Zinc metal will react with acids and strong alkalis to generate hydrogen gas. A violent, explosive reaction may occur when powdered zinc is heated with sulphur. Powdered zinc will become incandescent or ignite in the presence of fluorine, chlorine, bromine or interhalogens (e.g., chlorine trifluoride). Powdered zinc can also react explosively with halogenated hydrocarbons if heated. Mixtures with potassium chlorate or fused ammonium nitrate may explode on impact.

**Incompatibilities:** Contact with acids and alkalis will generate highly flammable hydrogen gas. Contact with acidic solutions of arsenic and antimony compounds may evolve highly toxic ARSINE or STIBINE gas. Incompatible with strong oxidizing agents such as chlorine, fluorine, bromine, sodium, potassium or barium peroxide, sodium or potassium chlorate, chromium trioxide and fused ammonium nitrate. Also incompatible with elemental sulphur dust, halogenated hydrocarbons or chlorinated solvents, chlorinated rubber, and ammonium sulphide or calcium disulphide.

**Hazardous Decomposition Products:** High temperature operations such as oxy-acetylene cutting, electric arc welding or overheating a molten bath will generate zinc oxide fume which, on inhalation in sufficient quantity, can produce metal fume fever, a transient influenza-like illness.

## SECTION 11. TOXICOLOGICAL INFORMATION

**General:** Zinc, especially in the metal form, is relatively non-toxic. However, it can react with other materials, such as oxygen or acids, to form compounds that can be potentially toxic. The primary route of exposure would be through the generation and inhalation of zinc oxide fume.

### Acute:

**Skin/Eye:** In most cases, dermal exposure to zinc or zinc compounds does not result in any noticeable toxic effects. Zinc metal is not chemically irritating to the eyes.

**Inhalation:** If excessive quantities of zinc oxide fume are inhaled, it can result in the condition called metal fume fever. The symptoms of metal fume fever will occur within 3 to 10 hours, and include immediate dryness and irritation of the throat, tightness of the chest and coughing, which may later be followed by flu-like symptoms of fever, malaise, perspiration, frontal headache, muscle cramps, low back pain, occasionally blurred vision, nausea, and vomiting. The symptoms are temporary and generally disappear, without medical intervention, within 24 to 48 hours of onset. There are no recognized complications, after effects, or chronic effects that result from this condition.

**Ingestion:** Zinc is not expected to be harmful if ingested. When ingested in excessive quantities, zinc can irritate the stomach resulting in nausea, vomiting, abdominal pain and diarrhea. Ingestion is not a typical route of occupational exposure.

### Chronic:

There is no chronic form of metal fume fever but in rare instances an acute incident may be followed by complaints such as bronchitis or pneumonia. Some workers may develop a short-term immunity (resistance) so that repeated exposure to zinc oxide fumes does not cause metal fume fever. This immunity (resistance) however is quickly lost after short absences from work (weekends or vacations). Workers exposed to finely-divided metallic zinc for up to 35 years revealed no acute or chronic illnesses

attributable to zinc. Prolonged or repeated skin contact with zinc dust or powder may cause dryness, irritation and cracking (dermatitis) since zinc is astringent and may tend to draw moisture from the skin. Zinc is not listed as a human carcinogen by the Occupational Safety and Health Administration (OSHA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), the American Conference of Governmental Industrial Hygienists (ACGIH) or the European Union (EU).

**Animal Toxicity:**

<u>Ingredient:</u>	<u>Acute Oral Toxicity:</u>	<u>Acute Dermal Toxicity:</u>	<u>Acute Inhalation Toxicity:</u>
Zinc	>5,000 mg/kg <sup>†</sup>	No data	No data

<sup>†</sup> LD<sub>50</sub>, Mouse, Oral,

**SECTION 12. ECOLOGICAL INFORMATION**

Zinc metal is relatively insoluble; however, processing of the product or extended exposure in aquatic and terrestrial environments may lead to the release of zinc compounds in bioavailable forms. Zinc is highly mobile, and can be toxic in the aquatic environment with water hardness, pH and dissolved organic carbon content being major regulating factors. Zinc also has the potential to bioaccumulate in plants and animals in both aquatic and terrestrial environments. In soils, zinc is moderately mobile in accordance with soil properties (e.g., cation exchange capacity, pH, redox potential, chemical species); these properties also influence its bioavailability to terrestrial plants.

**SECTION 13. DISPOSAL CONSIDERATIONS**

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

**SECTION 14. TRANSPORT INFORMATION**

PROPER SHIPPING NAME ..... Not applicable – not regulated.  
 U.S. DOT AND TRANSPORT CANADA HAZARD CLASSIFICATION .... Not applicable  
 U.S. DOT AND TRANSPORT CANADA PID ..... Not applicable  
 MARINE POLLUTANT ..... No  
 IMO CLASSIFICATION ..... Not regulated

**SECTION 15. REGULATORY INFORMATION**

**U.S.**  
 INGREDIENTS LISTED ON TSCA INVENTORY ..... Yes  
 HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD ..... No  
 CERCLA SECTION 103 HAZARDOUS SUBSTANCES ..... Zinc ..... Yes ..... RQ: 1,000 lb. (454 kg.)\*  
 \* reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).  
 EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE ..... No  
 EPCRA SECTION 311/312 HAZARD CATEGORIES ..... No Hazard Categories Apply  
 EPCRA SECTION 313 TOXIC RELEASE INVENTORY: ..... This product does not contain any toxic chemicals subject to the Toxic Release reporting requirements. However, potential by-products from working with this product - "Zinc (Fume or Dust)" CAS 7440-66-6 are reportable.

**SECTION 16. OTHER INFORMATION**

**Date of Original Issue:** July 23, 1997 **Version:** 01 (*First edition*)  
**Date of Latest Revision:** July 15, 2015 **Version:** 14

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, 7<sup>th</sup> Edition plus updates.

- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, 2015, Guide to Occupational Exposure Values.
- Bretherick's Handbook of Reactive Chemical Hazards, 20<sup>th</sup> Anniversary Edition (P. G. Urban, Ed), 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS) Hamilton, ON, CHEMINFO Record No. 239 – Zinc Metal.
- European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 30 January 2015.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, 13<sup>th</sup> Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (on-line version).
- Oak Ridge National Laboratory, Oak Ridge, Tennessee – Toxicity Summary for Zinc and Zinc Compounds, April 1992.
- Patty's Toxicology, 5<sup>th</sup> Edition, 2001 E. Bingham, B. Cohnsen & CH Powell (Eds.).
- U.S. Dept. of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 13<sup>th</sup> Report on Carcinogens, October 2014.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards (on-line edition).
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Zinc - August 2005.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS), CCOHS on-line version.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

**Notice to Reader**

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck American Metal Sales Incorporated and Teck Metals Ltd. extend no warranty and assume no responsibility for the accuracy of the content and expressly disclaim all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

# **VOCs / BTEX**

# Benzene

**Benzene**

Version 1.9

Revision Date 2016-01-08

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****Product information**

Product Name : Benzene  
Material : 1098293, 1059192, 1059060, 1037212, 1037213, 1037103,  
1029170, 1037104, 1015526, 1016960

**Company** : Chevron Phillips Chemical Company LP  
10001 Six Pines Drive  
The Woodlands, TX 77380

**Emergency telephone:****Health:**

866.442.9628 (North America)

1.832.813.4984 (International)

**Transport:**

CHEMTREC 1.800.424.9300 (within USA and Canada) or 703.527.3887 (outside USA and Canada)

Asia: +800 CHEMCALL (+800 2436 2255) China: +86-21-22157316

EUROPE: BIG +32.14.584545 (phone) or +32.14583516 (telefax)

South America SOS-Cotec Inside Brazil: 0800.111.767 Outside Brazil: +55.19.3467.1600

Responsible Department : Product Safety and Toxicology Group  
E-mail address : SDS@CPChem.com  
Website : www.CPChem.com

**SECTION 2: Hazards identification****Classification of the substance or mixture**

This product has been classified in accordance with the hazard communication standard 29 CFR 1910.1200; the SDS and labels contain all the information as required by the standard.

**Emergency Overview****Danger**

**Physical state:** Liquid    **Color:** Clear, Colorless    **Odor:** sweet, distinct

OSHA Hazards : Flammable Liquid, Aspiration hazard, Carcinogen, Moderate skin irritant, Moderate eye irritant, Mutagen, Target Organ Effects

**Classification**

**Benzene**

Version 1.9

Revision Date 2016-01-08

- : Flammable liquids , Category 2
- Skin irritation , Category 2
- Eye irritation , Category 2A
- Germ cell mutagenicity , Category 1B
- Carcinogenicity , Category 1A
- Specific target organ systemic toxicity - repeated exposure , Category 1 , Blood
- Aspiration hazard , Category 1

**Labeling**

Symbol(s)



Signal Word

: Danger

Hazard Statements

- : H225: Highly flammable liquid and vapor.
- H304: May be fatal if swallowed and enters airways.
- H315: Causes skin irritation.
- H319: Causes serious eye irritation.
- H340: May cause genetic defects.
- H350: May cause cancer.
- H372: Causes damage to organs (Blood) through prolonged or repeated exposure.

Precautionary Statements

- : **Prevention:**
- P201 Obtain special instructions before use.
- P202 Do not handle until all safety precautions have been read and understood.
- P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
- P233 Keep container tightly closed.
- P240 Ground/bond container and receiving equipment.
- P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
- P242 Use only non-sparking tools.
- P243 Take precautionary measures against static discharge.
- P260 Do not breathe dust/fume/gas/mist/vapor/spray.
- P264 Wash skin thoroughly after handling.
- P270 Do not eat, drink or smoke when using this product.
- P280 Wear protective gloves/ eye protection/ face protection.
- P281 Use personal protective equipment as required.
- Response:**
- P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
- P303 + P361 + P353 IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
- P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P308 + P313 IF exposed or concerned: Get medical advice/ attention.
- P331 Do NOT induce vomiting.
- P332 + P313 If skin irritation occurs: Get medical advice/ attention.
- P337 + P313 If eye irritation persists: Get medical advice/

**Benzene**

Version 1.9

Revision Date 2016-01-08

attention.

P362 Take off contaminated clothing and wash before reuse.

P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.

**Storage:**

P403 + P235 Store in a well-ventilated place. Keep cool.

P405 Store locked up.

**Disposal:**

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

**Carcinogenicity:**

<b>IARC</b>	Group 1: Carcinogenic to humans
	Benzene 71-43-2
<b>NTP</b>	Known to be human carcinogen
	Benzene 71-43-2
<b>ACGIH</b>	Confirmed human carcinogen
	Benzene 71-43-2

**SECTION 3: Composition/information on ingredients**

Synonyms : Aromatic Benzene  
Benzol  
Cyclohexatriene  
Phene  
Phenyl Hydride

Molecular formula : C<sub>6</sub>H<sub>6</sub>

Component	CAS-No.	Weight %
Benzene	71-43-2	100

**SECTION 4: First aid measures**

General advice : Move out of dangerous area. Show this material safety data sheet to the doctor in attendance. Material may produce a serious, potentially fatal pneumonia if swallowed or vomited.

If inhaled : If unconscious place in recovery position and seek medical advice. If symptoms persist, call a physician.

In case of skin contact : If skin irritation persists, call a physician. If on skin, rinse well with water. If on clothes, remove clothes.

In case of eye contact : Immediately flush eye(s) with plenty of water. Remove contact lenses. Protect unharmed eye. Keep eye wide open while rinsing. If eye irritation persists, consult a specialist.

If swallowed : Keep respiratory tract clear. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician.



**Benzene**

Version 1.9

Revision Date 2016-01-08

Take victim immediately to hospital.

**SECTION 5: Firefighting measures**

Flash point	:	-11 °C (12 °F) Method: Tag closed cup
Autoignition temperature	:	498 °C (928 °F)
Suitable extinguishing media	:	Alcohol-resistant foam. Carbon dioxide (CO <sub>2</sub> ). Dry chemical.
Unsuitable extinguishing media	:	High volume water jet.
Specific hazards during fire fighting	:	Do not allow run-off from fire fighting to enter drains or water courses.
Special protective equipment for fire-fighters	:	Wear self-contained breathing apparatus for firefighting if necessary.
Further information	:	Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. For safety reasons in case of fire, cans should be stored separately in closed containments. Use a water spray to cool fully closed containers.
Fire and explosion protection	:	Do not spray on an open flame or any other incandescent material. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapors). Use only explosion-proof equipment. Keep away from open flames, hot surfaces and sources of ignition.
Hazardous decomposition products	:	No data available.

**SECTION 6: Accidental release measures**

Personal precautions	:	Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.
Environmental precautions	:	Prevent product from entering drains. Prevent further leakage or spillage if safe to do so. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods for cleaning up	:	Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

**Benzene**

Version 1.9

Revision Date 2016-01-08

**SECTION 7: Handling and storage****Handling**

Advice on safe handling : Avoid formation of aerosol. Do not breathe vapors/dust. Avoid exposure - obtain special instructions before use. Avoid contact with skin and eyes. For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Provide sufficient air exchange and/or exhaust in work rooms. Container may be opened only under exhaust ventilation hood. Open drum carefully as content may be under pressure. Dispose of rinse water in accordance with local and national regulations.

Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary, but may not by themselves be sufficient. Review all operations, which have the potential to generating and accumulation of electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106 "Flammable and Combustible Liquids"; National Fire Protection Association (NFPA 77), "Recommended Practice on Static Electricity"; and/or the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising Out of Static, Lightning, and stray Currents".

Avoid formation of aerosol. Do not breathe vapors/dust. Avoid exposure - obtain special instructions before use. Avoid contact with skin and eyes. For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Take precautionary measures against static discharges. Provide sufficient air exchange and/or exhaust in work rooms. Container may be opened only under exhaust ventilation hood. Open drum carefully as content may be under pressure. Dispose of rinse water in accordance with local and national regulations.

Advice on protection against fire and explosion : Do not spray on an open flame or any other incandescent material. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapors). Use only explosion-proof equipment. Keep away from open flames, hot surfaces and sources of ignition.

**Storage**

Requirements for storage areas and containers : No smoking. 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. Observe label precautions. Electrical installations / working materials must comply with the technological safety standards.

**SECTION 8: Exposure controls/personal protection****Ingredients with workplace control parameters**

**Benzene**

Version 1.9

Revision Date 2016-01-08

**US**

Ingredients	Basis	Value	Control parameters	Note
Benzene	ACGIH	TWA	0.5 ppm,	BEI, A1, Skin,
	ACGIH	STEL	2.5 ppm,	BEI, A1, Skin,
	OSHA Z-1-A	TWA	1 ppm,	
	OSHA Z-1-A	CEIL	5 ppm,	
	OSHA Z-2	Peak	50 ppm,	(a),
	OSHA 29 CFR 1910.1028(c)	TWA	1 ppm,	
	OSHA 29 CFR 1910.1028(c)	STEL	5 ppm,	
	OSHA CARC	PEL	1 ppm,	
	OSHA CARC	STEL	5 ppm,	

(a) This standard applies to the industry segments exempt from the 1 ppm 8-hour TWA and 5 ppm STEL of the benzene standard at 1910.1028.

A1 Confirmed human carcinogen

BEI Substances for which there is a Biological Exposure Index or Indices (see BEI® section)

Skin Danger of cutaneous absorption

**Immediately Dangerous to Life or Health Concentrations (IDLH)**

Substance name	CAS-No.	Control parameters	Update
Benzene	71-43-2	Immediately Dangerous to Life or Health Concentration Value 500 ppm	1995-03-01

**Engineering measures**

Adequate ventilation to control airborne concentrations below the exposure guidelines/limits. Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

**Personal protective equipment**

- Respiratory protection : Wear a supplied-air NIOSH approved respirator unless ventilation or other engineering controls are adequate to maintain minimal oxygen content of 19.5% by volume under normal atmospheric pressure. Wear a NIOSH approved respirator that provides protection when working with this material if exposure to harmful levels of airborne material may occur, such as: Air-Purifying Respirator for Organic Vapors. Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, exposure levels are not known, or other circumstances where air-purifying respirators may not provide adequate protection.
- Hand protection : The suitability for a specific workplace should be discussed with the producers of the protective gloves. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
- Eye protection : Eye wash bottle with pure water. Tightly fitting safety goggles.
- Skin and body protection : Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. Wear as appropriate: Flame retardant

**Benzene**

Version 1.9

Revision Date 2016-01-08

antistatic protective clothing. Workers should wear antistatic footwear.

Hygiene measures : When using do not eat or drink. When using do not smoke. Wash hands before breaks and at the end of workday.

**SECTION 9: Physical and chemical properties****Information on basic physical and chemical properties****Appearance**

Physical state : Liquid  
 Color : Clear, Colorless  
 Odor : sweet, distinct

**Safety data**

Flash point : -11 °C (12 °F)  
 Method: Tag closed cup

Lower explosion limit : 1.2 %(V)

Upper explosion limit : 7.8 %(V)

Oxidizing properties : no

Autoignition temperature : 498 °C (928 °F)

Molecular formula : C<sub>6</sub>H<sub>6</sub>

Molecular weight : 78.12 g/mol

pH : Not applicable

Pour point : No data available

Boiling point/boiling range : 80 °C (176 °F)

Vapor pressure : 75.00 MMHG  
 at 20 °C (68 °F)

Relative density : 0.88  
 at 25 °C (77 °F)

Water solubility : 1.88 g/l  
 at 23.5 °C (74.3 °F)

Partition coefficient: n-octanol/water : log Pow: 2.13

Relative vapor density : 2.77  
 (Air = 1.0)

Evaporation rate : 2.8

Percent volatile : > 99 %

**Other information**

SDS Number:100000068511

7/14

**Benzene**

Version 1.9

Revision Date 2016-01-08

Conductivity : < 50 pSm  
at 20 °C

**SECTION 10: Stability and reactivity**

Reactivity : No decomposition if stored and applied as directed.

Chemical stability : This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.  
No decomposition if stored and applied as directed.

**Possibility of hazardous reactions**

Conditions to avoid : Heat, flames and sparks.

Materials to avoid : May react with oxygen and strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

Hazardous decomposition products : No data available

Other data : No decomposition if stored and applied as directed.

**SECTION 11: Toxicological information****Acute oral toxicity**

Benzene : LD50: > 2,000 mg/kg  
Species: Rat  
Sex: female

**Acute inhalation toxicity**

Benzene : LC50: 44.5 mg/l  
Exposure time: 4 h  
Species: Rat  
Sex: Not Specified  
Test atmosphere: vapor

**Acute dermal toxicity**

Benzene : LD50: > 8,260 mg/kg  
Species: Rabbit

**Benzene**

**Skin irritation** : May cause skin irritation in susceptible persons.

**Benzene**

**Eye irritation** : May cause irreversible eye damage.

**Sensitization**

**Benzene**

Version 1.9

Revision Date 2016-01-08

Benzene : Did not cause sensitization on laboratory animals.

**Repeated dose toxicity**

Benzene : Species: Rat, female  
Sex: female  
Application Route: oral gavage  
Dose: 0, 25, 50, 100 mg/kg  
Exposure time: 103 wk  
Number of exposures: 5 d/wk  
NOEL: < 25 mg/kg  
Lowest observable effect level: 25 mg/kg

Species: Rat, male  
Sex: male  
Application Route: oral gavage  
Dose: 0, 50, 100, 200 mg/kg  
Exposure time: 103 wk  
Number of exposures: 5 d/wk  
NOEL: < 50 mg/kg  
Lowest observable effect level: 50 mg/kg

Species: Mouse  
Application Route: oral gavage  
Dose: 0, 25, 50, 100 mg/kg  
Exposure time: 103 wk  
NOEL: < 25 mg/kg

**Carcinogenicity**

Benzene : Species: Rat  
Sex: female  
Dose: 0, 25, 50, 250 mg/kg  
Exposure time: 103 wks  
Number of exposures: daily, 5 days/week  
Test substance: yes  
Remarks: zymbal gland carcinomas, squamous cell papillomas

Species: Rat  
Sex: male  
Dose: 0, 50, 100, 200 mg/kg  
Exposure time: 103 wks  
Number of exposures: daily, 5 days/week  
Test substance: yes  
Remarks: zymbal gland carcinomas, squamous cell papillomas

Species: Mouse  
Sex: male and female  
Dose: 25, 50, 100 mg/kg  
Exposure time: 103 wks  
Number of exposures: daily, 5 days/week  
Test substance: yes  
Remarks: Clear evidence of multiple organ carcinogenicity.

**Benzene  
Aspiration toxicity** : May be fatal if swallowed and enters airways.

**Benzene**

Version 1.9

Revision Date 2016-01-08

Substances known to cause human aspiration toxicity hazards or to be regarded as if they cause human aspiration toxicity hazard.

**CMR effects**

**Benzene** : Carcinogenicity: Human carcinogen.  
 Mutagenicity: In vivo tests showed mutagenic effects  
 Teratogenicity: Did not show teratogenic effects in animal experiments.  
 Reproductive toxicity: Animal testing did not show any effects on fertility.

**Benzene****Further information**

: Chronic Health Hazard.  
 Solvents may degrease the skin.

**SECTION 12: Ecological information****Toxicity to fish**

**Benzene** : LC50: 5.3 mg/l  
 Exposure time: 96 h  
 Species: Oncorhynchus mykiss (rainbow trout)  
 flow-through test Test substance: yes  
 Method: OECD Test Guideline 203

**Toxicity to daphnia and other aquatic invertebrates**

**Benzene** : EC50: 10 mg/l  
 Exposure time: 48 h  
 Species: Daphnia magna (Water flea)  
 static test Test substance: yes  
 Method: OECD Test Guideline 202

**Toxicity to algae**

**Benzene** : ErC50: 100 mg/l  
 Exposure time: 72 h  
 Species: Pseudokirchneriella subcapitata (green algae)  
 Test substance: yes  
 Method: OECD Test Guideline 201

Elimination information (persistence and degradability)

**Biodegradability** : This material is expected to be readily biodegradable.

**Ecotoxicology Assessment****Acute aquatic toxicity**

**Benzene** : Toxic to aquatic life.

**Chronic aquatic toxicity**

**Benzene** : Harmful to aquatic life with long lasting effects.

**Benzene**

Version 1.9

Revision Date 2016-01-08

## Results of PBT assessment

Benzene : This substance is not considered to be persistent, bioaccumulating and toxic (PBT)., This substance is not considered to be very persistent and very bioaccumulating (vPvB).

## Additional ecological information

: Toxic to aquatic life.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal., Toxic to aquatic life.

**SECTION 13: Disposal considerations**

The information in this SDS pertains only to the product as shipped.

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

Product : The product should not be allowed to enter drains, water courses or the soil. Do not contaminate ponds, waterways or ditches with chemical or used container. Send to a licensed waste management company.

Contaminated packaging : Empty remaining contents. Dispose of as unused product. Do not re-use empty containers. Do not burn, or use a cutting torch on, the empty drum.

**SECTION 14: Transport information**

**The shipping descriptions shown here are for bulk shipments only, and may not apply to shipments in non-bulk packages (see regulatory definition).**

Consult the appropriate domestic or international mode-specific and quantity-specific Dangerous Goods Regulations for additional shipping description requirements (e.g., technical name or names, etc.) Therefore, the information shown here, may not always agree with the bill of lading shipping description for the material. Flashpoints for the material may vary slightly between the SDS and the bill of lading.

**US DOT (UNITED STATES DEPARTMENT OF TRANSPORTATION)**  
UN1114, BENZENE, 3, II, RQ (BENZENE)

**IMO / IMDG (INTERNATIONAL MARITIME DANGEROUS GOODS)**  
UN1114, BENZENE, 3, II, (-11 °C)

**IATA (INTERNATIONAL AIR TRANSPORT ASSOCIATION)**  
UN1114, BENZENE, 3, II

**ADR (AGREEMENT ON DANGEROUS GOODS BY ROAD (EUROPE))**



**Benzene**

Version 1.9

Revision Date 2016-01-08

UN1114, BENZENE, 3, II, (D/E)

**RID (REGULATIONS CONCERNING THE INTERNATIONAL TRANSPORT OF DANGEROUS GOODS (EUROPE))**

UN1114, BENZENE, 3, II

**ADN (EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY INLAND WATERWAYS)**

UN1114, BENZENE, 3, II

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**

<b>Other information</b>	<b>: Benzene and mixtures having 10% Benzene or more, S.T. 3, Cat.Y</b>
--------------------------	---

**SECTION 15: Regulatory information****National legislation**

CERCLA Reportable Quantity : 10 lbs  
Benzene

SARA 302 Reportable Quantity : This material does not contain any components with a SARA 302 RQ.

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

SARA 304 Reportable Quantity : This material does not contain any components with a section 304 EHS RQ.

SARA 313 Ingredients : The following components are subject to reporting levels established by SARA Title III, Section 313:

: Benzene - 71-43-2

**Clean Air Act**

Ozone-Depletion Potential : This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

The following chemical(s) are listed as HAP under the U.S. Clean Air Act, Section 12 (40 CFR 61):

**Benzene**

Version 1.9

Revision Date 2016-01-08

: Benzene - 71-43-2

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).

The following chemical(s) are listed under the U.S. Clean Air Act Section 111 SOCM I Intermediate or Final VOC's (40 CFR 60.489):

: Benzene - 71-43-2

**US State Regulations**

Pennsylvania Right To Know

: Benzene - 71-43-2

New Jersey Right To Know

: Benzene - 71-43-2

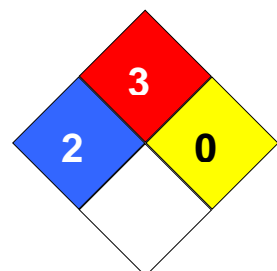
California Prop. 65  
Ingredients

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

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

**Notification status**

Europe REACH	:	On the inventory, or in compliance with the inventory
United States of America TSCA	:	On the inventory, or in compliance with the inventory
Canada DSL	:	On the inventory, or in compliance with the inventory
Australia AICS	:	On the inventory, or in compliance with the inventory
New Zealand NZIoC	:	On the inventory, or in compliance with the inventory
Japan ENCS	:	On the inventory, or in compliance with the inventory
Korea KECI	:	On the inventory, or in compliance with the inventory
Philippines PICCS	:	On the inventory, or in compliance with the inventory
China IECSC	:	On the inventory, or in compliance with the inventory

**SECTION 16: Other information****NFPA Classification**: Health Hazard: 2  
Fire Hazard: 3  
Reactivity Hazard: 0

**Benzene**

Version 1.9

Revision Date 2016-01-08

**Further information**

Legacy SDS Number : CPC00091

Significant changes since the last version are highlighted in the margin. This version replaces all previous versions.

The information in this SDS pertains only to the product as shipped.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Key or legend to abbreviations and acronyms used in the safety data sheet			
ACGIH	American Conference of Government Industrial Hygienists	LD50	Lethal Dose 50%
AICS	Australia, Inventory of Chemical Substances	LOAEL	Lowest Observed Adverse Effect Level
DSL	Canada, Domestic Substances List	NFPA	National Fire Protection Agency
NDSL	Canada, Non-Domestic Substances List	NIOSH	National Institute for Occupational Safety & Health
CNS	Central Nervous System	NTP	National Toxicology Program
CAS	Chemical Abstract Service	NZIoC	New Zealand Inventory of Chemicals
EC50	Effective Concentration	NOAEL	No Observable Adverse Effect Level
EC50	Effective Concentration 50%	NOEC	No Observed Effect Concentration
EGEST	EOSCA Generic Exposure Scenario Tool	OSHA	Occupational Safety & Health Administration
EOSCA	European Oilfield Specialty Chemicals Association	PEL	Permissible Exposure Limit
EINECS	European Inventory of Existing Chemical Substances	PICCS	Philippines Inventory of Commercial Chemical Substances
MAK	Germany Maximum Concentration Values	PRNT	Presumed Not Toxic
GHS	Globally Harmonized System	RCRA	Resource Conservation Recovery Act
>=	Greater Than or Equal To	STEL	Short-term Exposure Limit
IC50	Inhibition Concentration 50%	SARA	Superfund Amendments and Reauthorization Act.
IARC	International Agency for Research on Cancer	TLV	Threshold Limit Value
IECSC	Inventory of Existing Chemical Substances in China	TWA	Time Weighted Average
ENCS	Japan, Inventory of Existing and New Chemical Substances	TSCA	Toxic Substance Control Act
KECI	Korea, Existing Chemical Inventory	UVCB	Unknown or Variable Composition, Complex Reaction Products, and Biological Materials
<=	Less Than or Equal To	WHMIS	Workplace Hazardous Materials Information System
LC50	Lethal Concentration 50%		


# Toluene

# Safety Data Sheets (SDS)

## SECTION 1-IDENTIFICATION

<b>Product name:</b> Toluene
<b>Other names:-</b>
<b>Proper shipping name:</b> Toluene
<b>Recommended use of the chemical and restrictions on use:</b> The major use of toluene is as a mixture added to gasoline to improve octane ratings. Used as a solvent for paint, resins, lacquers inks & adhesives. Component of solvent blends and thinners. Used in the manufacture of chemicals, dyes, explosives, benzoic acid. Some grades of toluene may contain traces of xylene and benzene. The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation. WARNING: Intentional misuse by concentrating/inhaling contents may be lethal.
<b>Manufacturer/Supplier Name:</b> Taiwan SM Corp., Kaohsiung plant <b>Address:</b> NO.7, Industrial 1st Rd, Lin-Yuan Kaohsiung County 83203, Taiwan, R.O.C. <b>Phone No.:</b> 886-7-6414511
<b>Emergency phone No./Fax No.:</b> 886-7-6414511 Ext. 221 (on duty), 886-7-6414517 (off duty)/886-7-6423828

## SECTION 2-HAZARDS IDENTIFICATION

<b>GHS Classification:</b> Flammable Liquid Category 2 Acute Toxicity (Oral) Category 4 Skin Corrosion/ Irritation Category 2 Serious Eye Damage/ Eye Irritation Category 2 Specific Target Organ Toxicity Repeated Exposure Category 2 Hazardous To The Aquatic Environment (Acute) Category 3 Aspiration Hazard Category 1
<b>GHS Label elements:</b> <b>Hazard symbols</b> 
<b>Signal word</b> Danger
<b>Hazard statements</b> Highly flammable liquid and vapor Harmful if inhaled Causes skin irritation Causes serious eye irritation May cause damage to organs through prolonged or repeated exposure. May cause long lasting harmful effects to aquatic life. May be fatal if swallowed and enters airways.
<b>Precautionary statements</b> Use only in well ventilated area. Control of exposure by mechanical ventilation in an unventilated or confined space. Avoid breathing vapors and contact with skin and eyes. Wear breathing apparatus/protective gloves/face protection. Store in well-ventilated place. Disposal must be in accordance with applicable federal, state, or local regulations.
<b>Other hazards:</b> —

## SECTION 3-COMPOSITION/INFORMATION ON INGREDIENTS

CAS No.	Chemical Name	wt% by weight	EINECS No.
00108-88-3	Toluene	97.0 min.	203-625-9
Synonyms	Methylbenzol; Methylbenzene; Toluol; Phenylmethane		

## SECTION 4-FIRST AID MEASURES

### Description of necessary first aid measures

#### Eye:

1. Flush immediately with warm water for at least 20 minutes.
2. Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
3. If pain persists or recurs seek medical attention.
4. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

#### Skin:

1. Removing contaminated clothing, shoes, and leathery wearings, cleaning procedure is available before reused or waste treatment.
2. Washing affected area thoroughly with soap and water for at least 20 minutes.
3. Call a Physician if irritation develops or persists.

#### Ingestion:

1. If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomits.
2. If victim is conscious and alert, give 2~4 cupfuls of milk/water to dilute the substance in stomach.
3. Never give anything by mouth to an unconscious person.
4. Don't induce vomiting unless directed to do so by medical person.
5. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
6. Then seek for medical attention.

#### Inhalation:

1. Remove from further exposure and flush thoroughly with air.
2. Lay patient down. Keep warm and rested.
3. Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
4. If respiratory irritation, seek immediate medical assistance and call a physician.

### Most important symptoms/effects, acute and delayed

Headache, fatigue, drowsiness, insomnia, anorexia and pain in limbs, nervousness, impairment of memory.

### Indication of immediate medical attention and special treatment needed, if necessary

For acute or short term repeated exposures to toluene:

#### Inhalation:

1. Inhalation overexposure can produce toxic effects. Monitor for respiratory distress.
2. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Administer supplemental oxygen with assisted ventilation, as required.
3. This material (or a component) sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material.
4. Administration of sympathomimetic drugs should be avoided.

#### Ingestion:

1. If ingested, this material presents a significant aspiration and chemical pneumonitis hazard.
2. Induction of emesis is not recommended.
3. Consider activated charcoal and/or gastric lavage.
4. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

## SECTION 5-FIRE FIGHTING MEASURES

### Extinguishing media

Foam · CO<sub>2</sub> · Dry chemical · Water fog.

### Specific hazards arising from the chemical

1. Liquid and vapor are highly flammable.
2. Severe fire hazard when exposed to heat, flame and/or oxidizers.
3. Vapor may travel a considerable distance to source of ignition.
4. Heating may cause expansion or decomposition leading to violent rupture of containers.
5. On combustion, may emit toxic fumes of carbon monoxide (CO).

**Special protective equipment and precautions for fire-fighters**

1. Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies.
2. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles.
3. Cover pooling liquid with foam.
4. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out.
5. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines.
6. Be aware that burning liquid will float on water.
7. Notify appropriate authorities of potential fire and explosion hazard if liquid enter sewers or waterways

**SECTION 6-ACCIDENTAL RELEASE MEASURES****Personal precautions, protective equipment and emergency procedure**

1. Personal protective equipment (specified in Section 8)  
Eyes : Chemical safety goggles are recommended, and a face shield is added when needed.  
Skin : Wear appropriate protective gloves to avoid skin contact.  
Clothing: When direct contact is likely, use rubberized clothings, apron and boots.  
Respiratory : When limits are exceeded, wear a respirator approved by NIOSH/MSHA for protection against organic dust, mists and vapors.
2. Remove all sources of ignition. No smoking, naked lights or ignition sources. Ventilate area of leak or spill.
3. Keep unnecessary and unprotected personnel from entering. Evacuate personnel from the danger area. Consult with an expert about the emergency procedures.

**Environmental precautions**

1. Prevent spillage from entering drains, surface, and groundwater.
2. Contain and recover liquid when possible. Use non-sparking tools and equipment.
3. Collect liquid in an appropriate container or absorb with an inert material (e.g. vermiculite, dry sand, earth), and place in a chemical waste container.
4. Report the accidental spill/release to Local/State government.

**Methods and materials for containment and cleaning up**

Minor spill:

1. Remove all ignition sources.
2. Clean up all spills immediately.
3. Avoid breathing vapors and contact with skin and eyes.
4. Control personal contact by using protective equipment.
5. Contain and absorb small quantities with vermiculite or other absorbent material.
6. Wipe up.
7. Collect residues in a flammable waste container.

Major spill

1. Clear area of personnel and move upwind.
2. Alert emergency responders and tell them location and nature of hazard.
3. May be violently or explosively reactive.
4. Wear breathing apparatus plus protective gloves.
5. Prevent spillage from entering drains or water course.
6. No smoking, naked lights or ignition sources. Increase ventilation.
7. Stop leak if safe to do so.
8. Water spray or fog may be used to disperse/absorb vapor.
9. Contain spill with sand, earth or vermiculite.
10. Use only spark-free shovels and explosion proof equipment.
11. Collect recoverable product into labeled containers for recycling..
12. Absorb remaining product with sand, earth or vermiculite.
13. Collect solid residues and seal in labeled drums for disposal.
14. Wash area and prevent runoff into drains.
15. If contamination of drains or waterways occurs, advise emergency services.

**SECTION 7-HANDLING AND STORAGE****Precautions for safe handling**

1. Wash thoroughly after handling.
2. Use only in well ventilated area.
3. Ground and bond containers when transferring.
4. Use spark-free tools and explosion proof equipment.
5. Empty containers retain product residue (liquid/vapor), and can be dangerous.
6. Do not pressurize, cut, weld, braze, solder, drill, or expose empty containers to heat, sparks or open flames.

**Conditions for safe storage, including any incompatibilities**

1. Store in original containers in approved flame-proof area.
2. No smoking, naked lights, heat or ignition sources.
3. DO NOT store in pits, depressions, basements or areas where vapors may be trapped.
4. Keep containers securely sealed.
5. Store away from incompatible materials in a cool, dry well ventilated area.
6. Protect containers against physical damage and check regularly for leaks.
7. Keep containers tightly closed and store in a cool, dry, well-ventilated place, plainly labeled, and out of closed vehicles.
8. Ground all equipment containing this material.
9. Observe manufacturer's storing and handling recommendations.
10. Containers should be able to withstand pressures expected from warming and cooling in storage. This flammable liquid should be stored in a separate safety cabinet or room. A refrigerated room is preferable for materials with a flash point temperature lower than 70°F (21°C).

**SECTION 8-EXPOSURE CONTROLS, PERSONAL PROTECTION**

OSHA - Final PELs : 200 ppm TWA.

OSHA Ceiling : 300ppm.

ACGIH : 50 ppm, skin -potential forcutaneous absorption.

NIOSH : 100 ppm TWA; 375 mg/m<sup>3</sup> TWA; 500 ppm IDLH.

Taiwan TWA : 100 ppm (skin).

Taiwan STEL : 125 ppm (skin).

Taiwan Ceiling : -----.

Taiwan BEI : 1 mg/1 (before on duty).

**Engineering control**

1. Process should be located at least 17 meter (50 feet) away from open flames and all high temperature operations likely to cause ignition of the styrene monomer vapor.
2. In venting styrene monomer vapors, consideration should be given to possible halogenation of the vapors by low concentrations of free chlorine and bromine with the resultant formation of lacrimations.
3. Process should be designed so that the operator is not exposed to direct contact with Toluene or the vapor. The technical problems of designing equipment, providing adequate ventilation and operating procedures which promise maximum security and economy, can best be handled by competent engineers.
4. It is essential for safety that equipment be used and maintained as recommended by the manufacturer.
5. Tanks used to store or process Toluene should be closed vessels vented to a safe point of discharge in the outside atmosphere away from operating stations, roadways, and at least 17 meter (50 feet) from possible sources of ignitions. All sparks, flames, heated surface, or other sources of ignition should be kept away from all vents. It is advisable, to provide suction on vessels when inspection or observation openings are made, to minimize or eliminate escape of vapors.

**Personal protective equipment**

Eye Protection:

Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. A suitable emergency eye wash water and safety shower should be located near the work station.

Skin protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Clothing:

Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discard contaminated leather goods.

Respirators:

For known vapor concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator if adequate protection is provided. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134). For airborne vapor concentrations that exceed the recommended protection factors for organic vapor respirators, use a full-face, positive-pressure, supplied air respirator. Due to fire and explosion hazards, do not enter atmospheres containing concentrations greater than 10% of the lower flammable limit of this product.



## SECTION 9-PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Transparent liquid	Upper/lower explosive limits : 1.2% ~7.1%
Odour : pleasant aromatic petroleum odour	Vapor Pressure : 22 mmHg @20°C/68°F
Odour threshold : 0.16~37 ppm (detect) 1.9~69 ppm (recognition)	Vapor Density : 3.1 (air=1)
PH : Not available	Relative density : 0.86 (water=1)
Melting/Freezing Point : -95 °C	Solubility in water : 54~58 mg/100 ml
Initial boiling point/boiling range : 110.6 °C	Partition coefficient : 2.73 (n-octanol/water)
Flash point : 4.4 °C (closed cup)	Auto-ignition temperature : 480°C
Evaporation Rate : 2.24 (BuAc=1)	Decomposition temperature : Not available
Flammability (solid/gas) : Not available	Viscosity : 0.6 mPa.s max @20°C
Molecular Formula : C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>	Molecular Weight : 92.056

## SECTION 10-STABILITY AND REACTIVITY

<b>Reactivity</b> Vapor is explosive when exposed to heat or flame
<b>Chemical stability</b> Stable at room temperature in closed containers under normal storage and handling conditions.
<b>Possibility of hazardous reaction</b> Has not been reported.
<b>Condition to avoid</b> Product is highly flammable – Keep away from sources of ignition. Avoid the higher temperatures. Keep away from open fire, heating elements and heat radiating surface and prevent from forming of the vapours mixtures with air in explosion limits.
<b>Incompatible materials</b> Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetroxide; will attack some forms of plastics, rubber, coatings.
<b>Hazardous decomposition products</b> Carbon monoxide, carbon dioxide, hydrocarbons.

## SECTION 11-TOXICOLOGICAL INFORMATION

Routes of exposure Eye, Skin, inhalation, Ingestion.
Symptoms (treatments as indicated in Section 4) Eye: The liquid produces a high level of eye discomfort and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated. There is evidence that material may produce eye irritation in some persons and produce eye damage 24 hours or more after instillation. Severe inflammation may be expected with pain. There may be damage to the cornea. Unless treatment is prompt and adequate there may be permanent loss of vision. Conjunctivitis can occur following repeated exposure.  Skin: Contact with the material may damage the health of the individual; systemic effects may result following absorption. The material may cause moderate inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterized by redness, swelling and blistering. Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.  Ingestion: Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual. Swallowing of the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis; serious consequences may result. (ICSC13733). Considered an unlikely route of entry in commercial/industrial environments. The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.  Inhalation: Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual. There is some evidence to suggest that the material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage. Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by sleepiness, reduced alertness, loss of reflexes, lack of co-ordination, and vertigo. Inhalation of high concentrations of gas/vapour causes lung irritation with coughing and nausea, central nervous depression with headache and dizziness, slowing of reflexes, fatigue and inco-ordination. If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death. The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.

Chronic exposure: There has been some concern that this material can cause cancer or mutations but there is not enough data to make an assessment. Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.

**Toxicity**

LD50: <870 mg/kg (rat, oral)

LC50: 6000 ppm/6h (rat, inhalation)

**Chronic effect**

**Carcinogenicity:**

ACGIH : A4-Not classifiable as a Human Carcinogen.

OSHA : Possible select carcinogen.

IARC : Group 3 carcinogen.

Epide miology: Not available.

Teratogenicity: Teratogenic effects have occurred in experimental animals.

Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.

Neurotoxicity: Not available.

Mutagenicity: Not available.

## SECTION 12-ECOLOGICAL INFORMATION

**Ecotoxicity**

LC<sub>50</sub> (96 hr.) Fish: 7.3~22.8 mg/l

EC<sub>50</sub> (48 hr.) Water flea: —

Biocentration factor (BCF): 1.67~380

**Persistence and degradability**

1. The material are expected to form a slick on the surface of waters after release in calm sea conditions. This is expected to evaporate and enter the atmosphere where it will be degraded through reaction with hydroxyl radicals.
2. Some of the material will become associated with benthic sediments, and it is likely to be spread over a fairly wide area of sea floor. Marine sediments may be either aerobic or anaerobic. The material, in probability, is biodegradable, under aerobic conditions. Evidence also suggests that the hydrocarbons may be degradable under anaerobic conditions although such degradation in benthic sediments may be a relatively slow process.
3. Under aerobic conditions the material will degrade to water and carbon dioxide, while under aerobic processes it will produce water, methane, carbon dioxide and carbon dioxide.
4. Based on test results, as well as theoretical considerations, the potential for bioaccumulation may be high. Toxic effects are often observed in species such as blue mussel, daphnia, freshwater green algae, marine copepods and amphipods.

Half-life (Air): 10~104 hr

Half-life (Surface water): 96~528 hr

Half-life (Ground water): 168~672 hr

Half-life (Soil): 96~528 hr

**Bioaccumulative potential**

This material is not expected to significantly bioaccumulate.

**Mobility in soil:** —

**Other adverse effects:** —

## SECTION 13-DISPOSAL CONSIDERATIONS

Residues and spilled material are hazardous waste due to ignitability. Disposal must be in accordance with applicable federal, state, or local regulations.

The container for this product can present explosion or fire hazards, even when emptied. To avoid risk of injury, do not cut, puncture, or weld on or near this container. Since the emptied containers retain product residue, follow label warnings even after container is emptied.

## SECTION 14-TRANSPORTATION INFORMATION

US DOT	Shipping Name	Toluene	Hazard Labels	
	Hazard Class	3		
	UN Number	1294		
	Packing Group	II		
Sea(IMO/IMDG)	Shipping Name	Toluene	Hazard Labels	
	Hazard Class	3.2		
	UN Number	1294		
	Packing Group	II		
	IMDG Code Page	3285		
MARPOL	Not a DOT "Marine Pollutant" per 49 CFR 171.8.			
Air(ICA0/IATA)	Shipping Name	Toluene	Hazard Labels	
	Hazard Class	3.2		
	Subsidiary Class	1294		
	Packing Group	II		
RID/ ADR	No information available.			
Canadian TDG	Shipping Name	Toluene	Hazard Labels	
	Hazard Class	3		
	UN Number	1294		
	Packing Group	II		
	Subsidiary Class	9.2		

## SECTION 15-REGULATORY INFORMATION

### US FEDERAL

#### TSCA

CAS# 108-88-3 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 108-88-3: Effective Date: 10/4/82; Sunset Date: 10/4/92

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

#### SARA

Section 302 (RQ)

CAS# 108-88-3 : final RQ = 1000 pounds (454 kg)

Section 302 (TPQ)

None of the chemicals in this material have a TPQ.

SARA Codes

CAS# 108-88-3 : acute, flammable.

Section 313

This material contains Toluene (CAS# 108-88-3, 99% & 100%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.

#### Clean Air Act

CAS# 108-88-3 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

<p>Clean Water Act</p> <p>CAS# 108-88-3 is listed as a Hazardous Substance under the CWA.  CAS# 108-88-3 is listed as a Priority Pollutant under the Clean Water Act.  CAS# 108-88-3 is listed as a Toxic Pollutant under the Clean Water Act.</p>
<p>OSHA</p> <p>None of the chemicals in this product are considered highly hazardous by OSHA.</p>
<p>STATE</p> <p>Toluene can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.</p> <p>WARNING: This product contains Toluene, a chemical known to the state of California to cause birth defects or other reproductive harm.</p> <p>California No Significant Risk Level: None of the chemicals in this product are listed.</p>
<p>European/International Regulations</p> <p>European Labeling in Accordance with EC Directives</p> <p>Hazard Symbols: XN F  Risk Phrases : R 10 Flammable.  R 20 Harmful by inhalation.  Safety Phrases : S 9 Keep container in a well-ventilated place.  S 16 Keep away from sources of ignition - No smoking.  S 25 Avoid contact with eyes.  S 29 Do not empty into drains.  S 33 Take precautionary measures against static discharges.</p> <p>WGK (Water Danger/Protection)  CAS# 108-88-3: 2</p> <p>United Kingdom Occupational Exposure Limits  CAS# 108-88-3: OES-United Kingdom, TWA 50 ppm TWA; 191 mg/m3 TWA.  CAS# 108-88-3: OES-United Kingdom, STEL 150 ppm STEL; 574 mg/m3 STEL.</p> <p>CANADA  CAS#100-42-5 is listed on Canada's DSL/NDSL list.  This product has a WHMIS classification of B2, D2A (99%)/B3, D2A (100%).  CAS# 105-05-5 is not listed on Canada's Ingredient Disclosure List.</p> <p>Exposure Limits</p> <ul style="list-style-type: none"> <li>▪ CAS# 108-88-3: OEL-AUSTRALIA:TWA 100 ppm (375 mg/m3);STEL 150 ppm (560 mg/m3)</li> <li>▪ OEL-BELGIUM:TWA 100 ppm (377 mg/m3);STEL 150 ppm (565 mg/m3)</li> <li>▪ OEL-CZECHOSLOVAKIA:TWA 200 mg/m3;STEL 1000 mg/m3</li> <li>▪ OEL-DENMARK:TWA 50 ppm (190 mg/m3);Skin</li> <li>▪ OEL-FINLAND:TWA 100 ppm (375 mg/m3);STEL 150 ppm; Skin</li> <li>▪ OEL-FRANCE:TWA 100 ppm (375 mg/m3);STEL 150 ppm (560 mg/m3)</li> <li>▪ OEL-GERMANY:TWA 100 ppm (380 mg/m3)</li> <li>▪ OEL-HUNGARY:TWA 100 mg/m3;STEL 300 mg/m3;Skin</li> <li>▪ OEL-JAPAN:TWA 100 ppm (380 mg/m3)</li> <li>▪ OEL-THE NETHERLANDS:TWA 100 ppm (375 mg/m3);Skin</li> <li>▪ OEL-THE PHILIPPINES:TWA 100 ppm (375 mg/m3)</li> <li>▪ OEL-POLAND:TWA 100 mg/m3</li> <li>▪ OEL-RUSSIA:TWA 100 ppm; STEL 50 mg/m3</li> <li>▪ OEL-SWEDEN:TWA 50 ppm (200 mg/m3);STEL 100 ppm (400 mg/m3);Skin</li> <li>▪ OEL-SWITZERLAND:TWA 100 ppm (380 mg/m3);STEL 500 ppm</li> <li>▪ OEL-THAILAND:TWA 200 ppm; STEL 300 ppm</li> <li>▪ OEL-TURKEY:TWA 200 ppm (750 mg/m3)</li> <li>▪ OEL-UNITED KINGDOM:TWA 100 ppm (375 mg/m3);STEL 150 ppm; Skin OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV</li> </ul>

## SECTION 16-OTHER INFORMATION

### References and sources

1. CHEMINFO Data Bank, CCINFO CD, 2005-3
2. HAZARD TEXT Data Bank, TOMES PLUS CD, Vol.65, 2005
3. RETECS Data Bank, TOMES CPS CD, Vol.65, 2005
4. HSDB Data Bank, TOMES CPS CD, Vol.65, 2005
5. Hazardous Substance Data Bank, Environment Protection, Administration, Executive Yuan, ROC (Taiwan)
6. Chemwatch Data Bank, 2005-1
7. SDS, GHS in Taiwan, Council of Labor Affairs, Executive Yuan, ROC (Taiwan)

<b>Version</b>	<b>Date</b>	<b>Remark</b>
Version 1	06/01/1998	Original Version.
Version 2	04/20/2001	Updated 10 sections to 16 sections.
Version 3	08/01/2003	Updated "SECTION 9-PHYSICAL AND CHEMICAL PROPERTIES".
Version 4	01/01/2006	Updated "SECTION 14-TRANSPORTATION INFORMATION".
Version 5	08/05/2008	Updated each section by GHS SDS.
Prepared by	Safety & Environment Protection Section, Taiwan SM Corporation Kaohsiung Plant.	

# Ethylbenzene

---

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

Product name : BTEX-Standard

Product Number : 43728

Brand : Sigma-Aldrich

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

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

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

---

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

Germ cell mutagenicity (Category 1B), H340  
Carcinogenicity (Category 1A), H350  
Reproductive toxicity (Category 2), H361

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

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

Pictogram



Signal word : Danger

Hazard statement(s)

H340 : May cause genetic defects.  
H350 : May cause cancer.  
H361 : Suspected of damaging fertility or the unborn child.

Precautionary statement(s)

P201 : Obtain special instructions before use.  
P202 : Do not handle until all safety precautions have been read and understood.  
P280 : Wear protective gloves/ protective clothing/ eye protection/ face protection.  
P308 + P313 : IF exposed or concerned: Get medical advice/ attention.  
P405 : Store locked up.  
P501 : Dispose of contents/ container to an approved waste disposal plant.

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

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.2 Mixtures

##### Hazardous components

Component	Classification	Concentration
<b>Dimethyl sulfoxide</b>		
CAS-No. 67-68-5 EC-No. 200-664-3	Flam. Liq. 4; H227	>= 90 - <= 100 %
<b>Toluene</b>		
CAS-No. 108-88-3 EC-No. 203-625-9 Index-No. 601-021-00-3 Registration number 01-2119471310-51-XXXX	Flam. Liq. 2; Skin Irrit. 2; Repr. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; H225, H304, H315, H336, H361, H373, H401	>= 0.1 - < 1 %
<b>Benzene</b>		
CAS-No. 71-43-2 EC-No. 200-753-7 Index-No. 601-020-00-8 Registration number 01-2119447106-44-XXXX	Flam. Liq. 2; Skin Irrit. 2; Eye Irrit. 2A; Muta. 1B; Carc. 1A; STOT RE 1; Asp. Tox. 1; Aquatic Acute 3; Aquatic Chronic 3; H225, H304, H315, H319, H340, H350, H372, H412	>= 0.1 - < 1 %
<b>Ethylbenzene</b>		
CAS-No. 100-41-4 EC-No. 202-849-4 Index-No. 601-023-00-4	Flam. Liq. 2; Acute Tox. 4; Carc. 2; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H304, H332, H351, H373, H401, H412	>= 0.1 - < 1 %

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

### 4. FIRST AID MEASURES

#### 4.1 Description of first aid measures

##### General advice

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

##### If inhaled

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

##### In case of skin contact

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

##### In case of eye contact

Flush eyes with water as a precaution.

##### If swallowed

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

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

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

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

No data available



---

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

#### Suitable extinguishing media

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

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

No data available

### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information

No data available

---

## 6. ACCIDENTAL RELEASE MEASURES

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

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

For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

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

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

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

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

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

Recommended storage temperature 2 - 8 °C

### 7.3 Specific end use(s)

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

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Dimethyl sulfoxide	67-68-5	TWA	250.000000 ppm	USA. Workplace Environmental Exposure Levels (WEEL)
Toluene	108-88-3	TWA	100 ppm 375 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	150 ppm 560 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z37.12-1967		

		CEIL	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		Peak	500 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Visual impairment Female reproductive Pregnancy loss 2015 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	100 ppm 375 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	150 ppm 560 mg/m3	USA. NIOSH Recommended Exposure Limits
Benzene	71-43-2	TWA	0.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		
		STEL	2.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		
		TWA	10 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		CEIL	25 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		Peak	50 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028 The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.		
		TWA	0.1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		ST	1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		

Ethylbenzene	100-41-4	TWA	20.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Cochlear impair Kidney damage (nephropathy) Upper Respiratory Tract irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		STEL	125.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		TWA	100.000000 ppm 435.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	125.000000 ppm 545.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	100.000000 ppm 435.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Cochlear impair Kidney damage (nephropathy) Upper Respiratory Tract irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		TWA	100 ppm 435 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	125 ppm 545 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	100 ppm 435 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	100 ppm 435 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	125 ppm 545 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		PEL	5 ppm 22 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	30 ppm 130 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

### Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Toluene	108-88-3	Toluene	0.0200 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			
		Toluene	0.0300 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		o-Cresol	0.3000 mg/g	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
Benzene	71-43-2	S-Phenylmercapturic acid	0.0300 mg/g	In urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		t,t-Muconic acid	0.5000 mg/g	In urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
Ethylbenzene	100-41-4	Sum of mandelic acid and phenyl glyoxylic acid	0.7g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Ethylbenzene		In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		Not critical			
		Sum of mandelic acid and phenyl glyoxylic acid	0.15g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

## 8.2 Exposure controls

### Appropriate engineering controls

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

### Personal protective equipment

#### Eye/face protection

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

#### Skin protection

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

#### Body Protection

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

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face 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).

#### **Control of environmental exposure**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

---

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

a) Appearance	Form: clear, liquid Colour: colourless
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	No data available
f) Initial boiling point and boiling range	No data available
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	0.998 g/cm <sup>3</sup> at 20 °C (68 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

### **9.2 Other safety information**

No data available

---

## **10. STABILITY AND REACTIVITY**

### **10.1 Reactivity**

No data available

### **10.2 Chemical stability**

Stable under recommended storage conditions.

### **10.3 Possibility of hazardous reactions**

No data available

### **10.4 Conditions to avoid**

No data available

## 10.5 Incompatible materials

Strong oxidizing agents

## 10.6 Hazardous decomposition products

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Sulphur oxides

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

IARC: 1 - Group 1: Carcinogenic to humans (Benzene)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Ethylbenzene)

NTP: Known to be human carcinogen (Benzene)

OSHA: OSHA specifically regulated carcinogen (Benzene)

#### Reproductive toxicity

No data available

No data available

#### Specific target organ toxicity - single exposure

No data available

#### Specific target organ toxicity - repeated exposure

No data available

#### Aspiration hazard

No data available

#### Additional Information

RTECS: Not available

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

Eyes - Eye disease - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

Eyes - Eye disease - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence (Toluene)

Stomach - Irregularities - Based on Human Evidence (Benzene)

Stomach - Irregularities - Based on Human Evidence (p-Xylene)

Kidney - (m-Xylene)

Nerves. - (o-Xylene)

---

## 12. ECOLOGICAL INFORMATION

- 12.1 Toxicity**  
No data available
- 12.2 Persistence and degradability**  
No data available
- 12.3 Bioaccumulative potential**  
No data available
- 12.4 Mobility in soil**  
No data available
- 12.5 Results of PBT and vPvB assessment**  
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted
- 12.6 Other adverse effects**  
No data available

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

#### Contaminated packaging

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

Not dangerous goods

### IMDG

Not dangerous goods

### IATA

Not dangerous goods

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

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

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01
Ethylbenzene	100-41-4	2007-07-01

### SARA 311/312 Hazards

Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Dimethyl sulfoxide	67-68-5	2007-03-01
Toluene	108-88-3	2007-07-01
Benzene	71-43-2	2007-07-01

p-Xylene	106-42-3	2007-07-01
m-Xylene	108-38-3	2007-07-01
o-Xylene	95-47-6	2007-07-01
Ethylbenzene	100-41-4	2007-07-01

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
Dimethyl sulfoxide	67-68-5	2007-03-01
Toluene	108-88-3	2007-07-01
Benzene	71-43-2	2007-07-01
Ethylbenzene	100-41-4	2007-07-01

**California Prop. 65 Components**

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Benzene	71-43-2	2009-02-01
Ethylbenzene	100-41-4	2007-09-28

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	CAS-No.	Revision Date
Toluene	108-88-3	2009-02-01
Benzene	71-43-2	2009-02-01

---

**16. OTHER INFORMATION**

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

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Asp. Tox.	Aspiration hazard
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H227	Combustible liquid.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H336	May cause drowsiness or dizziness.
H340	May cause genetic defects.
H350	May cause cancer.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.
H412	Harmful to aquatic life with long lasting effects.
Muta.	Germ cell mutagenicity
Repr.	Reproductive toxicity
Skin Irrit.	Skin irritation
STOT RE	Specific target organ toxicity - repeated exposure
STOT SE	Specific target organ toxicity - single exposure

**HMIS Rating**

Health hazard: 0  
 Chronic Health Hazard: \*



Flammability: 0  
Physical Hazard 0

**NFPA Rating**

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

**Further information**

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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 Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

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

Version: 5.16

Revision Date: 09/23/2016

Print Date: 12/06/2016

# Xylenes

# SAFETY DATA SHEET

## Xylenes

### Section 1. Identification

<b>GHS product identifier</b>	: Xylenes
<b>Chemical name</b>	: xylene
<b>Other means of identification</b>	: Benzene, dimethyl-; Xylol; Benzene, dimethyl-, mixed isomers; xylene, mixed isomers, pure; Benzene, dimethyl-; Xylene (mixed)
<b>Product use</b>	: Synthetic/Analytical chemistry.
<b>Synonym</b>	: Benzene, dimethyl-; Xylol; Benzene, dimethyl-, mixed isomers; xylene, mixed isomers, pure; Benzene, dimethyl-; Xylene (mixed)
<b>SDS #</b>	: 001064
<b>Supplier's details</b>	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
<b>Emergency telephone number (with hours of operation)</b>	: 1-866-734-3438

### Section 2. Hazards identification

<b>OSHA/HCS status</b>	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
<b>Classification of the substance or mixture</b>	: FLAMMABLE LIQUIDS - Category 3 ACUTE TOXICITY (dermal) - Category 4 ACUTE TOXICITY (inhalation) - Category 4 SKIN CORROSION/IRRITATION - Category 2

#### GHS label elements

##### Hazard pictograms



##### Signal word

: Warning

##### Hazard statements

: Flammable liquid and vapor.  
May displace oxygen and cause rapid suffocation.  
Harmful in contact with skin or if inhaled.  
Causes skin irritation.

#### Precautionary statements

##### General

: Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

##### Prevention

: Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid breathing vapor. Wash hands thoroughly after handling.

## Section 2. Hazards identification

<b>Response</b>	: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or physician if you feel unwell. Take off contaminated clothing. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.
<b>Storage</b>	: Store in a well-ventilated place. Keep cool.
<b>Disposal</b>	: Dispose of contents and container in accordance with all local, regional, national and international regulations.
<b>Hazards not otherwise classified</b>	: None known.

## Section 3. Composition/information on ingredients

<b>Substance/mixture</b>	: Substance
<b>Chemical name</b>	: xylene
<b>Other means of identification</b>	: Benzene, dimethyl-; Xylol; Benzene, dimethyl-, mixed isomers; xylene, mixed isomers, pure; Benzene, dimethyl-; Xylene (mixed)

### CAS number/other identifiers

<b>CAS number</b>	: 1330-20-7
<b>Product code</b>	: 001064

Ingredient name	%	CAS number
xylene	100	1330-20-7

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

## Section 4. First aid measures

### Description of necessary first aid measures

<b>Eye contact</b>	: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.
<b>Inhalation</b>	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
<b>Skin contact</b>	: Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. If necessary, call a poison center or physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

## Section 4. First aid measures

- Ingestion** : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

### Most important symptoms/effects, acute and delayed

#### Potential acute health effects

- Eye contact** : Causes serious eye irritation.  
**Inhalation** : Harmful if inhaled.  
**Skin contact** : Harmful in contact with skin. Causes skin irritation.  
**Frostbite** : Try to warm up the frozen tissues and seek medical attention.  
**Ingestion** : Irritating to mouth, throat and stomach.

#### Over-exposure signs/symptoms

- Eye contact** : Adverse symptoms may include the following:  
 pain or irritation  
 watering  
 redness
- Inhalation** : No specific data.
- Skin contact** : Adverse symptoms may include the following:  
 irritation  
 redness
- Ingestion** : No specific data.

### Indication of immediate medical attention and special treatment needed, if necessary

- Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
- Specific treatments** : No specific treatment.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

## Section 5. Fire-fighting measures

### Extinguishing media

- Suitable extinguishing media** : Use dry chemical, CO<sub>2</sub>, water spray (fog) or foam.
- Unsuitable extinguishing media** : Do not use water jet.

## Section 5. Fire-fighting measures

- Specific hazards arising from the chemical** : Flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.
- Hazardous thermal decomposition products** : Decomposition products may include the following materials:  
carbon dioxide  
carbon monoxide
- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## Section 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
- For emergency responders** : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

### Methods and materials for containment and cleaning up

- Small spill** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

## Section 7. Handling and storage

### Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
- Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

## Section 8. Exposure controls/personal protection

### Control parameters

#### Occupational exposure limits

Ingredient name	Exposure limits
xylene	<p><b>ACGIH TLV (United States, 3/2012).</b>            STEL: 651 mg/m<sup>3</sup> 15 minutes.            STEL: 150 ppm 15 minutes.            TWA: 434 mg/m<sup>3</sup> 8 hours.            TWA: 100 ppm 8 hours.</p> <p><b>OSHA PEL (United States, 6/2010).</b>            TWA: 435 mg/m<sup>3</sup> 8 hours.            TWA: 100 ppm 8 hours.</p> <p><b>OSHA PEL 1989 (United States, 3/1989).</b>            STEL: 655 mg/m<sup>3</sup> 15 minutes.            STEL: 150 ppm 15 minutes.            TWA: 435 mg/m<sup>3</sup> 8 hours.            TWA: 100 ppm 8 hours.</p>

- Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

## Section 8. Exposure controls/personal protection

### Individual protection measures

- Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

### Appearance

- Physical state** : Liquid. [COLORLESS LIQUID WITH AROMATIC ODOR]
- Color** : Colorless.
- Molecular weight** : 106.17 g/mole
- Molecular formula** : C8-H10
- Boiling/condensation point** : 136.16°C (277.1°F)
- Melting/freezing point** : -94.96°C (-138.9°F)
- Critical temperature** : Not available.
- Odor** : Aromatic.
- Odor threshold** : Not available.
- pH** : Not available.
- Flash point** : Closed cup: 18°C (64.4°F)
- Burning time** : Not applicable.
- Burning rate** : Not applicable.
- Evaporation rate** : 0.77 (butyl acetate = 1)
- Flammability (solid, gas)** : Not available.
- Lower and upper explosive (flammable) limits** : Lower: 0.8%  
Upper: 6.7%



## Section 9. Physical and chemical properties

<b>Vapor pressure</b>	: 0.89 kPa (6.7 mm Hg) [room temperature]
<b>Vapor density</b>	: 3.7 (Air = 1)
<b>Specific Volume (ft<sup>3</sup>/lb)</b>	: 1.1628
<b>Gas Density (lb/ft<sup>3</sup>)</b>	: 0.86 (25°C / 77 to °F)
<b>Relative density</b>	: 0.861
<b>Solubility</b>	: Not available.
<b>Solubility in water</b>	: 0.146 g/l
<b>Partition coefficient: n-octanol/water</b>	: 3.12
<b>Auto-ignition temperature</b>	: 432°C (809.6°F)
<b>Decomposition temperature</b>	: Not available.
<b>SADT</b>	: Not available.
<b>Viscosity</b>	: Dynamic (room temperature): 0.581 mPa·s (0.581 cP)

## Section 10. Stability and reactivity

**Reactivity** : No specific test data related to reactivity available for this product or its ingredients.

**Chemical stability** : The product is stable.

**Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.

**Conditions to avoid** : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

**Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

## Section 11. Toxicological information

### Information on toxicological effects

#### Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
xylene	LC50 Inhalation Gas.	Rat	5000 ppm	4 hours
	LD50 Oral	Rat	4300 mg/kg	-

#### Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
xylene	Skin - Mild irritant	Rat	-	8 hours 60 microliters	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Moderate irritant	Rabbit	-	100 Percent	-

#### Sensitization

**Date of issue/Date of revision** : 10/16/2014. **Date of previous issue** : 10/12/2014. **Version** : 0.02 7/14

## Section 11. Toxicological information

Not available.

### Mutagenicity

Not available.

### Carcinogenicity

Not available.

### Classification

Product/ingredient name	OSHA	IARC	NTP
xylene	-	3	-

### Reproductive toxicity

Not available.

### Teratogenicity

Not available.

### Specific target organ toxicity (single exposure)

Not available.

### Specific target organ toxicity (repeated exposure)

Not available.

### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.

### Potential acute health effects

- Eye contact** : Causes serious eye irritation.
- Inhalation** : Harmful if inhaled.
- Skin contact** : Harmful in contact with skin. Causes skin irritation.
- Ingestion** : Irritating to mouth, throat and stomach.

### Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : Adverse symptoms may include the following:  
pain or irritation  
watering  
redness
- Inhalation** : No specific data.
- Skin contact** : Adverse symptoms may include the following:  
irritation  
redness
- Ingestion** : No specific data.

### Delayed and immediate effects and also chronic effects from short and long term exposure

#### Short term exposure

- Potential immediate effects** : Not available.
- Potential delayed effects** : Not available.

#### Long term exposure

*Date of issue*/*Date of revision* : 10/16/2014. *Date of previous issue* : 10/12/2014. *Version* : 0.02 8/14

## Section 11. Toxicological information

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

### Potential chronic health effects

Not available.

**General** : No known significant effects or critical hazards.

**Carcinogenicity** : No known significant effects or critical hazards.

**Mutagenicity** : No known significant effects or critical hazards.

**Teratogenicity** : No known significant effects or critical hazards.

**Developmental effects** : No known significant effects or critical hazards.

**Fertility effects** : No known significant effects or critical hazards.

### Numerical measures of toxicity

#### Acute toxicity estimates

Not available.

## Section 12. Ecological information

### Toxicity

Not available.

### Persistence and degradability

Not available.

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
xylene	3.12	8.1 to 25.9	low

### Mobility in soil

**Soil/water partition coefficient (K<sub>oc</sub>)** : Not available.

**Other adverse effects** : No known significant effects or critical hazards.

## Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere






## Section 13. Disposal considerations

inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

### United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Xylene	1330-20-7	Listed	U239

## Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
<b>UN number</b>	UN1307	UN1307	UN1307	UN1307	UN1307
<b>UN proper shipping name</b>	XYLENES	XYLENES	XYLENES	XYLENES	XYLENES
<b>Transport hazard class(es)</b>	3 	3 	3 	3 	3 
<b>Packing group</b>	III	III	III	III	III
<b>Environment</b>	No.	No.	No.	No.	No.
<b>Additional information</b>	<p><b>Reportable quantity</b> 100 lbs / 45.4 kg [13.946 gal / 52.791 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.</p> <p><b>Limited quantity</b> Yes.</p> <p><b>Packaging instruction</b> <b>Passenger aircraft</b> Quantity limitation: 5 L</p> <p><b>Cargo aircraft</b> Quantity limitation: 60 L</p> <p><b>Special provisions</b> IB2, T4, TP1</p>	-	-	-	<p><b>Passenger and Cargo Aircraft</b> Quantity limitation: 5 L</p> <p><b>Cargo Aircraft Only</b> Quantity limitation: 60 L</p> <p><b>Limited Quantities - Passenger Aircraft</b> Quantity limitation: 1 L</p>

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

**Special precautions for user** : **Transport within user’s premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** : Not available.

## Section 15. Regulatory information

**U.S. Federal regulations** : TSCA 8(a) CDR Exempt/Partial exemption: Not determined  
**United States inventory (TSCA 8b)**: This material is listed or exempted.  
**Clean Water Act (CWA) 311**: xylene

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Listed

**Clean Air Act Section 602 Class I Substances** : Not listed

**Clean Air Act Section 602 Class II Substances** : Not listed

**DEA List I Chemicals (Precursor Chemicals)** : Not listed

**DEA List II Chemicals (Essential Chemicals)** : Not listed

### SARA 302/304

#### Composition/information on ingredients

No products were found.

**SARA 304 RQ** : Not applicable.

### SARA 311/312

**Classification** : Fire hazard  
 Immediate (acute) health hazard

#### Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
xylene	100	Yes.	No.	No.	Yes.	No.

### SARA 313

	Product name	CAS number	%
<b>Form R - Reporting requirements</b>	xylene	1330-20-7	100
<b>Supplier notification</b>	xylene	1330-20-7	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

### State regulations

**Massachusetts** : This material is listed.

**New York** : This material is listed.

**New Jersey** : This material is listed.

**Pennsylvania** : This material is listed.

**Canada inventory** : This material is listed or exempted.

### International regulations

## Section 15. Regulatory information

**International lists**

- Australia inventory (AICS):** This material is listed or exempted.
- China inventory (IECSC):** This material is listed or exempted.
- Japan inventory:** This material is listed or exempted.
- Korea inventory:** This material is listed or exempted.
- Malaysia Inventory (EHS Register):** This material is listed or exempted.
- New Zealand Inventory of Chemicals (NZIoC):** This material is listed or exempted.
- Philippines inventory (PICCS):** This material is listed or exempted.
- Taiwan inventory (CSNN):** Not determined.

**Chemical Weapons Convention List Schedule I Chemicals** : Not listed

**Chemical Weapons Convention List Schedule II Chemicals** : Not listed

**Chemical Weapons Convention List Schedule III Chemicals** : Not listed

### Canada

**WHMIS (Canada)**

- : Class B-2: Flammable liquid
- Class D-2A: Material causing other toxic effects (Very toxic).
- Class D-2B: Material causing other toxic effects (Toxic).
- CEPA Toxic substances:** This material is not listed.
- Canadian ARET:** This material is not listed.
- Canadian NPRI:** This material is listed.
- Alberta Designated Substances:** This material is not listed.
- Ontario Designated Substances:** This material is not listed.
- Quebec Designated Substances:** This material is not listed.

## Section 16. Other information

**Canada Label requirements** : Class B-2: Flammable liquid  
Class D-2A: Material causing other toxic effects (Very toxic).  
Class D-2B: Material causing other toxic effects (Toxic).

### Hazardous Material Information System (U.S.A.)

Health	*	2
Flammability		3
Physical hazards		0

**Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.**

The customer is responsible for determining the PPE code for this material.

### National Fire Protection Association (U.S.A.)



## Section 16. Other information

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

### History

**Date of printing** : 10/16/2014.

**Date of issue/Date of revision** : 10/16/2014.

**Date of previous issue** : 10/12/2014.

**Version** : 0.02

**Key to abbreviations** :

- ATE = Acute Toxicity Estimate
- BCF = Bioconcentration Factor
- GHS = Globally Harmonized System of Classification and Labelling of Chemicals
- IATA = International Air Transport Association
- IBC = Intermediate Bulk Container
- IMDG = International Maritime Dangerous Goods
- LogPow = logarithm of the octanol/water partition coefficient
- MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
- UN = United Nations
- ACGIH – American Conference of Governmental Industrial Hygienists
- AIHA – American Industrial Hygiene Association
- CAS – Chemical Abstract Services
- CEPA – Canadian Environmental Protection Act
- CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (EPA)
- CFR – United States Code of Federal Regulations
- CPR – Controlled Products Regulations
- DSL – Domestic Substances List
- GWP – Global Warming Potential
- IARC – International Agency for Research on Cancer
- ICAO – International Civil Aviation Organisation
- Inh – Inhalation
- LC – Lethal concentration
- LD – Lethal dosage
- NDSL – Non-Domestic Substances List
- NIOSH – National Institute for Occupational Safety and Health
- TDG – Canadian Transportation of Dangerous Goods Act and Regulations
- TLV – Threshold Limit Value
- TSCA – Toxic Substances Control Act
- WEEL – Workplace Environmental Exposure Level
- WHMIS – Canadian Workplace Hazardous Material Information System

**References** : Not available.

▣ Indicates information that has changed from previously issued version.

### Notice to reader

**Date of issue/Date of revision** : 10/16/2014. **Date of previous issue** : 10/12/2014. **Version** : 0.02 13/14

## Section 16. Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

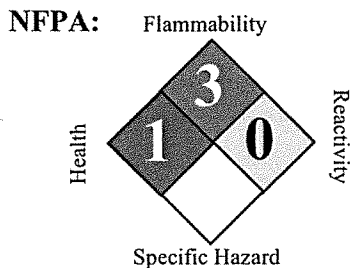
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



# Gasoline Range Organics

# Safety Data Sheet

## Gasoline, Unleaded



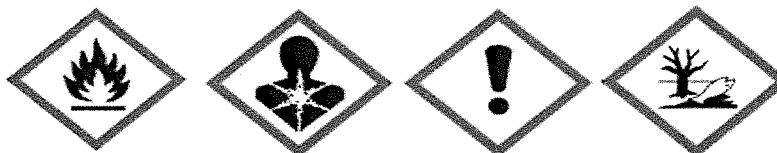
### SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

<b>Product name</b>	:	Gasoline, Unleaded
<b>Synonyms</b>	:	Blend of Highly Flammable Petroleum Distillates, Regular, Mid-Grade, Premium, 888100008809
<b>SDS Number</b>	:	888100008809
<b>Version</b>	:	1.1
<b>Product Use Description</b>	:	Fuel
<b>Company</b>	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259
<b>Tesoro Call Center</b>	:	(877) 783-7676
<b>Chemtrec (Emergency Contact)</b>	:	(800) 424-9300

### SECTION 2. HAZARDS IDENTIFICATION

**Classifications** : Flammable Liquid – Category 1 or 2 depending on formulation.  
 Aspiration Hazard – Category 1  
 Carcinogenicity – Category 2  
 Specific Target Organ Toxicity (Repeated Exposure) – Category 2  
 Specific Target Organ Toxicity (Single Exposure) – Category 3  
 Skin Irritation – Category 2  
 Eye Irritation – Category 2B  
 Chronic Aquatic Toxicity – Category 2

**Pictograms** :



**Signal Word** : **Danger**

**Hazard Statements**

Extremely flammable liquid and vapor.  
 May be fatal if swallowed and enters airways – do not siphon gasoline by mouth.  
 Suspected of causing blood cancer if repeated over-exposure by inhalation and/or skin contact occurs.  
 May cause damage to liver, kidneys and nervous system by repeated and prolonged inhalation or skin contact. Causes eye irritation. Can be absorbed through skin.  
 May cause drowsiness or dizziness. Extreme exposure such as intentional inhalation may cause unconsciousness, asphyxiation and death.  
 Repeated or prolonged skin contact can cause irritation and dermatitis.

Harmful to aquatic life.

### Precautionary statements

#### Prevention

- : Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Keep away from heat, sparks, open flames, welding and hot surfaces.
- No smoking.
- Keep container tightly closed.
- Ground and/or bond container and receiving equipment.
- Use explosion-proof electrical equipment.
- Use only non-sparking tools (if tools are used in flammable atmosphere).
- Take precautionary measures against static discharge.
- Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid).
- Wash hands or liquid-contacted skin thoroughly after handling.
- Do not eat, drink or smoke when using this product.
- Do not breathe vapors.
- Use only outdoors or in a well-ventilated area.

#### Response

- : In case of fire: Use dry chemical, CO<sub>2</sub>, water spray or fire fighting foam to extinguish.
- If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
- If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
- If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If skin or eye irritation persists, get medical attention.
- If inhaled: Remove person to fresh air and keep comfortable for breathing. Get medical attention if you feel unwell.

#### Storage

- : Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed. Use only approved containers. Some containers not approved for gasoline may dissolve and release flammable gasoline liquid and vapors.

#### Disposal

- : Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

### SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Gasoline, natural; Low boiling point naphtha	8006-61-9	10 - 30%
Toluene	108-88-3	10 - 30%
Xylene	1330-20-7	10 - 30%
Ethanol; ethyl alcohol	64-17-5	0-8.2%
Trimethylbenzene	25551-13-7	1 - 5%
Isopentane; 2-methylbutane	78-78-4	1 - 5%

Naphthalene	91-20-3	1 - 5%
Benzene	71-43-2	Less than 1.3%
Pentane	109-66-0	1 - 5%
Cyclohexane	110-82-7	1 - 5%
Ethylbenzene	100-41-4	1 - 5%
Butane	106-97-8	1 - 20%
Heptane [and isomers]	142-82-5	0.5 - 0.75%
N-hexane	110-54-3	0.5 - 0.75%

#### SECTION 4. FIRST AID MEASURES

<b>Inhalation</b>	: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Seek medical attention immediately.
<b>Skin contact</b>	: In case of contact, immediately flush skin with plenty of water. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Contaminated leather, particularly footwear, must be discarded. Note that contaminated clothing may be a fire hazard. Seek medical advice if symptoms persist or develop.
<b>Eye contact</b>	: Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice if symptoms persist or develop.
<b>Ingestion</b>	: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Obtain medical attention.
<b>Notes to physician</b>	: Symptoms: Dizziness, Discomfort, Headache, Nausea, Kidney disorders, Liver disorders. Aspiration may cause pulmonary edema and pneumonitis. Swallowing gasoline is more likely to be fatal for small children than adults, even if aspiration does not occur.

#### SECTION 5. FIRE-FIGHTING MEASURES

<b>Suitable extinguishing media</b>	: SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO <sub>2</sub> , water spray or fire fighting foam. LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers. Keep containers and surroundings cool with water spray.
<b>Specific hazards during fire fighting</b>	: Extremely flammable liquid and vapor. This material is combustible/flammable and is sensitive to fire, heat, and static discharge.
<b>Special protective equipment for fire-fighters</b>	: Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

**Further information** : Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam. Exposure to decomposition products may be a hazard to health. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use water spray to cool unopened containers. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

## SECTION 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions** : Evacuate personnel to safe areas. Ventilate the area. Remove all sources of ignition. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

**Environmental precautions** : Discharge into the environment must be avoided. If the product contaminates rivers and lakes or drains inform respective authorities.

**Methods for cleaning up** : Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations.

## SECTION 7. HANDLING AND STORAGE

**Precautions for safe handling** : Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initiated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

- (1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.
- (2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such as gasoline or naphtha).
- (3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initiated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

**Conditions for safe storage, including incompatibilities** : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Reports suggest that government-mandated ethanol, if present, may not be compatible with fiberglass gasoline tanks. Ethanol may dissolve fiberglass resin, causing engine damage and possibly allow leakage of explosive gasoline.

Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

No decomposition if stored and applied as directed. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Store only in containers approved and labeled for gasoline.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA	Benzene	71-43-2	TWA	1 ppm
		71-43-2	STEL	5 ppm
		71-43-2	OSHA_ACT	0.5 ppm
OSHA Z1	Xylene	1330-20-7	PEL	100 ppm 435 mg/m3
	Ethanol; Ethyl alcohol	64-17-5	PEL	1,000 ppm 1,900 mg/m3
	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
	Cyclohexane	110-82-7	PEL	300 ppm 1,050 mg/m3
	Ethylbenzene	100-41-4	PEL	100 ppm 435 mg/m3
	Heptane [and isomers]	142-82-5	PEL	500 ppm 2,000 mg/m3
	N-hexane	110-54-3	PEL	500 ppm 1,800 mg/m3
ACGIH	Toluene	108-88-3	TWA	50 ppm
	Xylene	1330-20-7	TWA	100 ppm
		1330-20-7	STEL	150 ppm
	Ethanol; Ethyl alcohol	64-17-5	TWA	1,000 ppm
	Trimethylbenzene	25551-13-7	TWA	25 ppm
	Isopentane; 2-Methylbutane	78-78-4	TWA	600 ppm
	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Benzene	71-43-2	TWA	0.5 ppm
		71-43-2	STEL	2.5 ppm
	Pentane	109-66-0	TWA	600 ppm
	Cyclohexane	110-82-7	TWA	100 ppm
	Ethylbenzene	100-41-4	TWA	100 ppm
		100-41-4	STEL	125 ppm
Heptane [and isomers]	142-82-5	TWA	400 ppm	
	142-82-5	STEL	500 ppm	

	N-hexane	110-54-3	TWA	50 ppm
<b>Engineering measures</b>	: Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use only intrinsically safe electrical equipment approved for use in classified areas.			
<b>Eye protection</b>	: Safety glasses or goggles are recommended where there is a possibility of splashing or spraying. Ensure that eyewash stations and safety showers are close to the workstation location.			
<b>Hand protection</b>	: Gloves constructed of nitrile or neoprene are recommended. Consult manufacturer specifications for further information.			
<b>Skin and body protection</b>	: If needed to prevent skin contact, chemical protective clothing such as of DuPont TyChem®, Saranex or equivalent recommended based on degree of exposure. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.			
<b>Respiratory protection</b>	: A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.			
<b>Work / Hygiene practices</b>	: Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.			

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance</b>	: Clear to straw colored liquid
<b>Odor</b>	: Characteristic hydrocarbon-like
<b>Odor threshold</b>	0.5 - 1.1 ppm
<b>pH</b>	: Not applicable
<b>Melting point/freezing point</b>	About -101°C (-150°F)
<b>Initial boiling point &amp; range</b>	Boiling point varies: 30 – 200°C (85 – 392°F)
<b>Flash point</b>	< -21°C (-5.8°F)
<b>Evaporation rate</b>	: Higher initially and declining as lighter components evaporate
<b>Flammability (solid, gas)</b>	: Flammable vapor released by liquid

Upper explosive limit	7.6 %(V)
Lower explosive limit	1.3 %(V)
Vapor pressure	345 - 1,034 hPa at 37.8 °C (100.0 °F)
Vapor density (air = 1)	Approximately 3 to 4
Relative density (water = 1)	0.8 g/mL
Solubility (in water)	Negligible
Partition coefficient (n-octanol/water)	2 – 7 as log Pow
Auto-ignition temperature	Approximately 250°C (480°F)
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	0.64 to 0.88 mm <sup>2</sup> /s range reported for gasoline
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature)	: Hydrocarbon liquids without static dissipater additive may have conductivity below 1 picoSiemens per meter (pS/m). The highest electro-static ignition risks are associated with "ultra-low conductivities" below 5 pS/m. See Section 7 for sources of information on defining safe loading and handling procedures for low conductivity products.

## SECTION 10. STABILITY AND REACTIVITY

Reactivity	: Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	: Stable under normal conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents, peroxides, alkaline products and strong acids. Contact with nitric and sulfuric acids will form nitroresols that can decompose violently.
Conditions to avoid	: Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	: Ignition and burning can release carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

## SECTION 11. TOXICOLOGICAL INFORMATION

Skin contact	: Irritating to skin. Can be partially absorbed through skin.
Eye contact	: Irritating to eyes.
Ingestion	: Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.



**Inhalation and further information**

Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, over excitation. Exposure to very high levels can result in unconsciousness and death.

Repeated over-exposure may cause liver and kidney injuries. Components of the product may affect the nervous system.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain. This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

**Component:**

Gasoline, natural; Low boiling point naphtha 8006-61-9

Acute oral toxicity: LD50 rat  
Dose: 18.8 mg/kg

Acute inhalation toxicity: LC50 rat  
Dose: 20.7 mg/l  
Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.  
Result: Mild skin irritation

Eye irritation: Classification: Irritating to eyes.  
Result: Moderate eye irritation

Toluene 108-88-3

Acute oral toxicity: LD50 rat  
Dose: 636 mg/kg

Acute dermal toxicity: LD50 rabbit  
Dose: 12,124 mg/kg

Acute inhalation toxicity: LC50 rat  
Dose: 49 mg/l  
Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.  
Result: Mild skin irritation  
Prolonged skin contact may defat the skin and produce dermatitis.

Eye irritation: Classification: Irritating to eyes.  
Result: Mild eye irritation

Xylene 1330-20-7

Acute oral toxicity: LD50 rat  
Dose: 2,840 mg/kg

Acute dermal toxicity: LD50 rabbit  
Dose: ca. 4,500 mg/kg

Acute inhalation toxicity: LC50 rat  
Dose: 6,350 mg/l  
Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.  
Result: Mild skin irritation

<b>Ethanol; Ethyl alcohol</b>	64-17-5	<p>Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.  <u>Eye irritation:</u> Classification: Irritating to eyes.            Result: Mild eye irritation</p>
		<p><u>Acute oral toxicity:</u> LD50 rat            Dose: 6,200 mg/kg</p>
		<p><u>Acute dermal toxicity:</u> LD50 rabbit            Dose: 19,999 mg/kg</p>
		<p><u>Acute inhalation toxicity:</u> LC50 rat            Dose: 8,001 mg/l            Exposure time: 4 h</p>
		<p><u>Skin irritation:</u> Classification: Irritating to skin.            Result: Mild skin irritation            Prolonged skin contact may cause skin irritation and/or dermatitis.  <u>Eye irritation:</u> Classification: Irritating to eyes.            Result: Mild eye irritation            Mild eye irritation</p>
<b>Naphthalene</b>	91-20-3	<p><u>Acute oral toxicity:</u> LD50 rat            Dose: 2,001 mg/kg</p>
		<p><u>Acute dermal toxicity:</u> LD50 rat            Dose: 2,501 mg/kg</p>
		<p><u>Acute inhalation toxicity:</u> LC50 rat            Dose: 101 mg/l            Exposure time: 4 h</p>
		<p><u>Skin irritation:</u> Classification: Irritating to skin.            Result: Mild skin irritation</p>
		<p><u>Eye irritation:</u> Classification: Irritating to eyes.            Result: Mild eye irritation</p>
		<p><u>Carcinogenicity:</u> N11.00422130</p>
<b>Benzene</b>	71-43-2	<p><u>Acute oral toxicity:</u> LD50 rat            Dose: 930 mg/kg</p>
		<p><u>Acute inhalation toxicity:</u> LC50 rat            Dose: 44 mg/l            Exposure time: 4 h</p>
		<p><u>Skin irritation:</u> Classification: Irritating to skin.            Result: Mild skin irritation            Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.  <u>Eye irritation:</u> Classification: Irritating to eyes.            Result: Risk of serious damage to eyes.</p>
<b>Pentane</b>	109-66-0	<p><u>Acute oral toxicity:</u> LD50 rat            Dose: 2,001 mg/kg</p>
		<p><u>Acute inhalation toxicity:</u> LC50 rat            Dose: 364 mg/l            Exposure time: 4 h</p>
		<p><u>Skin irritation:</u> Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.  <u>Eye irritation:</u> Classification: Irritating to eyes.            Result: Mild eye irritation</p>
<b>Cyclohexane</b>	110-82-7	<p><u>Acute dermal toxicity:</u> LD50 rabbit            Dose: 2,001 mg/kg</p>
		<p><u>Acute inhalation toxicity:</u> LC50 rat            Dose: 14 mg/l            Exposure time: 4 h</p>

		<p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
<b>Ethylbenzene</b>	100-41-4	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 3,500 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 15,500 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 18 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Risk of serious damage to eyes.</p>
<b>Heptane [and isomers]</b>	142-82-5	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 15,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 103 g/m<sup>3</sup> Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
<b>N-hexane</b>	110-54-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 25,000 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 171.6 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p> <p><u>Teratogenicity:</u> N11.00418960</p>

**Carcinogenicity**

<b>NTP</b>	:	Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2)
<b>IARC</b>	:	Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9) Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2) Ethylbenzene (CAS-No.: 100-41-4)
<b>OSHA</b>	:	Benzene (CAS-No.: 71-43-2)
<b>CA Prop 65</b>	:	WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene (CAS-No.: 108-88-3)

Benzene (CAS-No.: 71-43-2)

**SECTION 12. ECOLOGICAL INFORMATION**

**Additional ecological information** : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

**Component:**

<b>Toluene</b>	108-88-3	<p><u>Toxicity to fish:</u> LC50 Species: Carassius auratus (goldfish) Dose: 13 mg/l Exposure time: 96 h</p> <p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 11.5 mg/l Exposure time: 48 h</p> <p><u>Toxicity to algae:</u> IC50 Species: Selenastrum capricornutum (green algae) Dose: 12 mg/l Exposure time: 72 h</p>
<b>Ethanol; Ethyl alcohol</b>	64-17-5	<p><u>Toxicity to fish:</u> LC50 Species: Leuciscus idus (Golden orfe) Dose: 8,140 mg/l Exposure time: 48 h</p> <p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 9,268 - 14,221 mg/l Exposure time: 48 h</p>
<b>Isopentane; 2-Methylbutane</b>	78-78-4	<p><u>Toxicity to fish:</u> LC50 Species: Oncorhynchus mykiss (rainbow trout) Dose: 3.1 mg/l Exposure time: 96 h</p> <p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 2.3 mg/l Exposure time: 96 h</p>
<b>Naphthalene</b>	91-20-3	<p><u>Toxicity to algae:</u> EC50 Species: Dose: 33 mg/l Exposure time: 24 h</p>
<b>Pentane</b>	109-66-0	<p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 9.74 mg/l Exposure time: 48 h</p>
<b>Cyclohexane</b>	110-82-7	<p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 3.78 mg/l Exposure time: 48 h</p>

Heptane [and isomers]	142-82-5	<p><u>Toxicity to fish:</u> LC50 Species: Carassius auratus (goldfish) Dose: 4 mg/l Exposure time: 24 h</p> <p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 1.5 mg/l Exposure time: 48 h</p>
N-hexane	110-54-3	<p><u>Toxicity to fish:</u> LC50 Species: Pimephales promelas (fathead minnow) Dose: 2.5 mg/l Exposure time: 96 h</p> <p><u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 2.1 mg/l Exposure time: 48 h</p>

### SECTION 13. DISPOSAL CONSIDERATIONS

**Disposal** : Dispose of container and unused contents in accordance with federal, state and local requirements.

### SECTION 14. TRANSPORT INFORMATION

#### CFR

Proper shipping name : Petrol  
UN-No. : 1203  
Class : 3  
Packing group : II

#### TDG

Proper shipping name : Gasoline  
UN-No. : UN1203  
Class : 3  
Packing group : II

#### IATA Cargo Transport

UN UN-No. : UN1203  
Description of the goods : Gasoline  
Class : 3  
Packaging group : II  
ICAO-Labels : 3  
Packing instruction (cargo aircraft) : 364  
Packing instruction (cargo aircraft) : Y341

#### IATA Passenger Transport

UN UN-No. : UN1203  
Description of the goods : Gasoline  
Class : 3

Packaging group : II  
 ICAO-Labels : 3  
 Packing instruction (passenger aircraft) : 353  
 Packing instruction (passenger aircraft) : Y341

**IMDG-Code**

UN-No. : UN 1203  
 Description of the goods : Gasoline  
 Class : 3  
 Packaging group : II  
 IMDG-Labels : 3  
 EmS Number : F-E S-E  
 Marine pollutant : No

**SECTION 15. REGULATORY INFORMATION**

OSHA Hazards : Flammable liquid  
 Highly toxic by ingestion  
 Moderate skin irritant  
 Severe eye irritant  
 Carcinogen

TSCA Status : On TSCA Inventory

DSL Status : . All components are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard  
 Acute Health Hazard  
 Chronic Health Hazard

**CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)**

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Toluene 108-88-3  
 Benzene 71-43-2

**SECTION 16. OTHER INFORMATION**Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 08/09/2012

6, 8, 10, 12, 14, 16, 64, 68, 91, 112, 306, 1092, 1106, 1500, 1570, 1571, 1651, 1652, 1654, 1700, 1701, 1702, 1710, 1711, 1714, 1726, 1729, 1730, 1732, 1733, 1826, 1848, 1880, 1950

# **Diesel Range Organics**





# Safety Data Sheet

**Material Name: Diesel Fuel, All Types**

**SDS No. 9909**  
US GHS

**Synonyms:** Ultra Low Sulfur Diesel; Low Sulfur Diesel; No. 2 Diesel; Motor Vehicle Diesel Fuel; Non-Road Diesel Fuel; Locomotive/Marine Diesel Fuel

## \*\*\* Section 1 - Product and Company Identification \*\*\*

### Manufacturer Information

Hess Corporation  
1 Hess Plaza  
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS  
Emergency # 800-424-9300 CHEMTREC  
[www.hess.com](http://www.hess.com) (Environment, Health, Safety Internet Website)

## \*\*\* Section 2 - Hazards Identification \*\*\*

### GHS Classification:

Flammable Liquids - Category 3  
Skin Corrosion/Irritation – Category 2  
Germ Cell Mutagenicity – Category 2  
Carcinogenicity - Category 2  
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)  
Aspiration Hazard – Category 1  
Hazardous to the Aquatic Environment, Acute Hazard – Category 3

### GHS LABEL ELEMENTS

#### Symbol(s)



#### Signal Word

DANGER

#### Hazard Statements

Flammable liquid and vapor.  
Causes skin irritation.  
Suspected of causing genetic defects.  
Suspected of causing cancer.  
May cause respiratory irritation.  
May cause drowsiness or dizziness.  
May be fatal if swallowed and enters airways.  
Harmful to aquatic life.

#### Precautionary Statements

##### Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking  
Keep container tightly closed.  
Ground/bond container and receiving equipment.

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

Use explosion-proof electrical/ventilating/lighting/equipment.  
Use only non-sparking tools.  
Take precautionary measures against static discharge.  
Wear protective gloves/protective clothing/eye protection/face protection.  
Wash hands and forearms thoroughly after handling.  
Obtain special instructions before use.  
Do not handle until all safety precautions have been read and understood.  
Avoid breathing fume/mist/vapours/spray.

## Response

In case of fire: Use water spray, fog or foam to extinguish.  
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.  
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor if you feel unwell.  
If swallowed: Immediately call a poison center or doctor. Do NOT induce vomiting.  
IF exposed or concerned: Get medical advice/attention.

## Storage

Store in a well-ventilated place. Keep cool.  
Keep container tightly closed.  
Store locked up.

## Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

## \* \* \* Section 3 - Composition / Information on Ingredients \* \* \*

CAS #	Component	Percent
68476-34-6	Fuels, diesel, no. 2	100
91-20-3	Naphthalene	<0.1

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher.

## \* \* \* Section 4 - First Aid Measures \* \* \*

### First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

### First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and the area of the body burned.

### First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

## \* \* \* Section 5 - Fire Fighting Measures \* \* \*

### General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

### Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

### Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO<sub>2</sub>, water spray, fire fighting foam, and other gaseous agents.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

### Unsuitable Extinguishing Media

None

### Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

## \* \* \* Section 6 - Accidental Release Measures \* \* \*

### Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

### Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

### Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

## Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

## Prevention of Secondary Hazards

None

## \* \* \* Section 7 - Handling and Storage \* \* \*

### Handling Procedures

Handle as a combustible liquid. Keep away from heat, sparks, excessive temperatures and open flame! No smoking or open flame in storage, use or handling areas. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

### Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

### Incompatibilities

Keep away from strong oxidizers.

## \* \* \* Section 8 - Exposure Controls / Personal Protection \* \* \*

### Component Exposure Limits

#### Fuels, diesel, no. 2 (68476-34-6)

ACGIH: 100 mg/m<sup>3</sup> TWA (inhalable fraction and vapor, as total hydrocarbons, listed under Diesel fuel)  
Skin - potential significant contribution to overall exposure by the cutaneous route (listed under Diesel fuel)

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## Naphthalene (91-20-3)

ACGIH: 10 ppm TWA  
15 ppm STEL  
Skin - potential significant contribution to overall exposure by the cutaneous route  
OSHA: 10 ppm TWA; 50 mg/m<sup>3</sup> TWA  
NIOSH: 10 ppm TWA; 50 mg/m<sup>3</sup> TWA  
15 ppm STEL; 75 mg/m<sup>3</sup> STEL

## Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

## Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

## Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

## Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

## Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

## \* \* \* Section 9 - Physical & Chemical Properties \* \* \*

<b>Appearance:</b>	Clear, straw-yellow.	<b>Odor:</b>	Mild, petroleum distillate odor
<b>Physical State:</b>	Liquid	<b>pH:</b>	ND
<b>Vapor Pressure:</b>	0.009 psia @ 70 °F (21 °C)	<b>Vapor Density:</b>	>1.0
<b>Boiling Point:</b>	320 to 690 °F (160 to 366 °C)	<b>Melting Point:</b>	ND
<b>Solubility (H<sub>2</sub>O):</b>	Negligible	<b>Specific Gravity:</b>	0.83-0.876 @ 60°F (16°C)
<b>Evaporation Rate:</b>	Slow; varies with conditions	<b>VOC:</b>	ND
<b>Percent Volatile:</b>	100%	<b>Octanol/H<sub>2</sub>O Coeff.:</b>	ND
<b>Flash Point:</b>	>125 °F (>52 °C) minimum	<b>Flash Point Method:</b>	PMCC
<b>Upper Flammability Limit (UFL):</b>	7.5	<b>Lower Flammability Limit (LFL):</b>	0.6
<b>Burning Rate:</b>	ND	<b>Auto Ignition:</b>	494°F (257°C)

## \* \* \* Section 10 - Chemical Stability & Reactivity Information \* \* \*

### Chemical Stability

This is a stable material.

### Hazardous Reaction Potential

Will not occur.

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

## Incompatible Products

Keep away from strong oxidizers.

## Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

## \* \* \* Section 11 - Toxicological Information \* \* \*

### Acute Toxicity

#### A: General Product Information

Harmful if swallowed.

#### B: Component Analysis - LD50/LC50

##### Naphthalene (91-20-3)

Inhalation LC50 Rat >340 mg/m<sup>3</sup> 1 h; Oral LD50 Rat 490 mg/kg; Dermal LD50 Rat >2500 mg/kg; Dermal LD50 Rabbit >20 g/kg

### Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

### Potential Health Effects: Eye Critical Damage/ Stimulativeness

Contact with eyes may cause mild irritation.

### Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

### Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

### Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

### Generative Cell Mutagenicity

This material has been positive in a mutagenicity study.

### Carcinogenicity

#### A: General Product Information

Suspected of causing cancer.

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

## B: Component Carcinogenicity

### Fuels, diesel, no. 2 (68476-34-6)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans (listed under Diesel fuel)

### Naphthalene (91-20-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen

NTP: Reasonably Anticipated To Be A Human Carcinogen (Possible Select Carcinogen)

IARC: Monograph 82 [2002] (Group 2B (possibly carcinogenic to humans))

## Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

## Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

## Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity repeat exposure effects.

## Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

## \* \* \* Section 12 - Ecological Information \* \* \*

## Ecotoxicity

### A: General Product Information

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

### B: Component Analysis - Ecotoxicity - Aquatic Toxicity

#### Fuels, diesel, no. 2 (68476-34-6)

##### Test & Species

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	35 mg/L [flow-through]

##### Conditions

#### Naphthalene (91-20-3)

##### Test & Species

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	5.74-6.44 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	1.6 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	0.91-2.82 mg/L [static]
96 Hr LC50 Pimephales promelas	1.99 mg/L [static]

##### Conditions

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

96 Hr LC50 Lepomis macrochirus	31.0265 mg/L [static]
72 Hr EC50 Skeletonema costatum	0.4 mg/L
48 Hr LC50 Daphnia magna	2.16 mg/L
48 Hr EC50 Daphnia magna	1.96 mg/L [Flow through]
48 Hr EC50 Daphnia magna	1.09 - 3.4 mg/L [Static]

## Persistence/Degradability

No information available.

## Bioaccumulation

No information available.

## Mobility in Soil

No information available.

### \*\*\* Section 13 - Disposal Considerations \*\*\*

## Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

## Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

### \*\*\* Section 14 - Transportation Information \*\*\*

## DOT Information

Shipping Name: Diesel Fuel

NA #: 1993 Hazard Class: 3 Packing Group: III

Placard:



### \*\*\* Section 15 - Regulatory Information \*\*\*

## Regulatory Information

### Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

#### Naphthalene (91-20-3)

CERCLA: 100 lb final RQ; 45.4 kg final RQ

#### SARA Section 311/312 – Hazard Classes

<u>Acute Health</u>	<u>Chronic Health</u>	<u>Fire</u>	<u>Sudden Release of Pressure</u>	<u>Reactive</u>
X	X	X	--	--



# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the de minimis levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

## State Regulations

### Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Fuels, diesel, no. 2	68476-34-6	No	No	No	Yes	No	No
Naphthalene	91-20-3	Yes	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

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

### Component Analysis - WHMIS IDL

No components are listed in the WHMIS IDL.

### Additional Regulatory Information

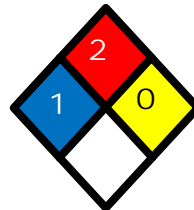
### Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Fuels, diesel, no. 2	68476-34-6	Yes	DSL	EINECS
Naphthalene	91-20-3	Yes	DSL	EINECS

## \*\*\* Section 16 - Other Information \*\*\*

**NFPA® Hazard Rating**

Health	1
Fire	2
Reactivity	0



**HMIS® Hazard Rating**

Health	1*	Slight
Fire	2	Moderate
Physical	0	Minimal

\*Chronic

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; ADG = Australian Code for the Transport of Dangerous Goods by Road and Rail; ADR/RID = European Agreement of Dangerous Goods by Road/Rail; AS = Standards Australia; DFG = Deutsche Forschungsgemeinschaft; DOT = Department of Transportation; DSL = Domestic Substances List; EEC = European Economic Community; EINECS = European Inventory of Existing Commercial Chemical Substances; ELINCS = European List of Notified Chemical Substances; EU = European Union; HMIS = Hazardous Materials Identification System; IARC = International Agency for Research on Cancer; IMO = International Maritime Organization; IATA = International Air Transport Association; MAK = Maximum Concentration Value in the Workplace; NDSL = Non-Domestic Substances List; NFPA = National Fire Protection Association; NOHSC = National Occupational Health & Safety Commission; NTP = National Toxicology Program; STEL = Short-term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; TSCA = Toxic Substances Control Act; TWA = Time Weighted Average

## Literature References

None

## Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

# **Trichloroethylene (TCE)**

## SAFETY DATA SHEET

Version 5.8  
Revision Date 09/23/2016  
Print Date 11/13/2016

---

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

Product name : Trichloroethylene

Product Number : 133124  
Brand : Aldrich  
Index-No. : 602-027-00-9

CAS-No. : 79-01-6

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

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

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

**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

---

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

Skin irritation (Category 2), H315  
Eye irritation (Category 2A), H319  
Germ cell mutagenicity (Category 2), H341  
Carcinogenicity (Category 1B), H350  
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336  
Acute aquatic toxicity (Category 3), H402  
Chronic aquatic toxicity (Category 3), H412

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

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

Pictogram



Signal word

Danger

Hazard statement(s)

H315 Causes skin irritation.  
H319 Causes serious eye irritation.  
H336 May cause drowsiness or dizziness.  
H341 Suspected of causing genetic defects.  
H350 May cause cancer.  
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear eye protection/ face protection.
P280	Wear protective gloves.
P281	Use personal protective equipment as required.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Synonyms	:	TCE Trichloroethene
Formula	:	C <sub>2</sub> HCl <sub>3</sub>
Molecular weight	:	131.39 g/mol
CAS-No.	:	79-01-6
EC-No.	:	201-167-4
Index-No.	:	602-027-00-9

### Hazardous components

Component	Classification	Concentration
<b>Trichloroethylene</b> Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Skin Irrit. 2; Eye Irrit. 2A; Muta. 2; Carc. 1B; STOT SE 3; Aquatic Acute 3; Aquatic Chronic 3; H315, H319, H336, H341, H350, H412	<= 100 %

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

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice

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

#### If inhaled

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

#### In case of skin contact

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

**In case of eye contact**

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

**If swallowed**

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

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

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

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

No data available

---

**5. FIREFIGHTING MEASURES****5.1 Extinguishing media****Suitable extinguishing media**

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

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

No data available

**5.3 Advice for firefighters**

Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**

No data available

---

**6. ACCIDENTAL RELEASE MEASURES****6.1 Personal precautions, protective equipment and emergency procedures**

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

For personal protection see section 8.

**6.2 Environmental precautions**

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

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

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

**6.4 Reference to other sections**

For disposal see section 13.

---

**7. HANDLING AND STORAGE****7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

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

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

Light sensitive. Handle and store under inert gas.

**7.3 Specific end use(s)**

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

---

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION****8.1 Control parameters****Components with workplace control parameters**

Component	CAS-No.	Value	Control parameters	Basis
Trichloroethylene	79-01-6	TWA	10.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment cognitive decrement Renal toxicity Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		STEL	25.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment cognitive decrement Renal toxicity Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		Potential Occupational Carcinogen See Appendix C See Appendix A		
		See Table Z-2		
		TWA	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		CEIL	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		Peak	300.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		Peak	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		STEL	100 ppm 537 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	300 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	25 ppm 135 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

**Biological occupational exposure limits**

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Trichloroethylene	79-01-6	Trichloroacetic acid	15.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)

	Remarks	End of shift at end of workweek			
		Trichloroethanol	0.5000 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Trichloroethylene		In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Trichloroethylene		In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

## 8.2 Exposure controls

### Appropriate engineering controls

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

### Personal protective equipment

#### Eye/face protection

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

#### Skin protection

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

#### Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

#### Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### Body Protection

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

#### Respiratory protection

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).

#### Control of environmental exposure

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



---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid, clear Colour: colourless
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -84.8 °C (-120.6 °F) - lit.
f) Initial boiling point and boiling range	86.7 °C (188.1 °F) - lit.
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 10.5 %(V) Lower explosion limit: 8 %(V)
k) Vapour pressure	81.3 hPa (61.0 mmHg) at 20.0 °C (68.0 °F)
l) Vapour density	No data available
m) Relative density	1.463 g/mL at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 2.29log Pow: 5
p) Auto-ignition temperature	410.0 °C (770.0 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

### 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Oxidizing agents, Strong bases, Magnesium

### 10.6 Hazardous decomposition products

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

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

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - 4,920 mg/kg

LC50 Inhalation - Mouse - 4 h - 8450 ppm

LD50 Dermal - Rabbit - > 20,000 mg/kg

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: Severe skin irritation - 24 h

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation - 24 h

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

In vitro tests showed mutagenic effects

#### Carcinogenicity

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

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (Trichloroethylene)

NTP: Reasonably anticipated to be a human carcinogen (Trichloroethylene)

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

#### Reproductive toxicity

No data available

No data available

#### Specific target organ toxicity - single exposure

No data available

#### Specific target organ toxicity - repeated exposure

No data available

#### Aspiration hazard

No data available

#### Additional Information

RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., Gastrointestinal disturbance, Kidney injury may occur., narcosis  
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

---

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

Toxicity to fish

LC50 - Pimephales promelas (fathead minnow) - 41 mg/l - 96.0 h

LOEC - other fish - 11 mg/l - 10.0 d

NOEC - Oryzias latipes - 40 mg/l - 10.0 d

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 18.00 mg/l - 48 h

Toxicity to algae IC50 - Pseudokirchneriella subcapitata (green algae) - 175.00 mg/l - 96 h

## 12.2 Persistence and degradability

No data available

## 12.3 Bioaccumulative potential

Does not bioaccumulate.

## 12.4 Mobility in soil

No data available

## 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## 12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Harmful to aquatic life with long lasting effects.

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

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

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. 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: 1710      Class: 6.1      Packing group: III  
Proper shipping name: Trichloroethylene  
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

### IMDG

UN number: 1710      Class: 6.1      Packing group: III      EMS-No: F-A, S-A  
Proper shipping name: TRICHLOROETHYLENE

### IATA

UN number: 1710      Class: 6.1      Packing group: III  
Proper shipping name: Trichloroethylene

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

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

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

Trichloroethylene

CAS-No.  
79-01-6Revision Date  
2007-07-01**Pennsylvania Right To Know Components**

Trichloroethylene

CAS-No.  
79-01-6Revision Date  
2007-07-01**New Jersey Right To Know Components**

Trichloroethylene

CAS-No.  
79-01-6Revision Date  
2007-07-01**California Prop. 65 Components**

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

Trichloroethylene

CAS-No.  
79-01-6Revision Date  
2011-09-01

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

Trichloroethylene

CAS-No.  
79-01-6Revision Date  
2011-09-01

---

**16. OTHER INFORMATION****Full text of H-Statements referred to under sections 2 and 3.**

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H402	Harmful to aquatic life.

**HMIS Rating**

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

**NFPA Rating**

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

**Further information**

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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 Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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

Version: 5.8

Revision Date: 09/23/2016

Print Date: 11/13/2016

# Vinyl Chloride

## SAFETY DATA SHEET

Version 3.15  
Revision Date 08/10/2016  
Print Date 07/13/2017

---

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

Product name : Vinyl chloride

Product Number : 387622  
Brand : Aldrich  
Index-No. : 602-023-00-7

CAS-No. : 75-01-4

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

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

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

**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

---

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

Flammable gases (Category 1), H220  
Gases under pressure (Liquefied gas), H280  
Carcinogenicity (Category 1A), H350  
Simple Asphyxiant,

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

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

Pictogram



Signal word : Danger

Hazard statement(s)

H220 : Extremely flammable gas.  
H280 : Contains gas under pressure; may explode if heated.  
H350 : May cause cancer.  
May displace oxygen and cause rapid suffocation.

Precautionary statement(s)

P201 : Obtain special instructions before use.  
P202 : Do not handle until all safety precautions have been read and understood.  
P210 : Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.  
 P308 + P313 IF exposed or concerned: Get medical advice/ attention.  
 P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.  
 P381 Eliminate all ignition sources if safe to do so.  
 P405 Store locked up.  
 P410 + P403 Protect from sunlight. Store in a well-ventilated place.  
 P501 Dispose of contents/ container to an approved waste disposal plant.

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS**

May form explosive peroxides.

---

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

**3.1 Substances**

Synonyms : Chloroethylene

Formula : C<sub>2</sub>H<sub>3</sub>Cl

Molecular weight : 62.50 g/mol

CAS-No. : 75-01-4

EC-No. : 200-831-0

Index-No. : 602-023-00-7

**Hazardous components**

Component	Classification	Concentration
<b>Vinyl chloride</b>		
	Flam. Gas 1; Press. Gas Liquefied gas; Carc. 1A; SA ; H220, H280, H350,	<= 100 %

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

---

**4. FIRST AID MEASURES**

**4.1 Description of first aid measures**

**General advice**

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

**If inhaled**

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

**In case of skin contact**

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

**In case of eye contact**

Flush eyes with water as a precaution.

**If swallowed**

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

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

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

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

No data available

---

**5. FIREFIGHTING MEASURES**

**5.1 Extinguishing media**

**Suitable extinguishing media**

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



## 5.2 Special hazards arising from the substance or mixture

No data available

## 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

## 5.4 Further information

Use water spray to cool unopened containers.

---

## 6. ACCIDENTAL RELEASE MEASURES

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

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

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

Clean up promptly by sweeping or vacuum.

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

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

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

Contents under pressure. Light sensitive.

### 7.3 Specific end use(s)

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

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Vinyl chloride	75-01-4	TWA	1 ppm	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	1 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Lung cancer Confirmed human carcinogen		
		STEL	5 ppm	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	1 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		STEL	5 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		See 1910.1017		
		Potential Occupational Carcinogen		

## 8.2 Exposure controls

### Appropriate engineering controls

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

### Personal protective equipment

#### Eye/face protection

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 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.

#### Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 120 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### Body Protection

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

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (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).

#### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

- |  |   |
|--|---|
| a) Appearance                              | Form: Liquefied gas                               |
| b) Odour                                   | No data available                                 |
| c) Odour Threshold                         | No data available                                 |
| d) pH                                      | No data available                                 |
| e) Melting point/freezing point            | Melting point/range: -153.8 °C (-244.8 °F) - lit. |
| f) Initial boiling point and boiling range | -13.4 °C (7.9 °F) - lit.                          |
| g) Flash point                             | -61.0 °C (-77.8 °F) - closed cup                  |
| h) Evaporation rate                        | No data available                                 |
| i) Flammability (solid, gas)               | No data available                                 |

j) Upper/lower flammability or explosive limits	Upper explosion limit: 33 %(V) Lower explosion limit: 3.6 %(V)
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	0.911 g/cm <sup>3</sup> at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

## 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

Contains the following stabiliser(s):

Hydroquinone (>=0 - <=0.0001 %)

Phenol (>=0 - <=0.01 %)

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

Heat, flames and sparks. Extremes of temperature and direct sunlight.

### 10.5 Incompatible materials

Chemically active metals, Copper

### 10.6 Hazardous decomposition products

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

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

No data available

LC50 Inhalation - Rat - 0.3 h - 180000 ppm

Remarks: Behavioral:Tremor. Behavioral:Convulsions or effect on seizure threshold. Respiratory disorder

Dermal: No data available

No data available

#### Skin corrosion/irritation

No data available

**Serious eye damage/eye irritation**

No data available

**Respiratory or skin sensitisation**

No data available

**Germ cell mutagenicity**

No data available

**Carcinogenicity**

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

Human carcinogen.

IARC: 1 - Group 1: Carcinogenic to humans (Vinyl chloride)

NTP: Known to be human carcinogen (Vinyl chloride)

OSHA: OSHA specifically regulated carcinogen (Vinyl chloride)

**Reproductive toxicity**

No data available

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: KU9625000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system -

Stomach - Irregularities - Based on Human Evidence (Phenol)

Liver - Irregularities - Based on Human Evidence

---

**12. ECOLOGICAL INFORMATION****12.1 Toxicity**

No data available

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

No data available

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

#### Contaminated packaging

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

UN number: 1086      Class: 2.1  
Proper shipping name: Vinyl chloride, stabilized  
Reportable Quantity (RQ): 1 lbs

Poison Inhalation Hazard: No

### IMDG

UN number: 1086      Class: 2.1      EMS-No: F-D, S-U  
Proper shipping name: VINYL CHLORIDE, STABILIZED

### IATA

UN number: 1086      Class: 2.1  
Proper shipping name: Vinyl chloride, stabilized  
IATA Passenger: Not permitted for transport

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Phenol	108-95-2	2007-07-01
Hydroquinone	123-31-9	2007-07-01

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01

### SARA 311/312 Hazards

Fire Hazard, Sudden Release of Pressure Hazard, Acute Health Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01
Phenol	108-95-2	2007-07-01
Hydroquinone	123-31-9	2007-07-01

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01
Phenol	108-95-2	2007-07-01

### New Jersey Right To Know Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01

### California Prop. 65 Components

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

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-09-28

---

## 16. OTHER INFORMATION

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

	May displace oxygen and cause rapid suffocation.
Carc.	Carcinogenicity
Flam. Gas	Flammable gases
H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H350	May cause cancer.
Press. Gas	Gases under pressure
SA	Simple Asphyxiant

### HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	3

### NFPA Rating

Health hazard:	2
Fire Hazard:	4
Reactivity Hazard:	0

### Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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 Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

### Preparation Information

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

Version: 3.15

Revision Date: 08/10/2016

Print Date: 07/13/2017

# MTBE

## Safety Data Sheet

### 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

**Material Name** : MTBE  
**Other Names / Synonyms** : tert-butyl methyl ether  
**Recommended Use / Restrictions of Use** : Fuel additive component. Chemical feedstock and component of motor gasoline. For use only in industrial processes.

**Supplier** : Shell Eastern Trading (PTE) Ltd

9 North Buona Vista Drive,  
#07-01,  
Tower 1, The Metropolis  
Singapore 138588  
Singapore

**Telephone** : +65-6384 8000  
**Emergency Telephone Number** : +44 (0) 151 350 4595

### 2. HAZARDS IDENTIFICATION

**GHS Classification** : Flammable liquids, Category 2  
Skin corrosion/irritation, Category 2  
Acute toxicity, Category 5  
Aspiration hazard, Category 2

**GHS Label Elements Symbol(s)** :



**Signal Words** : Danger

**Hazard Statement** : PHYSICAL HAZARDS:  
H225: Highly flammable liquid and vapour.

HEALTH HAZARDS:  
H315: Causes skin irritation.  
H303: May be harmful if swallowed.  
H305: May be harmful if swallowed and enters airways.

ENVIRONMENTAL HAZARDS:



## Safety Data Sheet

Not classified as an environmental hazard under GHS criteria.

### GHS Precautionary Statements

- Prevention** : P210: Keep away from heat/sparks/open flames/hot surfaces. - No smoking.  
P243: Take precautionary measures against static discharge.  
P261: Avoid breathing dust/fume/gas/mist/vapours/spray.  
P271: Use only outdoors or in a well-ventilated area.
- Response** : P304+P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- Storage** : P403+P235: Store in a well-ventilated place. Keep cool.
- Other Hazards which do not result in classification** : This material is a static accumulator. Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.  
In use, may form flammable/explosive vapour-air mixture.
- Additional Information** : This product is intended for use in closed systems only.

---

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

- Mixture Description** : Product is not a mixture according to regulation 1907/2006/EC.  
**Synonyms** : tert-butyl methyl ether  
2-methoxy-2-methylpropane  
**CAS No.** : 1634-04-4

#### Classification of components according to GHS

Chemical Identity	Synonyms	CAS	Hazard Class (category)	Hazard Statement	Conc.
Methyl tertiary butyl ether	Methyl tertiary butyl ether	1634-04-4	Flam. Liq., 2; Skin Corr., 3; Acute Tox., 5; Asp. Tox., 2;	H225; H316; H303; H305;	100.00 %

- Additional Information** : Refer to Ch 16 for full text of H phrases.

---

### 4. FIRST-AID MEASURES

- Inhalation** : Remove to fresh air. Do not attempt to rescue the victim unless

## Safety Data Sheet

	<p>proper respiratory protection is worn. If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting, or unresponsive, give 100% oxygen with rescue breathing or Cardiopulmonary Resuscitation (CPR) as required and transport to the nearest medical facility.</p>
<b>Skin Contact</b>	: Contaminated clothing may be a fire hazard and therefore should be soaked with water before being removed. Wash skin with water using soap if available.
<b>Eye Contact</b>	: Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.
<b>Ingestion</b>	: If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If vomiting occurs spontaneously, keep head below hips to prevent aspiration.
<b>Most Important Symptoms/Effects, Acute &amp; Delayed</b>	: Skin irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blisters. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure.
<b>Immediate medical attention, special treatment</b>	: Call a doctor or poison control center for guidance. Potential for chemical pneumonitis.

---

### 5. FIRE-FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

<b>Specific hazards arising from Chemicals</b>	: Hazardous combustion products may include: Carbon monoxide may be evolved if incomplete combustion occurs. Will float and can be reignited on surface water. The vapour is heavier than air, spreads along the ground and distant ignition is possible.
<b>Suitable Extinguishing Media</b>	: Use foam, water fog for major fires. Use dry chemical powder, carbon dioxide, sand or earth for minor fires.
<b>Unsuitable Extinguishing Media</b>	: Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.
<b>Protective Equipment &amp;</b>	: Proper protective equipment including chemical resistant

## Safety Data Sheet

- Precautions for Fire Fighters** gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).
- Additional Advice** : Keep adjacent containers cool by spraying with water.

---

### 6. ACCIDENTAL RELEASE MEASURES

Observe the relevant local and international regulations.

- Personal Precautions, Protective Equipment and Emergency Procedures** : Do not breathe fumes, vapour. Do not operate electrical equipment. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area and evacuate all personnel. Attempt to disperse the gas or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Monitor area with combustible gas meter. Vapour can travel for considerable distances both above and below the ground surface. Underground services (drains, pipelines, cable ducts) can provide preferential flow paths.
- Environmental Precautions** : Take measures to minimise the effects on groundwater. Prevent from spreading or entering into drains, ditches or rivers by using sand, earth, or other appropriate barriers. Contain residual material at affected sites to prevent material from entering drains (sewers), ditches, and waterways.
- Methods and Material for Containment and Cleaning Up** : Take precautionary measures against static discharges. For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
- Additional Advice** : Risk of explosion. Inform the emergency services if product enters surface water drains. Vapour may form an explosive mixture with air. Local authorities should be advised if significant spillages cannot be contained. To the extent that this product, including its chemical components (e.g. methyl

## Safety Data Sheet

tertiary butyl ether) may impact surface or groundwater, appropriate assessment and remediation (if necessary) should be implemented.

---

### 7. HANDLING AND STORAGE

- General Precautions** : Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Air-dry contaminated clothing in a well-ventilated area before laundering. Prevent spillages. Contaminated leather articles including shoes cannot be decontaminated and should be destroyed to prevent reuse.
- Precautions for Safe Handling** : Avoid inhaling vapour and/or mists. Avoid contact with skin, eyes and clothing. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Handling Temperature: Ambient. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.
- Conditions for Safe Storage** : Keep away from aerosols, flammables, oxidizing agents, corrosives and from other flammable products which are not harmful or toxic to man or to the environment. Keep container tightly closed. Must be stored in a diked (bunded) well-ventilated area, away from sunlight, ignition sources and other sources of heat. Vapours from tanks should not be released to atmosphere. Breathing losses during storage should be controlled by a suitable vapour treatment system. Storage Temperature: Ambient. Tank storage: Tanks must be specifically designed for use with this product. Bulk storage tanks should be diked (bunded). Locate tanks away from heat and other sources of ignition. Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions. Electrostatic charges will be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk. The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable. Refer to section 15 for any additional specific legislation covering the packaging and

## Safety Data Sheet

### Product Transfer

- storage of this product.
- : Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes. Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur. Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges. These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements. These activities may lead to static discharge e.g. spark formation. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge ( $\leq 1$  m/s until fill pipe submerged to twice its diameter, then  $\leq 7$  m/s). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.
- Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes. Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur. Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges. These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements. These activities may lead to static discharge e.g. spark formation. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge ( $\leq 1$  m/s until fill pipe submerged to twice its diameter, then  $\leq 7$  m/s). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.
- Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes. Even with proper grounding and bonding, this material can still accumulate an

## Safety Data Sheet

electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur. Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges. These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements. These activities may lead to static discharge e.g. spark formation. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge ( $\leq 1$  m/s until fill pipe submerged to twice its diameter, then  $\leq 7$  m/s). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.

- Recommended Materials** : For container paints, use epoxy paint, zinc silicate paint. For containers, or container linings use mild steel, stainless steel.
- Unsuitable Materials** : Most plastics. Natural, neoprene or nitrile rubbers.
- Container Advice** : Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers.
- Other Advice** : Ensure that all local regulations regarding handling and storage facilities are followed. See additional references that provide safe handling practices for liquids that are determined to be static accumulators: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity). CENELEC CLC/TR 50404 (Electrostatics – Code of practice for the avoidance of hazards due to static electricity).

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

#### Occupational Exposure Limits

Material	Source	Type	ppm	mg/m3	Notation
Methyl tertiary butyl ether	ACGIH	TWA	50 ppm		
	SG OEL	TWA	40 ppm	144 mg/m3	

## Safety Data Sheet

### Biological Exposure Index (BEI)

No biological limit allocated.

**Appropriate Engineering Controls** : Read in conjunction with the Exposure Scenario for your specific use contained in the Annex. The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Local exhaust ventilation is recommended.

**Individual Protection Measures** : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

**Respiratory Protection** : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. All respiratory protection equipment and use must be in accordance with local regulations. Select a filter suitable for combined particulate/organic gases and vapours [boiling point >65°C(149 °F)].

**Hand Protection** : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739, AS/NZS:2161) made from the following materials may provide suitable chemical protection: Longer term protection: Viton. Incidental contact/Splash protection: Nitrile rubber. PVC. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where

## Safety Data Sheet

	<p>suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognise that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time may be acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material.</p>
<b>Eye Protection</b>	: Chemical splash goggles (chemical monogoggles). If a local risk assessment deems it so, then chemical splash goggles may not be required and safety glasses may provide adequate eye protection.
<b>Protective Clothing</b>	: Chemical resistant gloves/gauntlets, boots, and apron (where risk of splashing). Chemical resistant gloves/gauntlets, boots, and apron. For spillage clean up use chemical resistant knee length boots. Where risk of splashing or in spillage clean up, use chemical resistant one-piece overall with integral hood.
<b>Thermal Hazards</b>	: Not applicable.
<b>Monitoring Methods</b>	: Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory. Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods <a href="http://www.cdc.gov/niosh/">http://www.cdc.gov/niosh/</a> Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods <a href="http://www.osha.gov/">http://www.osha.gov/</a>
<b>Environmental Exposure Controls</b>	: Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. Information on accidental release measures are to be found in section 6.

---

### 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance</b>	: Clear colourless. Liquid.
<b>Odour</b>	: Ethereal
<b>Odour threshold</b>	: 0.053
<b>pH</b>	: Not applicable
<b>Initial Boiling Point and Boiling Range</b>	: 55 °C / 131 °F
<b>Melting / freezing point</b>	: -109 °C / -164 °F



## Safety Data Sheet

<b>Flash point</b>	: -34 °C / -29 °F
<b>Upper / lower Flammability or Explosion limits</b>	: 1 - 8 %(V)
<b>Auto-ignition temperature</b>	: 460 °C / 860 °F (ASTM E-659)
<b>Vapour pressure</b>	: 25 kPa at 20 °C / 68 °F
<b>Relative Density</b>	: 0.75 at 15 °C / 59 °F
<b>Density</b>	: 745 kg/m <sup>3</sup> at 20 °C / 68 °F
<b>Water solubility</b>	: 48 g/l at 20 °C / 68 °F
<b>Solubility in other solvents</b>	: Data not available
<b>n-octanol/water partition coefficient (log Pow)</b>	: 0.94 at 20 °C / 68 °F
<b>Dynamic viscosity</b>	: 0.35 mPa.s at 20 °C / 68 °F
<b>Kinematic viscosity</b>	: Typical 0.53 mm <sup>2</sup> /s at 20 °C / 68 °F Typical 0.47 mm <sup>2</sup> /s at 40 °C / 104 °F
<b>Vapour density (air=1)</b>	: 3.23 at 20 °C / 68 °F
<b>Electrical conductivity</b>	: Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semi-conductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid.
<b>Evaporation rate (nBuAc=1)</b>	: 1.6 (DIN 53170, di-ethyl ether=1)
<b>Surface tension</b>	: Typical 72.1 mN/m at 21 °C / 70 °F 21.5 mN/m at 25 °C / 77 °F 19 mN/m at 40 °C / 104 °F
<b>Molecular weight</b>	: 102.18 g/mol
<b>Flammability</b>	: Not applicable.

### 10. STABILITY AND REACTIVITY

<b>Chemical stability</b>	: No hazardous reaction is expected when handled and stored according to provisions. Reacts violently with strong oxidising agents.
<b>Possibility of Hazardous Reactions</b>	: No, hazardous, exothermic polymerization cannot occur.
<b>Conditions to Avoid</b>	: Avoid heat, sparks, open flames and other ignition sources.
<b>Incompatible Materials</b>	: Strong oxidising agents. Strong acids. Strong bases.
<b>Hazardous Decomposition Products</b>	: May form explosive peroxides. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids,

## Safety Data Sheet

- liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation. peroxides
- Hazardous Polymerisation** : No, hazardous, exothermic polymerization cannot occur.
- Sensitivity to Mechanical Impact** : Not applicable.
- Sensitivity to Static Discharge** : Yes, in certain circumstances product can ignite due to static electricity.

---

### 11. TOXICOLOGICAL INFORMATION

#### Information on Toxicological effects

- Basis for Assessment** : Information given is based on product testing, and/or similar products, and/or components.
- Likely Routes of Exposure** : Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.
- Acute Oral Toxicity** : May be harmful if swallowed. LD50 > 2000 - <= 5000 mg/kg
- Acute Dermal Toxicity** : Low toxicity: LD50 > 5000 mg/kg
- Acute Inhalation Toxicity** : Low toxicity by inhalation.
- Skin corrosion/irritation** : Causes skin irritation.
- Serious eye damage/irritation** : Expected to be non-irritating to eyes.
- Respiratory Irritation** : Not expected to be a respiratory irritant.
- Respiratory or skin sensitisation** : Not expected to be a sensitiser.
- Aspiration Hazard** : Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.
- Germ cell mutagenicity** : Not mutagenic.
- Carcinogenicity** : Not expected to be carcinogenic.

Material	:	Carcinogenicity Classification
Methyl tertiary butyl ether	:	ACGIH Group A3: Confirmed animal carcinogen with unknown relevance to humans.
Methyl tertiary butyl ether	:	IARC 3: Not classifiable as to carcinogenicity to humans.

## Safety Data Sheet

Methyl tertiary butyl ether	:	GHS / CLP: No carcinogenicity classification
-----------------------------	---	--

<b>Reproductive and Developmental Toxicity</b>	:	Does not impair fertility. Not a developmental toxicant.
<b>Specific target organ toxicity - single exposure</b>	:	Not expected to be a hazard.
<b>Specific target organ toxicity - repeated exposure</b>	:	Not expected to be a hazard.  Kidney: caused kidney effects in male rats which are not considered relevant to humans
<b>Additional Information</b>	:	Not expected to be a hazard.

---

### 12. ECOLOGICAL INFORMATION

<b>Basis for Assessment</b>	:	Incomplete ecotoxicological data are available for this product. The information given below is based partly on a knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).
<b>Acute Toxicity</b>	:	Information given is based on product data.
<b>Fish</b>	:	Practically non toxic: LL/EL/IL50 > 100 mg/l
<b>Aquatic crustacea</b>	:	Practically non toxic: LL/EL/IL50 > 100 mg/l
<b>Algae/aquatic plants</b>	:	Practically non toxic: LL/EL/IL50 > 100 mg/l
<b>Microorganisms</b>	:	Practically non toxic: LL/EL/IL50 > 100 mg/l
<b>Chronic Toxicity</b>	:	
<b>Fish</b>	:	NOEC/NOEL > 100 mg/l
<b>Aquatic crustacea</b>	:	NOEC/NOEL > 10 - <=100 mg/l
<b>Mobility</b>	:	Floats on water. If product enters soil, it will be highly mobile and may contaminate groundwater. Methyl tertiary butyl ether degradation may result in the formation of tert-butyl alcohol (TBA).
<b>Persistence/degradability</b>	:	Not readily biodegradable. Oxidises rapidly by photo-chemical reactions in air. Expected to be inherently biodegradable. While biodegradation of Methyl tertiary butyl ether has been documented, it is generally less biodegradable than many petroleum hydrocarbons and has a potential to migrate relatively longer distances in groundwater.
<b>Bioaccumulative Potential</b>	:	Does not bioaccumulate significantly.
<b>Other Adverse Effects</b>	:	Not applicable

## Safety Data Sheet

---

### 13. DISPOSAL CONSIDERATIONS

- Material Disposal** : It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand. Do not dispose into the environment, in drains or in water courses. Given the nature and uses of this product, the need for disposal seldom arises. If necessary, dispose by controlled combustion in purpose-designed equipment. If this is not possible, contact the supplier.
- Container Disposal** : Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard. Do not puncture, cut, or weld uncleaned drums. Send to drum recoverer or metal reclaimer. Do not pollute the soil, water or environment with the waste container. For tanks seek specialist advice from suppliers. Dispose in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
- Local Legislation** : Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be in compliance.

---

### 14. TRANSPORT INFORMATION

**Land (as per ADR classification): Regulated**

- Class : 3  
Packing group : II  
Hazard identification no. : 33  
UN number : 2398  
Danger label (primary risk) : 3  
Proper shipping name : METHYL tert-BUTYL ETHER  
Environmentally Hazardous : No

**IMDG**

- Identification number : UN 2398

## Safety Data Sheet

Proper shipping name : METHYL tert-BUTYL ETHER  
Class / Division : 3  
Packing group : II  
Marine Pollutant: No

### IATA (Country variations may apply)

UN number : 2398  
Proper shipping name : Methyl tert-butyl ether  
Class / Division : 3  
Packing group : II

### Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Pollution Category : Z  
Ship Type : 3  
Product Name : tert-butyl methyl ether  
Special Precaution : Special Precautions: Refer to Chapter 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

---

## 15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

### Local Regulations

Workplace Safety and Health Act & Workplace Safety and Health (General Provision) Regulations : This product is not subject to the requirement in the Act/Regulations.  
Environmental Protection and Management Act and Environmental Protection and Management (Hazardous Substances) Regulations : This product is not subject to the requirement in the Act/Regulations.  
Maritime and Port Authority of Singapore (Dangerous Goods, Petroleum and Explosives) Regulations : This product is not subject to the requirement in the Act/Regulations.  
Fire Safety Act and Fire Safety (Petroleum & Flammable Materials) Regulations : This product is subject to the requirement in the Act/Regulations.

## Safety Data Sheet

### Chemical Inventory Status

TSCA	:	All components listed.
PICCS (PH)	:	All components listed.
NZIOC	:	All components listed.
KECI (KR)	:	All components listed.
CHINA INV	:	All components listed.
DSL	:	All components listed.
EINECS	:	All components listed.

**Other Information** : Environmental Protection and Management Act. Workplace Safety and Health Act 2006.

---

### 16. OTHER INFORMATION

#### Hazard Statement

H225	Highly flammable liquid and vapour.
H303	May be harmful if swallowed.
H305	May be harmful if swallowed and enters airways.
H316	Causes mild skin irritation.

**Additional Information** : This document contains important information to ensure the safe storage, handling and use of this product. The information in this document should be brought to the attention of the person in your organisation responsible for advising on safety matters.

**SDS Version Number** : 1.0

**SDS Effective Date** : 10.03.2014

**SDS Revisions** : A vertical bar (|) in the left margin indicates an amendment from the previous version.

**Uses and Restrictions** : This product must not be used in applications other than those recommended in Section 1, without first seeking the advice of the supplier.

**SDS Distribution** : The information in this document should be made available to all who may handle the product.

**Key/Legend to Abbreviations used in this** : The standard abbreviations and acronyms used in this document can be looked up in

## Safety Data Sheet

**SDS** reference literature (e.g. scientific dictionaries) and/or websites.

Flam. Liq.	Flammable liquids
Asp. Tox.	Aspiration hazard
STOT SE	Specific target organ toxicity - single exposure

**Key Literature References** : The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).

**Disclaimer** : This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

# **Petroleum Hydrocarbons / PAHs**





# Fisher Scientific

Part of Thermo Fisher Scientific

## SAFETY DATA SHEET

Revision Date 10-Feb-2015

Revision Number 1

### 1. Identification

**Product Name** Benzo[a]pyrene, 98%  
**Cat No. :** AC105600010; AC105601000  
**Synonyms** Benzo[def]chrysene.; 3,4-Benzopyrene; 3,4-Benzpyrene  
**Recommended Use** Laboratory chemicals.  
**Uses advised against** No Information available  
**Details of the supplier of the safety data sheet**

<b>Company</b>	<b>Entity / Business Name</b>	<b>Emergency Telephone Number</b>
Fisher Scientific One Reagent Lane Fair Lawn, NJ 07410 Tel: (201) 796-7100	Acros Organics One Reagent Lane Fair Lawn, NJ 07410	For information <b>US</b> call: 001-800-ACROS-01 / <b>Europe</b> call: +32 14 57 52 11 Emergency Number <b>US</b> :001-201-796-7100 / <b>Europe</b> : +32 14 57 52 99 <b>CHEMTREC</b> Tel. No. <b>US</b> :001-800-424-9300 / <b>Europe</b> :001-703-527-3887

### 2. Hazard(s) identification

#### **Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Sensitization	Category 1
Germ Cell Mutagenicity	Category 1A
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 1A

#### **Label Elements**

##### **Signal Word**

Danger

##### **Hazard Statements**

May cause an allergic skin reaction  
May cause genetic defects  
May cause cancer  
May damage fertility or the unborn child

**Precautionary Statements****Prevention**

Obtain special instructions before use  
 Do not handle until all safety precautions have been read and understood  
 Use personal protective equipment as required  
 Avoid breathing dust/fume/gas/mist/vapors/spray  
 Contaminated work clothing should not be allowed out of the workplace  
 Wear protective gloves

**Response**

IF exposed or concerned: Get medical attention/advice

**Skin**

IF ON SKIN: Wash with plenty of soap and water  
 If skin irritation or rash occurs: Get medical advice/attention  
 Wash contaminated clothing before reuse

**Storage**

Store locked up

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

Very toxic to aquatic life with long lasting effects

### 3. Composition / information on ingredients

Component	CAS-No	Weight %
Benzo[a]pyrene	50-32-8	> 96

### 4. First-aid measures

<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes.
<b>Inhalation</b>	Move to fresh air.
<b>Ingestion</b>	Do not induce vomiting.
<b>Most important symptoms/effects</b>	May cause allergic skin reaction. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
<b>Notes to Physician</b>	Treat symptomatically

### 5. Fire-fighting measures

<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point Method -</b>	No information available
<b>Autoignition Temperature</b>	No information available
<b>Explosion Limits</b>	

<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

**Specific Hazards Arising from the Chemical**

Keep product and empty container away from heat and sources of ignition.

**Hazardous Combustion Products**

None known

**Protective Equipment and Precautions for Firefighters**

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

<b>Health</b>	<b>Flammability</b>	<b>Instability</b>	<b>Physical hazards</b>
2	0	0	N/A

**6. Accidental release measures****Personal Precautions**

Ensure adequate ventilation. Use personal protective equipment.

**Environmental Precautions**

See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

**Methods for Containment and Clean Up** No information available.

Up

**7. Handling and storage****Handling**

Ensure adequate ventilation.

**Storage**

Keep containers tightly closed in a dry, cool and well-ventilated place.

**8. Exposure controls / personal protection****Exposure Guidelines**

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Benzo[a]pyrene		TWA: 0.2 mg/m <sup>3</sup>	

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Benzo[a]pyrene	TWA: 0.005 mg/m <sup>3</sup>		TWA:

**Legend**

OSHA - Occupational Safety and Health Administration

**Engineering Measures**

Ensure adequate ventilation, especially in confined areas.

**Personal Protective Equipment****Eye/face Protection**

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection**

Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respiratory Protection**

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures**

Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Powder Solid
<b>Appearance</b>	Dark yellow
<b>Odor</b>	aromatic
<b>Odor Threshold</b>	No information available
<b>pH</b>	
<b>Melting Point/Range</b>	175 179 °C
<b>Boiling Point/Range</b>	°C @ 760 mmHg
<b>Flash Point</b>	
<b>Evaporation Rate</b>	No information available
<b>Flammability (solid,gas)</b>	No information available
<b>Flammability or explosive limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Vapor Pressure</b>	No information available
<b>Vapor Density</b>	No information available
<b>Relative Density</b>	No information available
<b>Solubility</b>	Insoluble in water
<b>Partition coefficient; n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	No information available
<b>Decomposition Temperature</b>	No information available
<b>Viscosity</b>	No information available
<b>Molecular Formula</b>	C20H12
<b>Molecular Weight</b>	252.31

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	Stable under normal conditions.
<b>Conditions to Avoid</b>	Incompatible products.
<b>Incompatible Materials</b>	Strong oxidizing agents
<b>Hazardous Decomposition Products</b>	None under normal use conditions
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### **Component Information**

**Toxicologically Synergistic Products** No information available

#### **Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation** No information available

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Benzo[a]pyrene	50-32-8	Group 1	Reasonably Anticipated	A2	X	Not listed

**Mutagenic Effects** No information available

<b>Reproductive Effects</b>	No information available.
<b>Developmental Effects</b>	No information available.
<b>Teratogenicity</b>	No information available.
<b>STOT - single exposure</b>	None known
<b>STOT - repeated exposure</b>	None known
<b>Aspiration hazard</b>	No information available
<b>Symptoms / effects,both acute and delayed</b>	Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
<b>Endocrine Disruptor Information</b>	No information available

Component	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Benzo[a]pyrene	Group III Chemical	Not applicable	Not applicable

**Other Adverse Effects** The toxicological properties have not been fully investigated.

## 12. Ecological information

### Ecotoxicity

Do not empty into drains.

**Persistence and Degradability** No information available  
**Bioaccumulation/ Accumulation** No information available.

**Mobility** No information available.

Component	log Pow
Benzo[a]pyrene	6.06

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Benzo[a]pyrene - 50-32-8	U022	-

## 14. Transport information

### DOT

**UN-No** UN3077  
**Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.  
**Hazard Class** 9  
**Packing Group** III

### TDG

**UN-No** UN3077  
**Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.  
**Hazard Class** 9  
**Packing Group** III

### IATA

**UN-No** UN3077  
**Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.  
**Hazard Class** 9  
**Packing Group** III

### IMDG/IMO

**UN-No** UN3077

Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.  
 Hazard Class 9  
 Packing Group III

## 15. Regulatory information

### International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Benzo[a]pyrene	X	X	-	200-028-5	-		X	-	-	X	X

#### Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

### U.S. Federal Regulations

TSCA 12(b) Not applicable

### SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Benzo[a]pyrene	50-32-8	> 96	0.1

### SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

### Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Benzo[a]pyrene	-	-	X	X

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration  
Not applicable

### CERCLA

Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Benzo[a]pyrene	1 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Benzo[a]pyrene	50-32-8	Carcinogen	0.06 µg/day	Carcinogen

### State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Benzo[a]pyrene	X	X	X	X	X

**U.S. Department of Transportation**

Reportable Quantity (RQ): N  
 DOT Marine Pollutant N  
 DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**

This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

**Canada**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

**WHMIS Hazard Class** D2A Very toxic materials



## 16. Other information

**Prepared By** Regulatory Affairs  
 Thermo Fisher Scientific  
 Email: EMSDS.RA@thermofisher.com

**Revision Date** 10-Feb-2015

**Print Date** 10-Feb-2015

**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

**End of SDS**

## SAFETY DATA SHEET

Version 5.10  
Revision Date 05/24/2016  
Print Date 11/14/2016

---

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

Product name : Dibenz[*a,h*]anthracene

Product Number : 48574  
Brand : Supelco  
Index-No. : 601-041-00-2

CAS-No. : 53-70-3

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

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

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

**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

---

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

Carcinogenicity (Category 1B), H350  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

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

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

Pictogram



Signal word : Danger

Hazard statement(s)

H350 : May cause cancer.  
H410 : Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 : Obtain special instructions before use.  
P202 : Do not handle until all safety precautions have been read and understood.  
P273 : Avoid release to the environment.  
P280 : Wear protective gloves/ protective clothing/ eye protection/ face protection.  
P308 + P313 : IF exposed or concerned: Get medical advice/ attention.



P391 Collect spillage.  
P405 Store locked up.  
P501 Dispose of contents/ container to an approved waste disposal plant.

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

---

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1 Substances

Synonyms : 1,2:5,6-Dibenzanthracene

Formula : C<sub>22</sub>H<sub>14</sub>

Molecular weight : 278.35 g/mol

CAS-No. : 53-70-3

EC-No. : 200-181-8

Index-No. : 601-041-00-2

#### Hazardous components

Component	Classification	Concentration
<b>Dibenz[a,h]anthracene</b>	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

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

---

### 4. FIRST AID MEASURES

#### 4.1 Description of first aid measures

##### General advice

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

##### If inhaled

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

##### In case of skin contact

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

##### In case of eye contact

Flush eyes with water as a precaution.

##### If swallowed

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

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

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

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

No data available

---

### 5. FIREFIGHTING MEASURES

#### 5.1 Extinguishing media

##### Suitable extinguishing media

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

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

No data available

#### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

#### 5.4 Further information

No data available

---

## 6. ACCIDENTAL RELEASE MEASURES

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

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.  
For personal protection see section 8.

### 6.2 Environmental precautions

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

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

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

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

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

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

Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

### 7.3 Specific end use(s)

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

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Dibenz[a,h]anthracene	53-70-3	PEL	0.2 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

#### Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Dibenz[a,h]anthracene	53-70-3	1-Hydroxypyrene (1-HP)		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

### 8.2 Exposure controls

#### Appropriate engineering controls

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

#### Personal protective equipment

##### Eye/face protection

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

### **Skin protection**

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

#### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

#### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

### **Body Protection**

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

### **Respiratory protection**

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

### **Control of environmental exposure**

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

---

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

- |   |   |
|---|---|
| a) Appearance                                   | Form: solid   |
| b) Odour  | No data available                                       |
| c) Odour Threshold                              | No data available                                       |
| d) pH   | No data available                                       |
| e) Melting point/freezing point                 | Melting point/range: 262 - 265 °C (504 - 509 °F) - lit. |
| f) Initial boiling point and boiling range      | 524 °C (975 °F) - lit.                                  |
| g) Flash point                                  | No data available                                       |
| h) Evaporation rate                             | No data available                                       |
| i) Flammability (solid, gas)                    | No data available                                       |
| j) Upper/lower flammability or explosive limits | No data available                                       |
| k) Vapour pressure                              | No data available                                       |
| l) Vapour density                               | No data available                                       |
| m) Relative density                             | No data available                                       |

- |   |                   |
|---|-------------------|
| n) Water solubility                       | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition temperature              | No data available |
| q) Decomposition temperature              | No data available |
| r) Viscosity                              | No data available |
| s) Explosive properties                   | No data available |
| t) Oxidizing properties                   | No data available |

## 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

#### Carcinogenicity

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

Possible human carcinogen

IARC: 2A - Group 2A: Probably carcinogenic to humans (Dibenz[a,h]anthracene)

NTP: Reasonably anticipated to be a human carcinogen (Dibenz[a,h]anthracene)

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

**Reproductive toxicity**

No data available

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: HN2625000

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

Lungs -

---

**12. ECOLOGICAL INFORMATION**

**12.1 Toxicity**

Toxicity to daphnia and other aquatic invertebrates      Immobilization EC50 - Daphnia magna (Water flea) - 0.496 mg/l - 24 h

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

---

**13. DISPOSAL CONSIDERATIONS**

**13.1 Waste treatment methods**

**Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

Not dangerous goods

### IMDG

UN number: 3077      Class: 9      Packing group: III      EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Dibenz[a,h]anthracene)  
Marine pollutant:yes

### IATA

UN number: 3077      Class: 9      Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenz[a,h]anthracene)

### Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

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

### SARA 313 Components

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

### SARA 311/312 Hazards

Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Dibenz[a,h]anthracene	53-70-3	1993-04-24

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Dibenz[a,h]anthracene	53-70-3	1993-04-24

### New Jersey Right To Know Components

	CAS-No.	Revision Date
Dibenz[a,h]anthracene	53-70-3	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. Dibenz[a,h]anthracene	53-70-3	2007-09-28

---

## 16. OTHER INFORMATION

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

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

### HMIS Rating

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

Physical Hazard 0

**NFPA Rating**

Health hazard: 0

Fire Hazard: 0

Reactivity Hazard: 0

**Further information**

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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 Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

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

Version: 5.10

Revision Date: 05/24/2016

Print Date: 11/14/2016

## SAFETY DATA SHEET

Version 5.6  
Revision Date 05/24/2016  
Print Date 11/13/2016

---

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

Product name : Benzo[*b*]fluoranthene

Product Number : 275336  
Brand : Aldrich  
Index-No. : 601-034-00-4

CAS-No. : 205-99-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

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

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

**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

---

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

Carcinogenicity (Category 1B), H350  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

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

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

Pictogram



Signal word

Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

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

P273

Avoid release to the environment.

P281

Use personal protective equipment as required.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P391

Collect spillage.



P405  
P501

Store locked up.  
Dispose of contents/ container to an approved waste disposal plant.

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

---

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1 Substances

Synonyms : 3,4-Benzofluoranthene  
Benz[e]acephenanthrylene  
2,3-Benzfluoranthene  
3,4-Benz[e]acephenanthrylene  
Benzo[b]fluoranthene  
Benzo[e]fluoranthene  
NSC 89265

Formula : C<sub>20</sub>H<sub>12</sub>  
Molecular weight : 252.31 g/mol  
CAS-No. : 205-99-2  
EC-No. : 205-911-9  
Index-No. : 601-034-00-4

#### Hazardous components

Component	Classification	Concentration
<b>Benz[e]acephenanthrylene</b>		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

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

---

### 4. FIRST AID MEASURES

#### 4.1 Description of first aid measures

##### General advice

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

##### If inhaled

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

##### In case of skin contact

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

##### In case of eye contact

Flush eyes with water as a precaution.

##### If swallowed

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

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

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

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

No data available

---

### 5. FIREFIGHTING MEASURES

#### 5.1 Extinguishing media

##### Suitable extinguishing media

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

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

No data available

**5.3 Advice for firefighters**  
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**  
No data available

---

## 6. ACCIDENTAL RELEASE MEASURES

**6.1 Personal precautions, protective equipment and emergency procedures**  
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.  
For personal protection see section 8.

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

**6.3 Methods and materials for containment and cleaning up**  
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

**6.4 Reference to other sections**  
For disposal see section 13.

---

## 7. HANDLING AND STORAGE

**7.1 Precautions for safe handling**  
Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.  
Provide appropriate exhaust ventilation at places where dust is formed.  
For precautions see section 2.2.

**7.2 Conditions for safe storage, including any incompatibilities**  
Keep container tightly closed in a dry and well-ventilated place.  
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

**7.3 Specific end use(s)**  
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**8.1 Control parameters**  
**Components with workplace control parameters**  
Contains no substances with occupational exposure limit values.

**8.2 Exposure controls**  
**Appropriate engineering controls**  
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

### Personal protective equipment

#### Eye/face protection

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

#### Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min  
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact  
Material: Nitrile rubber  
Minimum layer thickness: 0.11 mm  
Break through time: 480 min  
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

### **Body Protection**

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

### **Respiratory protection**

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

### **Control of environmental exposure**

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

---

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

- |   |   |
|---|---|
| a) Appearance                                   | Form: solid   |
| b) Odour  | No data available                                       |
| c) Odour Threshold                              | No data available                                       |
| d) pH   | No data available                                       |
| e) Melting point/freezing point                 | Melting point/range: 163 - 165 °C (325 - 329 °F) - lit. |
| f) Initial boiling point and boiling range      | No data available                                       |
| g) Flash point                                  | No data available                                       |
| h) Evaporation rate                             | No data available                                       |
| i) Flammability (solid, gas)                    | No data available                                       |
| j) Upper/lower flammability or explosive limits | No data available                                       |
| k) Vapour pressure                              | No data available                                       |
| l) Vapour density                               | No data available                                       |
| m) Relative density                             | No data available                                       |
| n) Water solubility                             | No data available                                       |
| o) Partition coefficient: n-octanol/water       | No data available                                       |
| p) Auto-ignition temperature                    | No data available                                       |
| q) Decomposition                                | No data available                                       |

temperature

- r) Viscosity No data available
- s) Explosive properties No data available
- t) Oxidizing properties No data available

## 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

TDLo Oral - Mouse - 7.57 mg/kg

Remarks: Liver:Changes in liver weight. Endocrine:Changes in thymus weight.

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

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

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[e]acephenanthrylene)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[e]acephenanthrylene)

NTP: Reasonably anticipated to be a human carcinogen (Benz[e]acephenanthrylene)  
NTP: Reasonably anticipated to be a human carcinogen (Benz[e]acephenanthrylene)  
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.  
No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**

No data available

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: Not available

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

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

---

**12. ECOLOGICAL INFORMATION**

**12.1 Toxicity**

Toxicity to daphnia and other aquatic invertebrates      Immobilization EC50 - Daphnia magna (Water flea) - > 1.024 mg/l - 24 h

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life.

---

**13. DISPOSAL CONSIDERATIONS**

**13.1 Waste treatment methods**

**Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

Not dangerous goods

### IMDG

UN number: 3077      Class: 9      Packing group: III      EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.  
(Benz[e]acephenanthrylene)  
Marine pollutant:yes

### IATA

UN number: 3077      Class: 9      Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[e]acephenanthrylene)

### Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

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

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

### SARA 311/312 Hazards

Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

### New Jersey Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

### California Prop. 65 Components

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

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-09-28

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

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-09-28

---

## 16. OTHER INFORMATION

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

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.

H400 Very toxic to aquatic life.  
H410 Very toxic to aquatic life with long lasting effects.

**HMIS Rating**

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

**NFPA Rating**

Health hazard: 2  
Fire Hazard: 0  
Reactivity Hazard: 0

**Further information**

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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 Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

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

Version: 5.6

Revision Date: 05/24/2016

Print Date: 11/13/2016

## SAFETY DATA SHEET

Version 5.7  
Revision Date 06/02/2016  
Print Date 11/14/2016

---

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

Product name : Benz[a]anthracene  
Product Number : B2209  
Brand : Aldrich  
Index-No. : 601-033-00-9  
CAS-No. : 56-55-3

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA  
Telephone : +1 800-325-5832  
Fax : +1 800-325-5052

**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

---

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

Carcinogenicity (Category 1B), H350  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

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

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

Pictogram



Signal word

Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

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

P273

Avoid release to the environment.

P281

Use personal protective equipment as required.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P391

Collect spillage.



P405  
P501

Store locked up.  
Dispose of contents/ container to an approved waste disposal plant.

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

---

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1 Substances

Synonyms : 1,2-Benzanthracene  
Tetraphene

Formula : C<sub>18</sub>H<sub>12</sub>  
Molecular weight : 228.29 g/mol  
CAS-No. : 56-55-3  
EC-No. : 200-280-6  
Index-No. : 601-033-00-9

#### Hazardous components

Component	Classification	Concentration
<b>Benz[a]anthracene</b>	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

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

---

### 4. FIRST AID MEASURES

#### 4.1 Description of first aid measures

##### General advice

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

##### If inhaled

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

##### In case of skin contact

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

##### In case of eye contact

Flush eyes with water as a precaution.

##### If swallowed

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

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

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

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

No data available

---

### 5. FIREFIGHTING MEASURES

#### 5.1 Extinguishing media

##### Suitable extinguishing media

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

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

No data available

#### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

#### 5.4 Further information

No data available

---

## 6. ACCIDENTAL RELEASE MEASURES

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

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.  
For personal protection see section 8.

### 6.2 Environmental precautions

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

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

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

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid formation of dust and aerosols.  
Provide appropriate exhaust ventilation at places where dust is formed.  
For precautions see section 2.2.

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

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

### 7.3 Specific end use(s)

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

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

#### Appropriate engineering controls

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

#### Personal protective equipment

##### Eye/face protection

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

##### Skin protection

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

##### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

##### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

### **Body Protection**

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

### **Respiratory protection**

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

### **Control of environmental exposure**

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

---

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

- |   |  |
|---|--|
| a) Appearance                                   | Form: solid                                      |
| b) Odour  | No data available                                |
| c) Odour Threshold                              | No data available                                |
| d) pH   | No data available                                |
| e) Melting point/freezing point                 | Melting point/range: 157 - 159 °C (315 - 318 °F) |
| f) Initial boiling point and boiling range      | 437.6 °C (819.7 °F)                              |
| g) Flash point                                  | No data available                                |
| h) Evaporation rate                             | No data available                                |
| i) Flammability (solid, gas)                    | No data available                                |
| j) Upper/lower flammability or explosive limits | No data available                                |
| k) Vapour pressure                              | No data available                                |
| l) Vapour density                               | No data available                                |
| m) Relative density                             | No data available                                |
| n) Water solubility                             | No data available                                |
| o) Partition coefficient: n-octanol/water       | No data available                                |
| p) Auto-ignition temperature                    | No data available                                |
| q) Decomposition temperature                    | No data available                                |
| r) Viscosity                                    | No data available                                |
| s) Explosive properties                         | No data available                                |
| t) Oxidizing properties                         | No data available                                |

### **9.2 Other safety information**

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

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

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - > 200 mg/kg

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

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

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)

NTP: Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)

NTP: Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)

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

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

**Reproductive toxicity**

No data available

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: Not available

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

---

**12. ECOLOGICAL INFORMATION****12.1 Toxicity**

No data available

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.  
Very toxic to aquatic life.

---

**13. DISPOSAL CONSIDERATIONS****13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

---

**14. TRANSPORT INFORMATION****DOT (US)**

Not dangerous goods

**IMDG**

UN number: 3077      Class: 9      Packing group: III      EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benz[a]anthracene)  
Marine pollutant:yes

**IATA**

UN number: 3077      Class: 9      Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[a]anthracene)

**Further information**

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

## 15. REGULATORY INFORMATION

### SARA 302 Components

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

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

### New Jersey Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

### California Prop. 65 Components

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

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	2007-09-28

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

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	2007-09-28

## 16. OTHER INFORMATION

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

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

### HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

### NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

### Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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 Corporation and its Affiliates shall not be held liable for any damage resulting from handling

or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

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

Version: 5.7

Revision Date: 06/02/2016

Print Date: 11/14/2016

## SAFETY DATA SHEET

Version 5.8  
Revision Date 05/27/2016  
Print Date 04/18/2017

---

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

Product name : Naphthalene

Product Number : 147141  
Brand : Aldrich  
Index-No. : 601-052-00-2

CAS-No. : 91-20-3

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

Identified uses : Laboratory chemicals, Synthesis of substances

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

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

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

**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

---

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

Flammable solids (Category 2), H228  
Acute toxicity, Oral (Category 4), H302  
Carcinogenicity (Category 2), H351  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

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

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

Pictogram



Signal word

Warning

Hazard statement(s)

H228 Flammable solid.  
H302 Harmful if swallowed.  
H351 Suspected of causing cancer.  
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.  
P202 Do not handle until all safety precautions have been read and understood.



P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Formula	: C <sub>10</sub> H <sub>8</sub>
Molecular weight	: 128.17 g/mol
CAS-No.	: 91-20-3
EC-No.	: 202-049-5
Index-No.	: 601-052-00-2

#### Hazardous components

Component	Classification	Concentration
<b>Naphthalene</b>	Flam. Sol. 2; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H228, H302, H351, H410	<= 100 %

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

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice

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

#### If inhaled

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

#### In case of skin contact

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

#### In case of eye contact

Flush eyes with water as a precaution.

#### If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

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

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

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

No data available

---

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

#### Suitable extinguishing media

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

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

No data available

### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information

Use water spray to cool unopened containers.

---

## 6. ACCIDENTAL RELEASE MEASURES

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

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

For personal protection see section 8.

### 6.2 Environmental precautions

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

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

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

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

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

Storage class (TRGS 510): Flammable solid hazardous materials

### 7.3 Specific end use(s)

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

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Naphthalene	91-20-3	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Hemolytic anemia Upper Respiratory Tract irritation Cataract Confirmed animal carcinogen with unknown relevance to humans		

		Danger of cutaneous absorption		
		TWA	10.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Hematologic effects Upper Respiratory Tract irritation Eye irritation Eye damage Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		STEL	15.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Hematologic effects Upper Respiratory Tract irritation Eye irritation Eye damage Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	10.000000 ppm 50.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	10.000000 ppm 50.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	15.000000 ppm 75.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	10 ppm 50 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	15 ppm 75 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	10 ppm 50 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	10 ppm 50 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	15 ppm 75 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		PEL	0.1 ppm 0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

**Biological occupational exposure limits**

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Naphthalene	91-20-3	1-Naphthol + 2-Naphthol			ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

## 8.2 Exposure controls

### Appropriate engineering controls

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

### Personal protective equipment

#### Eye/face protection

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

#### Skin protection

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

#### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

#### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### Body Protection

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

#### Respiratory protection

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

#### Control of environmental exposure

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

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

- |  |   |
|--|---|
| a) Appearance                              | Form: flakes, granules<br>Colour: white               |
| b) Odour                                   | aromatic  |
| c) Odour Threshold                         | No data available                                     |
| d) pH                                      | No data available                                     |
| e) Melting point/freezing point            | Melting point/range: 80 - 82 °C (176 - 180 °F) - lit. |
| f) Initial boiling point and boiling range | 218 °C (424 °F) - lit.                                |

g) Flash point	80.0 °C (176.0 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 5.9 %(V) Lower explosion limit: 0.9 %(V)
k) Vapour pressure	1.3 hPa (1.0 mmHg) at 53.0 °C (127.4 °F) 0.04 hPa (0.03 mmHg) at 25.0 °C (77.0 °F)
l) Vapour density	No data available
m) Relative density	1.085 g/cm <sup>3</sup> at 24.7 °C (76.5 °F)
n) Water solubility	0.0308 g/l at 25 °C (77 °F) - OECD Test Guideline 105 - slightly soluble
o) Partition coefficient: n-octanol/water	log Pow: 3.4 at 25 °C (77 °F)
p) Auto-ignition temperature	526.0 °C (978.8 °F)
q) Decomposition temperature	No data available
r) Viscosity	1.05 mm <sup>2</sup> /s at 81.5 °C (178.7 °F) -
s) Explosive properties	No data available
t) Oxidizing properties	No data available

## 9.2 Other safety information

Surface tension	31.8 mN/m at 100.0 °C (212.0 °F)
-----------------	----------------------------------

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

Heat, flames and sparks.

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - 490.0 mg/kg

LC50 Inhalation - Rat - male and female - 4 h - > 0.4 mg/l  
(OECD Test Guideline 403)

LD50 Dermal - Rabbit - 20,000 mg/kg

No data available

**Skin corrosion/irritation**

Skin - Rabbit

Result: No skin irritation - 24 h

**Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Mild eye irritation

**Respiratory or skin sensitisation**

Maximisation Test - Guinea pig

Result: Does not cause skin sensitisation.

(OECD Test Guideline 406)

**Germ cell mutagenicity**

Ames test

S. typhimurium

Result: negative

Rat - male

Result: negative

**Carcinogenicity**

Carcinogenicity - Rat - male and female - inhalation (vapour)

Tumorigenic: Tumors at site of application.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Naphthalene)

NTP: Reasonably anticipated to be a human carcinogen (Naphthalene)

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

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

Repeated dose toxicity Rat - male and female - Oral - NOAEL : 100 mg/kg - LOAEL : 400 mg/kg - OECD Test Guideline 408

RTECS: QJ0525000

Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer., Naphthalene is retinotoxic and systemic absorption of its vapors above 15ppm, may result in: cataracts, optic neuritis, corneal injury, Eye irritation, Ingestion may provoke the following symptoms: hemolytic anemia, hemoglobinuria, Nausea, Headache, Vomiting, Gastrointestinal disturbance, Convulsions, anemia, Kidney injury may occur., Seizures., Coma.

Heart -

---

**12. ECOLOGICAL INFORMATION****12.1 Toxicity**

Toxicity to fish flow-through test LC50 - Pimephales promelas (fathead minnow) - 7.9 mg/l - 96 h (OECD Test Guideline 203)

Toxicity to daphnia and other aquatic static test EC50 - Daphnia magna (Water flea) - 2.16 mg/l - 48 h

invertebrates

## 12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d  
Result: 2 % - Not readily biodegradable.

## 12.3 Bioaccumulative potential

Bioaccumulation Fish

Bioconcentration factor (BCF): 427 - 1,158

## 12.4 Mobility in soil

No data available

## 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## 12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.  
Very toxic to aquatic life with long lasting effects.

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

#### Contaminated packaging

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

UN number: 1334 Class: 4.1 Packing group: III  
Proper shipping name: Naphthalene, crude  
Reportable Quantity (RQ): 100 lbs  
Marine pollutant: yes  
Poison Inhalation Hazard: No

### IMDG

UN number: 1334 Class: 4.1 Packing group: III EMS-No: F-A, S-G  
Proper shipping name: NAPHTHALENE, CRUDE  
Marine pollutant: yes Marine pollutant: yes

### IATA

UN number: 1334 Class: 4.1 Packing group: III  
Proper shipping name: Naphthalene, crude

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

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

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

### SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

## Pennsylvania Right To Know Components

Naphthalene	CAS-No. 91-20-3	Revision Date 2007-07-01
-------------	--------------------	-----------------------------

## New Jersey Right To Know Components

Naphthalene	CAS-No. 91-20-3	Revision Date 2007-07-01
-------------	--------------------	-----------------------------

## California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer. Naphthalene	CAS-No. 91-20-3	Revision Date 1990-01-01
--	--------------------	-----------------------------

---

## 16. OTHER INFORMATION

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

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Flam. Sol.	Flammable solids
H228	Flammable solid.
H302	Harmful if swallowed.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

### HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	2
Physical Hazard	2

### NFPA Rating

Health hazard:	2
Fire Hazard:	2
Reactivity Hazard:	2

### Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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 Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

### Preparation Information

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

Version: 5.8

Revision Date: 05/27/2016

Print Date: 04/18/2017



# PCBs

**SAFETY DATA SHEET**

**1. SUBSTANCE AND SOURCE IDENTIFICATION**

**Product Identifier**

**SRM Number:** 3090  
**SRM Name:** Aroclors in Transformer Oil  
**Other Means of Identification:** Not Applicable.

**Recommended Use of This Material and Restrictions of Use**

This Standard Reference Material (SRM) is a set of six different solutions of individual Aroclors in transformer oil and consists of six 2-mL ampoules, each containing approximately 1.2 mL of each of the following SRMs: SRM 3075, Aroclor 1016 in Transformer Oil; SRM 3076, Aroclor 1232 in Transformer Oil; SRM 3077, Aroclor 1242 in Transformer Oil; SRM 3078, Aroclor 1248 in Transformer Oil; SRM 3079, Aroclor 1254 in Transformer Oil; and SRM 3080; Aroclor 1260 in Transformer Oil. This SRM is intended primarily for calibrating chromatographic instrumentation and methods of analysis used for the determination of Aroclors and polychlorinated biphenyls (PCBs) in transformer oil.

**Company Information**

National Institute of Standards and Technology  
 Standard Reference Materials Program  
 100 Bureau Drive, Stop 2300  
 Gaithersburg, Maryland 20899-2300

Telephone: 301-975-2200  
 FAX: 301-948-3730  
 E-mail: SRMMSDS@nist.gov  
 Website: <http://www.nist.gov/srm>

Emergency Telephone ChemTrec:  
 1-800-424-9300 (North America)  
 +1-703-527-3887 (International)

**2. HAZARDS IDENTIFICATION**

**Classification**

**Physical Hazard:** Not classified.  
**Health Hazard:** Carcinogenicity Category 1B  
 Reproductive Toxicity Category 2  
 Aspiration Hazard Category 1

**Label Elements**

**Symbol**



**Signal Word**

DANGER

**Hazard Statement(s)**

H304 May be fatal if swallowed and enters airways.  
 H350 May cause cancer <inhalation, ingestion>.  
 H361 Suspected of damaging fertility or the unborn child.

**Precautionary Statement(s):**

P201 Obtain special instructions before use.  
 P202 Do not handle until all safety precautions have been read and understood.  
 P280 Wear protective gloves, protective clothing, and eye protection.

P308+P313 If exposed or concerned: Get medical attention.

P301+P310 If swallowed: Immediately call a doctor.

- P331 Do NOT induce vomiting.  
P405 Store locked up.  
P501 Dispose of contents and container according to local regulations.

**Hazards Not Otherwise Classified:** Not applicable.

**Ingredients(s) with Unknown Acute Toxicity:** Not applicable.

---

### 3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

---

**Substance:** Aroclor 1260 in transformer oil.

**Other Designations:**

Transformer oil (hydrotreated light naphthenic distillate (petroleum), hydraulic petroleum oil, distillates, petroleum).

Aroclor 1232: PCB 1232; chlorodiphenyl (32 % Cl); polychlorinated biphenyl; chlorobiphenyls; PCB; PCBs.

Aroclor 1242: PCB 1242; chlorodiphenyl (42 % Cl); polychlorinated biphenyl; chlorobiphenyls; PCB; PCBs.

Aroclor 1248: PCB 1248; chlorodiphenyl (48 % Cl); polychlorinated biphenyl; chlorobiphenyls; PCB; PCBs.

Aroclor 1254: PCB 1254; chlorodiphenyl (54 % Cl); polychlorinated biphenyl; chlorobiphenyls; PCB; PCBs.

Aroclor 1260: PCB 1260; chlorodiphenyl (60 % Cl); polychlorinated biphenyl; chlorobiphenyls; PCB; PCBs.

Components are listed in compliance with OSHA 29 CFR 1910.1200.

Hazardous Component(s)	CAS Number	EC Number <sup>(a)</sup> (EINECS)	Nominal Mass Concentration (%)
<b>SRM 3075</b>			
Transformer Oil	64742-53-6	265-156-6	>99.99
<b>SRM 3076</b>			
Transformer Oil	64742-53-6	265-156-6	balance
Aroclor 1232	11141-16-5	215-648-1	0.43
<b>SRM 3077</b>			
Transformer Oil	64742-53-6	265-156-6	balance
Aroclor 1242	53469-21-9	215-648-1	0.41
<b>SRM 3078</b>			
Transformer Oil	64742-53-6	265-156-6	balance
Aroclor 1248	12672-29-6	215-648-1	0.37
<b>SRM 3079</b>			
Transformer Oil	64742-53-6	265-156-6	balance
Aroclor 1254	11097-69-1	215-648-1	0.36
<b>SRM 3080</b>			
Transformer Oil	64742-53-6	265-156-6	balance
Aroclor 1260	11096-82-5	215-648-1	0.11

<sup>(a)</sup> EC Number as PCB, polychlorinated biphenyl

---

### 4. FIRST AID MEASURES

---

**Description of First Aid Measures:**

**Inhalation:** If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

**Skin Contact:** Wash exposed skin with soap and water for at least 15 minutes. Seek medical attention if needed.

**Eye Contact:** Immediately flush eyes, including under the eyelids with copious amounts of water for at least 15 minutes. Seek immediate medical attention.

**Ingestion:** Aspiration hazard. Do not induce vomiting. If vomiting occurs, keep head lower than hips to prevent aspiration. If not breathing, give artificial respiration by qualified personnel. Seek immediate medical attention.

**Most Important Symptoms/Effects, Acute and Delayed:** Irritation, dizziness, nausea, coughing, and aspiration.

**Indication of any immediate medical attention and special treatment needed, if necessary:** Not applicable.

---

## 5. FIRE FIGHTING MEASURES

---

**Fire and Explosion Hazards:** Slight fire hazard. See Section 9, “Physical and Chemical Properties” for flammability properties.

**Extinguishing Media:**

Suitable: Regular dry chemical, carbon dioxide, regular foam.

Unsuitable: Straight streams of water.

**Specific Hazards Arising from the Chemical:** None listed.

**Special Protective Equipment and Precautions for Fire-Fighters:** Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

**NFPA Ratings** (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 2

Fire = 1

Reactivity = 0

---

## 6. ACCIDENTAL RELEASE MEASURES

---

**Personal Precautions, Protective Equipment and Emergency Procedures:** Use suitable protective equipment; see Section 8, “Exposure Controls and Personal Protection”.

**Methods and Materials for Containment and Clean up:** Absorb spilled material with sand or non-combustible material and collect in appropriate container for disposal. Keep out of water supplies and sewers.

---

## 7. HANDLING AND STORAGE

---

**Safe Handling Precautions:** See Section 8, “Exposure Controls and Personal Protection”.

**Storage:** Store and handle in accordance with all current regulations and standards. The storage floor must be impermeable and form a collecting basin so that, in the event of an accident spillage, the liquid cannot spread beyond the storage area.

---

## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

---

**Exposure Limits:**

Transformer oil: No occupational exposure limits established.

Aroclors: NIOSH (TWA): 0.001 mg/m<sup>3</sup> (related to 1,1'-Biphenyl, chloro derivatives)

**Engineering Controls:** Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

**Personal Protection Measures:** In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

**Respiratory Protection:** If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

**Eye/Face Protection:** Wear splash resistant safety goggles with a face shield. An eye wash station should be readily available near areas of use.

**Skin and Body Protection:** Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

---

### Descriptive Properties

<b>Appearance (physical state, color, etc.):</b>	<b>Transformer oil (&gt;99 %)</b> clear, yellow liquid
<b>Molecular Formula:</b>	not applicable
<b>Molar Mass (g/mol):</b>	not applicable
<b>Odor:</b>	not available
<b>Odor threshold:</b>	not available
<b>pH:</b>	not available
<b>Evaporation rate:</b>	not available
<b>Melting point/freezing point:</b>	-55 °C (-67 °F)
<b>Pour point:</b>	-40 °C (-40 °F)
<b>Density:</b>	0.8912 g/mL at 22 °C <sup>(b)</sup>
<b>Vapor Pressure:</b>	0.1 mmHg 20 °C <sup>(a)</sup>
<b>Vapor Density (air = 1):</b>	>5 at 101 kPa <sup>(a)</sup>
<b>Kinematic Viscosity:</b>	12 cSt (12 mm <sup>2</sup> /s) at 40 °C
<b>Solubility(ies):</b>	insoluble in water
<b>Partition coefficient (n-octanol/water):</b>	>6.5 <sup>(a)</sup>

### Thermal Stability Properties

<b>Autoignition Temperature:</b>	>315 °C (599 °F) <sup>(a)</sup>
<b>Thermal Decomposition:</b>	not available
<b>Initial boiling point and boiling range:</b>	260 °C to 371 °C (500 °F to 700 °F)
<b>Explosive Limits, LEL:</b>	not available
<b>Explosive Limits, UEL:</b>	not available
<b>Flash Point:</b>	>145 °C (293 °F) <sup>(a)</sup>
<b>Flammability (solid, gas):</b>	not applicable

<sup>(a)</sup> Physical property listed in the NIST Certificate of Analysis. Values are not certified.

<sup>(b)</sup> Vendor supplied health and safety information.

---

## 10. STABILITY AND REACTIVITY

---

**Reactivity:** Stable at normal temperatures and pressure.

**Stability:**  X  Stable   Unstable

**Possible Hazardous Reactions:** None listed.

**Conditions to Avoid:** Avoid excessive heat; high energy ignition sources.

**Incompatible Materials:** Oxidizers.

**Fire/Explosion Information:** See Section 5, "Fire Fighting Measures".

**Hazardous Decomposition:** Oxides of carbon, sulfur oxides, aldehydes.

**Hazardous Polymerization:**   Will Occur  X  Will Not Occur

---

## 11. TOXICOLOGICAL INFORMATION

---

**Route of Exposure:**  X  Inhalation  X  Skin  X  Ingestion

**Symptoms Related to the Physical, Chemical and Toxicological Characteristics:** Dizziness, nausea, coughing.

**Potential Health Effects (Acute, Chronic and Delayed):**

**Inhalation:** Acute exposure to high levels of vapor from transformer oil may cause central nervous system depression, headache, dizziness, nausea, vomiting, anorexia, incoordination and unconsciousness. Prolonged or repeated exposure may cause irritation. Short term exposure to Aroclors may cause irritation or liver damage; long term exposure may cause rash, itching, hair loss, digestive issues, headache, dizziness, impotence, coma, and cancer.

**Skin Contact:** Short term and long term contact with transformer oil may cause skin irritation and dermatitis. Short-term exposure to Aroclors may cause skin irritation or liver damage; long term exposure to Aroclors may cause same effects as for inhalation, plus hair loss and reproductive effects.

**Eye Contact:** Acute exposure of liquid or vapor may cause irritation.

**Ingestion:** Acute ingestion of transformer oil may cause abdominal pain, nausea, and vomiting. Small amounts of oil aspirated during ingestion or vomiting may cause lung damage; no information available for long-term exposure to transformer oil. Short term exposure to Aroclors may cause liver damage; long term exposure to Aroclors may cause same effects as for inhalation, plus hyperactivity, menstrual disorders, reproductive effects.

**Numerical Measures of Toxicity:**

**Acute Toxicity:** Not classified.

**Component:** Transformer oil

Rat, Oral LD50: >5000 mg/kg

Rat, Inhalation LC50: 2180 mg/m<sup>3</sup> (4 h)

Rabbit, Skin LD50: >2000 mg/kg

**Component:** Aroclor 1232

Rat, Oral LD50: 4470 mg/kg

**Component:** Aroclor 1242

Rat, Oral LD50: 4250 mg/kg

**Component:** Aroclor 1248

Rat, Oral LD50: 11000 mg/kg

**Component:** Aroclor 1254

Rat, Oral LD50: 1010 mg/kg

**Component:** Aroclor 1260

Rat, Oral LD50: 1315 mg/kg

**Skin Corrosion/Irritation:** Not classified.

Transformer oil, Rabbit, skin: 0.5 mL/24 h, moderate

**Serious Eye Damage/ Eye Irritation:** Not classified.

Transformer oil, Rabbit, eye: 0.1 mL, mild

**Respiratory Sensitization:** No data available; not classified.

**Skin Sensitization:** No data available; not classified.

**Germ Cell Mutagenicity:** No data available; not classified.

**Carcinogenicity:** Category 1B

**Listed as a Carcinogen/Potential Carcinogen**  Yes  No

Transformer oil is not listed by NTP, IARC, or OSHA as a carcinogen/potential carcinogen.

Aroclors are listed by NTP as *reasonably anticipated to be a human carcinogen* (as PCB, polychlorinated biphenyl, CAS number 1336-36-3) and by IARC as Group 1, *carcinogenic to humans* (related to Polychlorinated biphenyls).

**Reproductive Toxicity:** Category 2

Aroclors: Overexposure has resulted in decreased birth weight in offspring of exposed mothers. Significant exposure to PCBs that reach the fetus can cause teratogenic effects.

**Component:** Aroclor 1232

Oral Rat TDLo: 420 mg/kg TDLo (21 days)

**Component:** Aroclor 1242

Oral Rat TDLo: 945 mg/kg TDLo (prior to copulation, 36 week)

**Component:** Aroclor 1248

Monkey, Oral TDLo: 32 mg/kg (pregnant 1-23 week, 91 days)

**Component:** Aroclor 1254

Oral Mammal TDLo - species unspecified: 14 mg/kg, prior to copulation 30 day(s)

**Component:** Aroclor 1260

Oral Rat TDLo: 210 mg/kg, pregnant 14-20 days

**STOT, Single Exposure:** No data available; not classified.

**STOT, Repeated Exposure:** Not classified; this SRM contains less than 1 % of Aroclor, a Category 2 target organ toxicant.

**Aspiration Hazard:** Category 1

Transformer oil is a human aspiration toxicity hazard.

---

## 12. ECOLOGICAL INFORMATION

---

### Ecotoxicity Data:

Transformer oil: Fish, Rainbow Trout (*Oncorhynchus mykiss*) LC50: >5000 mg/L (96 h)  
Invertebrate, Water flea (*Daphnia magna*) EC50: >1000 mg/L (48 h)  
Aroclor 1232: No data available.  
Aroclor 1242: Fish, Fathead minnow (*Pimephales promelas*) LC50 (flow-through, newly hatched): 0.015 mg/L (96 h)  
Aroclor 1248: No data available.  
Aroclor 1254: No data available.  
Aroclor 1260: No data available.

**Persistence and Degradability:** Has the potential to biodegradable.

**Bioaccumulative Potential:** No data available

**Mobility in Soil:** Expected to migrate from land to water and vice versa.

**Other Adverse effects:** Keep out of water supplies.

---

## 13. DISPOSAL CONSIDERATIONS

---

**Waste Disposal:** Dispose of waste in accordance with all applicable federal, state, and local regulations.

---

## 14. TRANSPORTATION INFORMATION

---

**U.S. DOT and IATA:** This material is not regulated by IATA or DOT.

---

## 15. REGULATORY INFORMATION

---

### U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): Aroclors 1 lb. (0.454 kg) final RQ.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Aroclors, 0.1 % supplier notification limit (related or polychlorinated biphenyls).

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	Yes.
CHRONIC HEALTH:	Yes.
FIRE:	No.
REACTIVE:	No.
PRESSURE:	No.

**State Regulations:**

California Proposition 65:

WARNING! This product contains a chemical (Aroclors 1232, 1242, 1248, 1254 and 1260, related to PCBs) known to the state of California to cause cancer, reproductive, and/or developmental effects.

**U.S. TSCA Inventory:** Transformer oil is listed.

**TSCA 12(b), Export Notification:** Aroclors 1232, 1242, 1248, 1254 and 1260 is listed in Section 6, 50 ppm de minimus concentration (see 40 CFR 761, related to polychlorinated biphenyls).

**Canadian Regulations:**

WHMIS Information: Not provided for this material.

**16. OTHER INFORMATION**

**Issue Date:** 27 May 2015

**Sources:** ChemADVISOR, Inc., SDS, *Aroclor 1232*, 20 March 2015  
 ChemADVISOR, Inc., SDS, *Aroclor 1242*, 20 March 2015  
 ChemADVISOR, Inc., SDS, *Aroclor 1248*, 20 March 2015  
 ChemADVISOR, Inc., SDS, *Aroclor 1254*, 20 March 2015  
 ChemADVISOR, Inc., SDS, *Aroclor 1260*, 20 March 2015.  
 ChemADVISOR, Inc., SDS, *Transformer Oil*, 20 March 2015.  
 Vendor MSDS, Exxon Mobile Corporation, UNIVOLT N 61 B, 30 May 2014.

**Key of Acronyms:**

ACGIH	American Conference of Governmental Industrial Hygienists	NRC	Nuclear Regulatory Commission
ALI	Annual Limit on Intake	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transportation Agency	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	RM	Reference Material
LC50	Lethal Concentration	STEL	Short Term Exposure Limit
LD50	Median Lethal Dose or Lethal Dose, 50 %	STOT	Specific Target Organ Toxicity
LEL	Lower Explosive Limit	TLV	Threshold Limit Value
MSDS	Material Safety Data Sheet	TPQ	Threshold Planning Quantity
NFPA	National Fire Protection Association	TSCA	Toxic Substances Control Act
NIOSH	National Institute for Occupational Safety and Health	TWA	Time Weighted Average
NIST	National Institute of Standards and Technology	UEL	Upper Explosive Limit
		WHMIS	Workplace Hazardous Materials Information System

**Disclaimer:** Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate of Analysis.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <http://www.nist.gov/srm>.



# Pesticides

# Chlordane

## SAFETY DATA SHEET

## 1. Identification

<b>Product identifier</b>	<b>Chlordane</b>	
<b>Other means of identification</b>		
<b>Item</b>	N-11425	
<b>Recommended use</b>	For Laboratory Use Only	
<b>Recommended restrictions</b>	None known.	
<b>Manufacturer/Importer/Supplier/Distributor information</b>		
<b>Manufacturer</b>		
<b>Company name</b>	Chem Service, Inc.	
<b>Address</b>	660 Tower Lane West Chester, PA 19380 United States	
<b>Telephone</b>	Toll Free	800-452-9994
	Direct	610-692-3026
<b>Website</b>	www.chemservice.com	
<b>E-mail</b>	info@chemservice.com	
<b>Emergency phone number</b>	Chemtrec US	800-424-9300
	Chemtrec outside US	+1 703-527-3887

## 2. Hazard(s) identification

<b>Physical hazards</b>	Not classified.	
<b>Health hazards</b>	Acute toxicity, oral	Category 3
	Acute toxicity, dermal	Category 3
	Acute toxicity, inhalation	Category 1
	Carcinogenicity	Category 2
	Reproductive toxicity	Category 2
<b>Environmental hazards</b>	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 1
<b>OSHA defined hazards</b>	Not classified.	
<b>Label elements</b>		



<b>Signal word</b>	Danger
<b>Hazard statement</b>	Toxic if swallowed. Toxic in contact with skin. Fatal if inhaled. Suspected of causing cancer. Suspected of damaging fertility or the unborn child. Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.
<b>Precautionary statement</b>	
<b>Prevention</b>	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area. Do not breathe vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. Wear respiratory protection.
<b>Response</b>	If swallowed: Immediately call a poison center/doctor. If on skin: Wash with plenty of water. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center/doctor. Specific treatment is urgent (see this label). Rinse mouth. Take off immediately all contaminated clothing and wash it before reuse. Collect spillage.
<b>Storage</b>	Store in a well-ventilated place. Keep container tightly closed. Store locked up.

<b>Disposal</b>	Dispose of contents/container in accordance with local/regional/national/international regulations.
<b>Hazard(s) not otherwise classified (HNOC)</b>	None known.
<b>Supplemental information</b>	Not applicable.

### 3. Composition/information on ingredients

#### Substances

Chemical name	Common name and synonyms	CAS number	%
Chlordane		57-74-9	100

### 4. First-aid measures

<b>Inhalation</b>	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a physician or poison control center immediately.
<b>Skin contact</b>	Take off immediately all contaminated clothing. Wash off with soap and plenty of water. Call a POISON CENTER or doctor/physician if you feel unwell.
<b>Eye contact</b>	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.
<b>Ingestion</b>	Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
<b>Most important symptoms/effects, acute and delayed</b>	Direct contact with eyes may cause temporary irritation.
<b>Indication of immediate medical attention and special treatment needed</b>	Provide general supportive measures and treat symptomatically. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
<b>General information</b>	Take off immediately all contaminated clothing. IF exposed or concerned: Get medical advice/attention. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

### 5. Fire-fighting measures

<b>Suitable extinguishing media</b>	Alcohol resistant foam. Water fog. Dry chemical powder. Carbon dioxide (CO <sub>2</sub> ).
<b>Unsuitable extinguishing media</b>	Do not use water jet as an extinguisher, as this will spread the fire.
<b>Specific hazards arising from the chemical</b>	During fire, gases hazardous to health may be formed.
<b>Special protective equipment and precautions for firefighters</b>	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
<b>Fire fighting equipment/instructions</b>	Move containers from fire area if you can do so without risk.
<b>Specific methods</b>	Use standard firefighting procedures and consider the hazards of other involved materials.
<b>General fire hazards</b>	No unusual fire or explosion hazards noted.

### 6. Accidental release measures

<b>Personal precautions, protective equipment and emergency procedures</b>	Immediately evacuate personnel to safe areas. Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Do not breathe vapor. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
--	---

**Methods and materials for containment and cleaning up** This material is classified as a water pollutant under the Clean Water Act and should be prevented from contaminating soil or from entering sewage and drainage systems which lead to waterways.

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

**Environmental precautions** Avoid release to the environment. Contact local authorities in case of spillage to drain/aquatic environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

## 7. Handling and storage

**Precautions for safe handling** Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe vapor. Do not taste or swallow. Avoid contact with skin. Avoid contact with eyes. Avoid contact during pregnancy/while nursing. Avoid prolonged exposure. Avoid contact with clothing. Use only outdoors or in a well-ventilated area. Wear appropriate personal protective equipment. Observe good industrial hygiene practices. When using, do not eat, drink or smoke. Wash hands thoroughly after handling. Wash contaminated clothing before reuse. Avoid release to the environment. Do not empty into drains.

**Conditions for safe storage, including any incompatibilities** Store locked up. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

## 8. Exposure controls/personal protection

### Occupational exposure limits

#### US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Material	Type	Value
Chlordane (CAS 57-74-9)	PEL	0.5 mg/m3

#### US. ACGIH Threshold Limit Values

Material	Type	Value
Chlordane (CAS 57-74-9)	TWA	0.5 mg/m3

#### US. NIOSH: Pocket Guide to Chemical Hazards

Material	Type	Value
Chlordane (CAS 57-74-9)	TWA	0.5 mg/m3

**Biological limit values** No biological exposure limits noted for the ingredient(s).

### Exposure guidelines

#### US - California OELs: Skin designation

Chlordane (CAS 57-74-9) Can be absorbed through the skin.

#### US - Minnesota Haz Subs: Skin designation applies

Chlordane (CAS 57-74-9) Skin designation applies.

#### US - Tennessee OELs: Skin designation

Chlordane (CAS 57-74-9) Can be absorbed through the skin.

#### US ACGIH Threshold Limit Values: Skin designation

Chlordane (CAS 57-74-9) Can be absorbed through the skin.

#### US NIOSH Pocket Guide to Chemical Hazards: Skin designation

Chlordane (CAS 57-74-9) Can be absorbed through the skin.

#### US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Chlordane (CAS 57-74-9) Can be absorbed through the skin.

**Appropriate engineering controls** Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

### Individual protection measures, such as personal protective equipment

**Eye/face protection** Wear eye/face protection. Wear safety glasses with side shields (or goggles).

#### Skin protection

**Hand protection** Wear protective gloves.

<b>Other</b>	Wear appropriate chemical resistant clothing.
<b>Respiratory protection</b>	Wear positive pressure self-contained breathing apparatus (SCBA).
<b>Thermal hazards</b>	Wear appropriate thermal protective clothing, when necessary.
<b>General hygiene considerations</b>	When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

## 9. Physical and chemical properties

### Appearance

<b>Physical state</b>	Liquid.
<b>Form</b>	Liquid
<b>Color</b>	Amber
<b>Odor</b>	Not available.
<b>Odor threshold</b>	Not available.
<b>pH</b>	Not available.
<b>Melting point/freezing point</b>	219.2 - 221 °F (104 - 105 °C) trans isomer 222.8 - 224.6 °F (106 - 107 °C) cis isomer
<b>Initial boiling point and boiling range</b>	347 °F (175 °C) 0.133322 kPa
<b>Flash point</b>	Not available.
<b>Evaporation rate</b>	Not available.
<b>Flammability (solid, gas)</b>	Not available.
<b>Upper/lower flammability or explosive limits</b>	
<b>Flammability limit - lower (%)</b>	Not available.
<b>Flammability limit - upper (%)</b>	Not available.
<b>Explosive limit - lower (%)</b>	Not available.
<b>Explosive limit - upper (%)</b>	Not available.
<b>Vapor pressure</b>	0.000001 kPa at 25 °C
<b>Vapor density</b>	14
<b>Relative density</b>	Not available.
<b>Solubility(ies)</b>	
<b>Solubility (water)</b>	0.001 g/l
<b>Partition coefficient (n-octanol/water)</b>	5.16
<b>Auto-ignition temperature</b>	Not available.
<b>Decomposition temperature</b>	Not available.
<b>Viscosity</b>	Not available.
<b>Other information</b>	
<b>Density</b>	1.5898 g/cm3 estimated
<b>Molecular formula</b>	C10-H6-Cl8
<b>Molecular weight</b>	409.8 g/mol
<b>Specific gravity</b>	1.59 - 1.63 at 25 °C

## 10. Stability and reactivity

<b>Reactivity</b>	The product is stable and non-reactive under normal conditions of use, storage and transport.
<b>Chemical stability</b>	Material is stable under normal conditions.
<b>Possibility of hazardous reactions</b>	Hazardous polymerization does not occur.
<b>Conditions to avoid</b>	Contact with incompatible materials.
<b>Incompatible materials</b>	Strong oxidizing agents.

**Hazardous decomposition products** No hazardous decomposition products are known.

## 11. Toxicological information

### Information on likely routes of exposure

**Inhalation** Fatal if inhaled.  
**Skin contact** Toxic in contact with skin.  
**Eye contact** Direct contact with eyes may cause temporary irritation.  
**Ingestion** Toxic if swallowed.

**Symptoms related to the physical, chemical and toxicological characteristics** Direct contact with eyes may cause temporary irritation.

### Information on toxicological effects

**Acute toxicity** Fatal if inhaled. Toxic if swallowed. Toxic in contact with skin.

Product	Species	Test Results
Chlordane (CAS 57-74-9)		
<b>Acute</b>		
<b>Dermal</b>		
LD50	Rat	590 - 840 mg/kg
<b>Inhalation</b>		
LC50	Cat	0.1 mg/l, 4 Hours
<b>Oral</b>		
LD50	Mouse	430 mg/kg
	Rabbit	300 mg/kg
	Rat	590 mg/kg
TD	Rat	25 mg/kg
<b>Other</b>		
LD50	Rat	343 mg/kg

\* Estimates for product may be based on additional component data not shown.

**Skin corrosion/irritation** Prolonged skin contact may cause temporary irritation.

**Serious eye damage/eye irritation** Direct contact with eyes may cause temporary irritation.

### Respiratory or skin sensitization

**Respiratory sensitization** Not available.

**Skin sensitization** This product is not expected to cause skin sensitization.

**Germ cell mutagenicity** No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

**Carcinogenicity** Suspected of causing cancer.

### IARC Monographs. Overall Evaluation of Carcinogenicity

Chlordane (CAS 57-74-9) 2B Possibly carcinogenic to humans.

### US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

**Reproductive toxicity** Suspected of damaging fertility or the unborn child.

**Specific target organ toxicity - single exposure** Not classified.

**Specific target organ toxicity - repeated exposure** Not classified.

**Aspiration hazard** Not available.

**Chronic effects** Prolonged inhalation may be harmful. Prolonged exposure may cause chronic effects.

## 12. Ecological information

**Ecotoxicity** Very toxic to aquatic life with long lasting effects. Accumulation in aquatic organisms is expected.

Product	Species		Test Results
Chlordane (CAS 57-74-9)			
<b>Aquatic</b>			
Crustacea	EC50	Water flea (Simocephalus serrulatus)	0.012 - 0.032 mg/l, 48 hours
Fish	LC50	Rainbow trout, donaldson trout (Oncorhynchus mykiss)	0.0048 - 0.0172 mg/l, 96 hours

\* Estimates for product may be based on additional component data not shown.

**Persistence and degradability** No data is available on the degradability of this product.

**Bioaccumulative potential** Not available.

**Partition coefficient n-octanol / water (log Kow)**  
5.16

**Mobility in soil** No data available.

**Other adverse effects** No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

### 13. Disposal considerations

**Disposal instructions** Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.

**Local disposal regulations** Dispose in accordance with all applicable regulations.

**Hazardous waste code** The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

#### US RCRA Hazardous Waste U List: Reference

Chlordane (CAS 57-74-9) U036

**Waste from residues / unused products** Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

**Contaminated packaging** Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

### 14. Transport information

#### DOT

**UN number** UN2810  
**UN proper shipping name** Toxic, liquids, organic, n.o.s. (Chlordane RQ = 1 LBS), MARINE POLLUTANT  
**Transport hazard class(es)**  
**Class** 6.1(PGIII)  
**Subsidiary risk** -  
**Label(s)** 6.1  
**Packing group** III  
**Environmental hazards**  
**Marine pollutant** Yes  
**Special precautions for user** Read safety instructions, SDS and emergency procedures before handling.  
**Special provisions** IB3, T7, TP1, TP28  
**Packaging exceptions** 153  
**Packaging non bulk** 203  
**Packaging bulk** 241

#### IATA

**UN number** UN2810  
**UN proper shipping name** Toxic liquid, organic, n.o.s. (Chlordane)  
**Transport hazard class(es)**  
**Class** 6.1(PGIII)  
**Subsidiary risk** -  
**Packing group** III  
**Environmental hazards** No.  
**ERG Code** 6L



**Special precautions for user** Read safety instructions, SDS and emergency procedures before handling.

**Other information**

**Passenger and cargo aircraft** Allowed.

**Cargo aircraft only** Allowed.

**IMDG**

**UN number** UN2810

**UN proper shipping name** TOXIC LIQUID, ORGANIC, N.O.S. (Chlordane), MARINE POLLUTANT

**Transport hazard class(es)**

**Class** 6.1(PGIII)

**Subsidiary risk** -

**Packing group** III

**Environmental hazards**

**Marine pollutant** Yes

**EmS** F-A, S-A

**Special precautions for user** Read safety instructions, SDS and emergency procedures before handling.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** Not available.

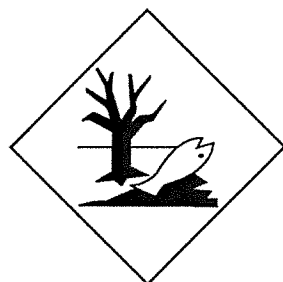
**DOT**



**IATA; IMDG**



**Marine pollutant**



**General information**

DOT Regulated Marine Pollutant. IMDG Regulated Marine Pollutant.

**15. Regulatory information**

**US federal regulations**

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

One or more components are not listed on TSCA.

**TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**

Not regulated.

**CERCLA Hazardous Substance List (40 CFR 302.4)**

Chlordane (CAS 57-74-9) Listed.

**SARA 304 Emergency release notification**

Chlordane (CAS 57-74-9) 1 LBS

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

Not listed.

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

**Hazard categories**  
 Immediate Hazard - Yes  
 Delayed Hazard - Yes  
 Fire Hazard - No  
 Pressure Hazard - No  
 Reactivity Hazard - No

**SARA 302 Extremely hazardous substance**

Chemical name	CAS number	Reportable quantity	Threshold planning quantity	Threshold planning quantity, lower value	Threshold planning quantity, upper value
---------------	------------	---------------------	-----------------------------	--	--

Chlordane	57-74-9	1	1000 lbs		
-----------	---------	---	----------	--	--

**SARA 311/312 Hazardous chemical** Yes

**SARA 313 (TRI reporting)**

Chemical name	CAS number	% by wt.
Chlordane	57-74-9	100

**Other federal regulations****Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List**

Chlordane (CAS 57-74-9)

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)**

Not regulated.

**Clean Water Act (CWA) Section 112(r) (40 CFR 68.130)**  
 Hazardous substance  
 Bioaccumulative chemical of concern

**Safe Drinking Water Act (SDWA)**  
 0 mg/l  
 0.002 mg/l

**US state regulations****US - New Jersey RTK - Substances: Listed substance**

Chlordane (CAS 57-74-9)

**US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)**

Not listed.

**US. Massachusetts RTK - Substance List**

Chlordane (CAS 57-74-9)

**US. New Jersey Worker and Community Right-to-Know Act**

Chlordane (CAS 57-74-9)

**US. Pennsylvania RTK - Hazardous Substances**

Chlordane (CAS 57-74-9)

**US. Pennsylvania Worker and Community Right-to-Know Law**

Chlordane (CAS 57-74-9)

**US. Rhode Island RTK**

Chlordane (CAS 57-74-9)

**US. California Proposition 65**

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

**US - California Proposition 65 - CRT: Listed date/Carcinogenic substance**

Chlordane (CAS 57-74-9) Listed: July 1, 1988

**International Inventories**

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No

Country(s) or region	Inventory name	On inventory (yes/no)*
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

\*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

## 16. Other information, including date of preparation or last revision

**Issue date** 10-08-2014

**Revision date** 11-27-2015

**Version #** 02

**Disclaimer** The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded SDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Safety Data Sheet (SDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an SDS for a solution or mixture the user should refer to the SDS for every component of the solution or mixture. Chem Service warrants that this SDS is based upon the most current information available to Chem Service at the time it was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. This SDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

Copyright © 2000-2014 Chem Service, Inc. All rights reserved except that this SDS may be printed for the use of a customer or prospective customer of Chem Service, Inc provided the entire SDS is printed. The SDS may not be placed in any database or otherwise stored or distributed in electronic or any other form.

This product is furnished FOR LABORATORY USE ONLY.

**4,4' – DDT**

## SAFETY DATA SHEET

### 1. SUBSTANCE AND SOURCE IDENTIFICATION

**Product Identifier**

**RM Number:** 8469  
**RM Name:** 4,4'-DDT  
**Other Means of Identification:** Not applicable.

**Recommended Use of This Material and Restrictions of Use**

This Reference Material (RM) is intended for use in the evaluation of procedures and working standards in used in the measurement of dichlorodiphenyltrichloroethane (4,4'-DDT) in environmental samples. RM 8469 is provided as a primary reference compound of measured purity for 4,4'-DDT. A unit of RM 8469 consists of one vial containing approximately 100 mg of 4,4'-DDT.

**Company Information**

National Institute of Standards and Technology  
 Standard Reference Materials Program  
 100 Bureau Drive, Stop 2300  
 Gaithersburg, Maryland 20899-2300

Telephone: 301-975-2200  
 FAX: 301-948-3730  
 E-mail: SRMMSDS@nist.gov  
 Website: <http://www.nist.gov/srm>

Emergency Telephone ChemTrec:  
 1-800-424-9300 (North America)  
 +1-703-527-3887 (International)

### 2. HAZARDS IDENTIFICATION

**Classification**

**Physical Hazard:** Not classified.  
**Health Hazard:** Acute Toxicity, Oral, Dermal Category 3  
 Carcinogenicity Category 2  
 STOT, Repeated exposure Category 1

**Label Elements**

**Symbol**



**Signal Word**

DANGER

**Hazard Statement(s):**

H301+H311 Toxic if swallowed or in contact with skin.  
 H351 Suspected of causing cancer.  
 H372 Causes damage to organs <central nervous system> through prolonged or repeated exposure <ingestion>.

**Precautionary Statement(s):**

P201 Obtain special instructions before use.  
 P202 Do not handle until all safety precautions have been read and understood.  
 P260 Do not breathe dust.  
 P264 Wash hands thoroughly after handling.  
 P270 Do not eat, drink or smoke when using this product.  
 P280 Wear protective gloves, protective clothing, and eye protection.  
 P301+P310 If on skin: Wash with plenty of water.  
 P361+P364 Take off immediately all contaminated clothing and wash it before reuse.

P301+P310 If swallowed: Immediately call a doctor.  
P330 Rinse mouth.  
P312 Call a doctor.  
P405 Store locked up.  
P501 Dispose of contents and container according to local regulations.

**Hazards Not Otherwise Classified:** Not applicable.

**Ingredients(s) with Unknown Acute Toxicity:** Not applicable.

---

### 3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

---

**Substance:** 4,4'-DDT

**Other Designations:** DDT; *p,p'*-DDT; 1,1'-(2,2,2-trichloroethylidene)bis(4-chlorobenzene); dicophane; 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane; alpha,alpha-bis(p-chlorophenyl)-beta,beta,beta-trichloroethane; pentachlorin; RCRA U061; C<sub>14</sub>H<sub>9</sub>Cl<sub>5</sub>.

Components listed below are in compliance with OSHA's 29 CFR 1910.1200.

Component(s)	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
4,4'-DDT	50-29-3	200-024-3	99.8

---

### 4. FIRST AID MEASURES

---

**Description of First Aid Measures:**

**Inhalation:** If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

**Skin Contact:** Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

**Eye Contact:** Flush eyes with water for at least 15 minutes. Then get immediate medical attention.

**Ingestion:** If swallowed, drink plenty of water, do NOT induce vomiting. Get immediate medical attention. Induce vomiting only at the instructions of a physician. Do not give anything by mouth to unconscious or convulsive person.

**Most Important Symptoms/Effects, Acute and Delayed:** Organochlorine pesticides cause liver and kidney damage.

**Indication of any immediate medical attention and special treatment needed, if necessary:** If any of the above symptoms are present, seek medical attention if needed.

---

### 5. FIRE FIGHTING MEASURES

---

**Fire and Explosion Hazards:** Slight fire hazard. See Section 9, "Physical and Chemical Properties" for flammability properties.

**Extinguishing Media:**

Suitable: Regular dry chemical, water, and regular foam.

Unsuitable: None listed.

**Specific Hazards Arising from the Chemical:** None listed.

**Special Protective Equipment and Precautions for Fire-Fighters:** Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

**NFPA Ratings** (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 2

Fire = 1

Reactivity = 0

---

### 6. ACCIDENTAL RELEASE MEASURES

---

**Personal Precautions, Protective Equipment and Emergency Procedures:** Any accumulated material on surfaces should be removed and properly disposed of. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection".

**Methods and Materials for Containment and Clean up:** Do not touch spilled material. Notify safety personnel of spills. Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Isolate hazard area and deny entry. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

---

## 7. HANDLING AND STORAGE

---

**Safe Handling Precautions:** Minimize dust generation and accumulation on surfaces. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. See Section 8, "Exposure Controls and Personal Protection".

**Storage:** Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances (See Section 10, "Stability and Reactivity").

---

## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

---

### Exposure Limits:

ACGIH (TLV): 1 mg/m<sup>3</sup> (TWA)

NIOSH (REL): 0.5 mg/m<sup>3</sup> (TWA)  
500 mg/m<sup>3</sup> (IDLH)

OSHA (PEL): 1 mg/m<sup>3</sup> (TWA)  
Prevent or reduce skin absorption.

**Engineering Controls:** Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

**Personal Protection:** In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

**Respiratory Protection:** If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

**Eye/Face Protection:** Wear splash resistant safety goggles with a face shield. An eye wash station should be readily available near areas of use.

**Skin and Body Protection:** Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

---

<b>Descriptive Properties:</b>	<b>4,4'-DDT</b>
<b>Appearance</b> (physical state, color, etc.):	white crystalline solid
<b>Molecular Formula:</b>	C <sub>14</sub> H <sub>9</sub> Cl <sub>5</sub>
<b>Molar Mass (g/mol):</b>	354.49
<b>Odor:</b>	not available
<b>Odor threshold:</b>	not available
<b>pH:</b>	not available
<b>Evaporation rate:</b>	not applicable
<b>Melting point/freezing point:</b>	107 °C to 109 °C (224.6 °F to 228.2 °F)
<b>Specific Gravity (water=1):</b>	1.56 at 15 °C
<b>Vapor Pressure (mmHg):</b>	not available
<b>Vapor Density (air = 1):</b>	not applicable
<b>Viscosity (cP):</b>	not applicable
<b>Solubility(ies):</b>	insoluble in water (0.12 ppm at 25 °C), soluble in acetone, ether, pyridines, kerosene, benzene, carbon tetrachloride, dioxane, chloroform, and organic solvents
<b>Partition coefficient (n-octanol/water):</b>	not available
<b>Particle Size:</b>	not available

<b>Thermal Stability Properties:</b>	<b>4,4' DDT</b>
Autoignition Temperature (°C):	not available
Thermal Decomposition (°C):	not available
Initial boiling point and boiling range (°C):	260 °C (500 °F)
Explosive Limits, LEL (Volume %):	not available
Explosive Limits, UEL (Volume %):	not available
Flash Point (°C):	not available
Flammability (solid, gas):	not available

## 10. STABILITY AND REACTIVITY

**Reactivity:** Stable at normal temperatures and pressure.

**Stability:**  Stable  Unstable

**Possible Hazardous Reactions:** None listed.

**Conditions to Avoid:** Avoid heat, flames, sparks and other sources of ignition. Keep out of water supplies and sewers.

**Incompatible Materials:** Bases, combustible materials, metal salts, metals, and oxidizing materials.

**Fire/Explosion Information:** See Section 5, "Fire Fighting Measures".

**Hazardous Decomposition:** Thermal decomposition will produce chlorides and oxides of carbon.

**Hazardous Polymerization:**  Will Occur  Will Not Occur

## 11. TOXICOLOGICAL INFORMATION

**Route of Exposure:**  Inhalation  Skin  Ingestion

**Symptoms Related to the Physical, Chemical and Toxicological Characteristics:** Nausea, vomiting, diarrhea, stomach pain, and headache.

**Potential Health Effects (Acute, Chronic and Delayed):**

**Inhalation:** Same as ingestion if sufficient amounts are absorbed through the lungs.

**Skin Contact:** Same as ingestion if sufficient amounts are absorbed through the skin.

**Eye Contact:** May cause eye irritation.

**Ingestion:** Oral ingestion of food is the primary source of exposure for the general population. Acute and chronic ingestion was cause nausea, vomiting, diarrhea, stomach pain, headache, dizziness, disorientation, tingling sensation, kidney damage, liver damage, convulsions, coma, and death. 4,4'-DDT may cross the placenta and can be excreted in breast milk.

**Numerical Measures of Toxicity:**

**Acute Toxicity:** Category 3, Oral, Dermal

Rat, Oral LD50: 87 mg/kg

Rabbit, Dermal LD50: 300 mg/kg

**Skin Corrosion/Irritation:** Not classified; no data available.

**Serious Eye Damage/Irritation:** Not classified.

Human, Eye: 423 mg/m<sup>3</sup> for 1 h day for 6 d (irritation)

**Respiratory Sensitization:** Not classified; no data available.

**Skin Sensitization:** Not classified; no data available.

**Germ Cell Mutagenicity:** Not classified; no data available.

**Carcinogenicity:** Category 2

**Listed as a Carcinogen/Potential Carcinogen**  Yes  No

4,4'-DDT is listed by IARC as Group 2B (possibly carcinogenic to humans) and by NTP as *Reasonably Anticipated To Be A Human Carcinogen*. It is not listed by OSHA as a carcinogen/potential carcinogen.

Tumorigenic effects: Rat, Oral TD: 438 mg/kg (2 years)

Mutagenic effects: Human, 200 µg/L (72 h)



**Reproductive Toxicity:** Not classified; no data available.  
Rat, Oral, TDLo: 430 mg/kg (pregnant 1 d to 21 d, 21 d).

**Specific Target Organ Toxicity, Single Exposure:** Not classified; no data available.

**Specific Target Organ Toxicity, Repeated Exposure:** Category 1, prolonged or repeated exposure may damage the central nervous system.

**Aspiration Hazard:** Not classified; no data available.

---

## 12. ECOLOGICAL INFORMATION

---

### Ecotoxicity Data:

Fish Toxicity: Rainbow trout (*Oncorhynchus mykiss*) LC50 [static]: 1.25 µg/L to 3.59 µg/L (96 h)  
Invertebrate: Water flea (*Daphnia magna*) LC50 [static]: 0.000 46 mg/L to 0.001 mg/L (48 h)

**Persistence and Degradability:** No data available.

**Bioaccumulative Potential:** BCF 1.17 species: fish.

**Mobility in Soil:** No data available.

**Other Adverse effects:** No data available.

---

## 13. DISPOSAL CONSIDERATIONS

---

**Waste Disposal:** Dispose of waste in accordance with all applicable federal, state, and local regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U061.

---

## 14. TRANSPORTATION INFORMATION

---

**U.S. DOT and IATA:** UN2761, Organochlorine pesticide, solid, n.o.s. (4,4'-DDT); Hazard class 6.1, PG III, Excepted Quantity: E1.

---

## 15. REGULATORY INFORMATION

---

### U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): 1 lb (0.454 kg) final RQ.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Not regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	Yes.
CHRONIC HEALTH:	Yes.
FIRE:	No.
REACTIVE:	No.
PRESSURE:	No.

### State Regulations:

California Proposition 65: WARNING! This product contains a chemical (4,4'-DDT) known to the state of California to cause cancer and reproductive/developmental effects.

**U.S. TSCA Inventory:** Listed.

**TSCA 12(b), Export Notification:** Section 5, 0.1 % de minimus concentration.

### Canadian Regulations:

WHMIS Information: Not provided for this material.

---

## 16. OTHER INFORMATION

---

**Issue Date:** 28 May 2015

**Sources:** ChemADVISOR, Inc., SDS *Dichlorodiphenyltrichloroethane*, 20 March 2015.

### Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NRC	Nuclear Regulatory Commission
ALI	Annual Limit on Intake	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EC50	Effective Concentration, 50 %	RM	Reference Material
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transportation Agency	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	SRM	Standard Reference Material
LC50	Lethal Concentration, 50 %	STEL	Short Term Exposure Limit
LD50	Lethal Dose, 50 %	TLV	Threshold Limit Value
LEL	Lower Explosive Limit	TPQ	Threshold Planning Quantity
MSDS	Material Safety Data Sheet	TSCA	Toxic Substances Control Act
NFPA	National Fire Protection Association	TWA	Time Weighted Average
NIOSH	National Institute for Occupational Safety and Health	UEL	Upper Explosive Limit
NIST	National Institute of Standards and Technology	WHMIS	Workplace Hazardous Materials Information System

**Disclaimer:** Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The reference values for this material are given in the NIST Report of Investigation.

Users of this RM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail [srmmsds@nist.gov](mailto:srmmsds@nist.gov); or via the Internet at <http://www.nist.gov/srm>.

# **Dieldrin**

## 1. Identification

<b>Product identifier</b>	<b>Dieldrin</b>	
<b>Other means of identification</b>		
<b>Product code</b>	N-11688	
<b>Recommended use</b>	For Laboratory Use Only	
<b>Recommended restrictions</b>	None known.	
<b>Manufacturer/Importer/Supplier/Distributor information</b>		
<b>Manufacturer</b>		
<b>Company name</b>	Chem Service, Inc.	
<b>Address</b>	660 Tower Lane West Chester, PA 19380 United States	
<b>Telephone</b>	Toll Free	800-452-9994
	Direct	610-692-3026
<b>Website</b>	www.chemservice.com	
<b>E-mail</b>	info@chemservice.com	
<b>Emergency phone number</b>	Chemtrec US	800-424-9300
	Chemtrec outside US	+1 703-527-3887

## 2. Hazard(s) identification

<b>Physical hazards</b>	Not classified.	
<b>Health hazards</b>	Acute toxicity, oral	Category 2
	Acute toxicity, dermal	Category 1
	Acute toxicity, inhalation	Category 1
	Carcinogenicity	Category 2
	Specific target organ toxicity, repeated exposure	Category 1
<b>Environmental hazards</b>	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 1
<b>OSHA defined hazards</b>	Not classified.	
<b>Label elements</b>		



<b>Signal word</b>	Danger
<b>Hazard statement</b>	Fatal if swallowed. Fatal in contact with skin. Fatal if inhaled. Suspected of causing cancer. Causes damage to organs through prolonged or repeated exposure. Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.
<b>Precautionary statement</b>	
<b>Prevention</b>	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area. Do not breathe dust/fume. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. Wear respiratory protection.
<b>Response</b>	If swallowed: Immediately call a poison center/doctor. If on skin: Wash with plenty of water. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center/doctor. Specific treatment is urgent (see this label). Rinse mouth. Take off immediately all contaminated clothing and wash it before reuse. Collect spillage.
<b>Storage</b>	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
<b>Disposal</b>	Dispose of contents/container in accordance with local/regional/national/international regulations.
<b>Hazard(s) not otherwise classified (HNOC)</b>	None known.

### 3. Composition/information on ingredients

#### Substances

Chemical name	Common name and synonyms	CAS number	%
Dieldrin		60-57-1	100

\*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

### 4. First-aid measures

<b>Inhalation</b>	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a physician or poison control center immediately.
<b>Skin contact</b>	Take off immediately all contaminated clothing. IF ON SKIN: Gently wash with plenty of soap and water. Call a physician or poison control center immediately.
<b>Eye contact</b>	Do not rub eyes. Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately.
<b>Ingestion</b>	Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
<b>Most important symptoms/effects, acute and delayed</b>	Prolonged exposure may cause chronic effects.
<b>Indication of immediate medical attention and special treatment needed</b>	Provide general supportive measures and treat symptomatically. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
<b>General information</b>	Take off immediately all contaminated clothing. IF exposed or concerned: Get medical advice/attention. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before reuse. Discard any shoes or clothing items that cannot be decontaminated.

### 5. Fire-fighting measures

<b>Suitable extinguishing media</b>	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
<b>Unsuitable extinguishing media</b>	Do not use water jet as an extinguisher, as this will spread the fire.
<b>Specific hazards arising from the chemical</b>	During fire, gases hazardous to health may be formed.
<b>Special protective equipment and precautions for firefighters</b>	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
<b>Fire-fighting equipment/instructions</b>	Use water spray to cool unopened containers.
<b>Specific methods</b>	Use standard firefighting procedures and consider the hazards of other involved materials.
<b>General fire hazards</b>	No unusual fire or explosion hazards noted.

### 6. Accidental release measures

<b>Personal precautions, protective equipment and emergency procedures</b>	Immediately evacuate personnel to safe areas. Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Do not breathe dust. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
<b>Methods and materials for containment and cleaning up</b>	Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). This material is classified as a water pollutant under the Clean Water Act and should be prevented from contaminating soil or from entering sewage and drainage systems which lead to waterways. Stop the flow of material, if this is without risk. Collect spillage.  Large Spills: Wet down with water and dike for later disposal. Following product recovery, flush area with water.  Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal.  Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

**Environmental precautions** Avoid release to the environment. Contact local authorities in case of spillage to drain/aquatic environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

## 7. Handling and storage

**Precautions for safe handling** Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation. Do not breathe dust. Do not get this material in contact with eyes. Do not get this material in contact with skin. Do not taste or swallow. Avoid prolonged exposure. Do not get this material on clothing. Use only outdoors or in a well-ventilated area. Wear appropriate personal protective equipment. Observe good industrial hygiene practices. When using, do not eat, drink or smoke. Wash hands thoroughly after handling. Wash contaminated clothing before reuse. Avoid release to the environment. Do not empty into drains.

**Conditions for safe storage, including any incompatibilities** Store locked up. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

## 8. Exposure controls/personal protection

### Occupational exposure limits

#### US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Material	Type	Value
Dieldrin (CAS 60-57-1)	PEL	0.25 mg/m3

#### US. ACGIH Threshold Limit Values

Material	Type	Value	Form
Dieldrin (CAS 60-57-1)	TWA	0.1 mg/m3	Inhalable fraction and vapor.

#### US. NIOSH: Pocket Guide to Chemical Hazards

Material	Type	Value
Dieldrin (CAS 60-57-1)	TWA	0.25 mg/m3

**Biological limit values** No biological exposure limits noted for the ingredient(s).

### Exposure guidelines

#### US - California OELs: Skin designation

Dieldrin (CAS 60-57-1) Can be absorbed through the skin.

#### US - Minnesota Haz Subs: Skin designation applies

Dieldrin (CAS 60-57-1) Skin designation applies.

#### US - Tennessee OELs: Skin designation

Dieldrin (CAS 60-57-1) Can be absorbed through the skin.

#### US ACGIH Threshold Limit Values: Skin designation

Dieldrin (CAS 60-57-1) Can be absorbed through the skin.

#### US NIOSH Pocket Guide to Chemical Hazards: Skin designation

Dieldrin (CAS 60-57-1) Can be absorbed through the skin.

#### US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Dieldrin (CAS 60-57-1) Can be absorbed through the skin.

**Appropriate engineering controls** Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

### Individual protection measures, such as personal protective equipment

**Eye/face protection** Wear eye/face protection. Chemical goggles are recommended.

#### Skin protection

**Hand protection** Wear protective gloves.

**Other** Wear appropriate chemical resistant clothing.

**Respiratory protection** Wear positive pressure self-contained breathing apparatus (SCBA).

**Thermal hazards** Wear appropriate thermal protective clothing, when necessary.

**General hygiene considerations** When using, do not eat, drink or smoke. Do not get this material on clothing. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

## 9. Physical and chemical properties

### Appearance

**Physical state** Solid.

<b>Form</b>	Solid. Crystalline Solid
<b>Color</b>	Colorless to light tan
<b>Odor</b>	Not available.
<b>Odor threshold</b>	Not available.
<b>pH</b>	Not available.
<b>Melting point/freezing point</b>	347.9 °F (175.5 °C)
<b>Initial boiling point and boiling range</b>	Not available.
<b>Flash point</b>	Not available.
<b>Evaporation rate</b>	Not available.
<b>Flammability (solid, gas)</b>	Not available.
<b>Upper/lower flammability or explosive limits</b>	
<b>Flammability limit - lower (%)</b>	Not available.
<b>Flammability limit - upper (%)</b>	Not available.
<b>Explosive limit - lower (%)</b>	Not available.
<b>Explosive limit - upper (%)</b>	Not available.
<b>Vapor pressure</b>	0 kPa at 20 °C
<b>Vapor density</b>	13.2
<b>Relative density</b>	Not available.
<b>Solubility(ies)</b>	
<b>Solubility (water)</b>	0.2 mg/l
<b>Partition coefficient (n-octanol/water)</b>	5.4
<b>Auto-ignition temperature</b>	Not available.
<b>Decomposition temperature</b>	Not available.
<b>Viscosity</b>	Not available.
<b>Other information</b>	
<b>Density</b>	1.75 g/cm <sup>3</sup>
<b>Molecular formula</b>	C <sub>12</sub> H <sub>8</sub> Cl <sub>6</sub> O
<b>Molecular weight</b>	380.91 g/mol
<b>Specific gravity</b>	1.75

## 10. Stability and reactivity

<b>Reactivity</b>	The product is stable and non-reactive under normal conditions of use, storage and transport.
<b>Chemical stability</b>	Material is stable under normal conditions.
<b>Possibility of hazardous reactions</b>	Hazardous polymerization does not occur.
<b>Conditions to avoid</b>	Contact with incompatible materials.
<b>Incompatible materials</b>	Strong acids. Strong oxidizing agents. Phenols.
<b>Hazardous decomposition products</b>	No hazardous decomposition products are known.

## 11. Toxicological information

### Information on likely routes of exposure

<b>Ingestion</b>	Fatal if swallowed.
<b>Inhalation</b>	Fatal if inhaled.
<b>Skin contact</b>	Fatal in contact with skin.
<b>Eye contact</b>	Direct contact with eyes may cause temporary irritation.

**Symptoms related to the physical, chemical and toxicological characteristics** Direct contact with eyes may cause temporary irritation.

### Information on toxicological effects

**Acute toxicity** Fatal if inhaled. Fatal in contact with skin. Fatal if swallowed.

Product	Species	Test Results
Dieldrin (CAS 60-57-1)		
<b>Acute</b>		
<i>Dermal</i>		
LD50	Rat	56 mg/kg
<i>Oral</i>		
LD50	Dog	65 mg/kg
	Domestic goat	100 - 200 mg/kg
	Monkey	3 mg/kg
	Mouse	38 mg/kg
	Rat	24 mg/kg
	Sheep	50 - 75 mg/kg
<i>Other</i>		
LD50	Mouse	10.5 mg/kg
	Rat	9 mg/kg

\* Estimates for product may be based on additional component data not shown.

**Skin corrosion/irritation** Prolonged skin contact may cause temporary irritation.

**Serious eye damage/eye irritation** Direct contact with eyes may cause temporary irritation.

**Respiratory or skin sensitization**

**Respiratory sensitization** Not available.

**Skin sensitization** This product is not expected to cause skin sensitization.

**Germ cell mutagenicity** No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

**Carcinogenicity** Suspected of causing cancer.

**IARC Monographs. Overall Evaluation of Carcinogenicity**

Dieldrin (CAS 60-57-1) 3 Not classifiable as to carcinogenicity to humans.

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

Not listed.

**Reproductive toxicity** This product is not expected to cause reproductive or developmental effects.

**Specific target organ toxicity - single exposure** Not classified.

**Specific target organ toxicity - repeated exposure** Causes damage to organs through prolonged or repeated exposure.

**Aspiration hazard** Not available.

**Chronic effects** Prolonged inhalation may be harmful. Causes damage to organs through prolonged or repeated exposure.

**12. Ecological information**

**Ecotoxicity** Very toxic to aquatic life with long lasting effects. Accumulation in aquatic organisms is expected.

Product	Species	Test Results
Dieldrin (CAS 60-57-1)		
<b>Aquatic</b>		
Crustacea	EC50	Water flea (Daphnia magna)
		0.074 - 0.0854 mg/l, 48 hours
Fish	LC50	Rainbow trout, donaldson trout (Oncorhynchus mykiss)
		0.001 - 0.0013 mg/l, 96 hours

\* Estimates for product may be based on additional component data not shown.

**Persistence and degradability** No data is available on the degradability of this product.

**Bioaccumulative potential** Not available.

**Partition coefficient n-octanol / water (log Kow)**

5.4

**Mobility in soil** No data available.

**Other adverse effects** No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.



### 13. Disposal considerations

<b>Disposal instructions</b>	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.
<b>Local disposal regulations</b>	Dispose in accordance with all applicable regulations.
<b>Hazardous waste code</b>	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
<b>US RCRA Hazardous Waste P List: Reference</b>	
Dieldrin (CAS 60-57-1)	P037
<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

### 14. Transport information

#### DOT

<b>UN number</b>	UN2811
<b>UN proper shipping name</b>	Toxic solids, organic, n.o.s. (Dieldrin RQ = 1 LBS), MARINE POLLUTANT
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGI, II)
<b>Subsidiary risk</b>	-
<b>Label(s)</b>	6.1
<b>Packing group</b>	II
<b>Environmental hazards</b>	
<b>Marine pollutant</b>	Yes
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.
<b>Special provisions</b>	IB8, IP2, IP4, T3, TP33
<b>Packaging exceptions</b>	153
<b>Packaging non bulk</b>	212
<b>Packaging bulk</b>	242

#### IATA

<b>UN number</b>	UN2811
<b>UN proper shipping name</b>	Toxic solid, organic, n.o.s. (Dieldrin)
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGI, II)
<b>Subsidiary risk</b>	-
<b>Packing group</b>	II
<b>Environmental hazards</b>	No.
<b>ERG Code</b>	6L
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.
<b>Other information</b>	
<b>Passenger and cargo aircraft</b>	Allowed.
<b>Cargo aircraft only</b>	Allowed.

#### IMDG

<b>UN number</b>	UN2811
<b>UN proper shipping name</b>	TOXIC SOLID, ORGANIC, N.O.S. (Dieldrin), MARINE POLLUTANT
<b>Transport hazard class(es)</b>	
<b>Class</b>	6.1(PGI, II)
<b>Subsidiary risk</b>	-
<b>Packing group</b>	II
<b>Environmental hazards</b>	
<b>Marine pollutant</b>	Yes
<b>EmS</b>	F-A, S-A
<b>Special precautions for user</b>	Read safety instructions, SDS and emergency procedures before handling.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** Not applicable.

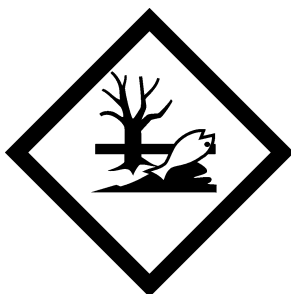
DOT



IATA; IMDG



Marine pollutant



## 15. Regulatory information

### US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.  
One or more components are not listed on TSCA.

#### TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

#### CERCLA Hazardous Substance List (40 CFR 302.4)

Dieldrin (CAS 60-57-1)

Listed.

#### SARA 304 Emergency release notification

Not regulated.

#### US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

### Superfund Amendments and Reauthorization Act of 1986 (SARA)

#### Hazard categories

Immediate Hazard - Yes  
Delayed Hazard - Yes  
Fire Hazard - No  
Pressure Hazard - No  
Reactivity Hazard - No

#### SARA 302 Extremely hazardous substance

Not listed.

#### SARA 311/312 Hazardous chemical

Yes

#### SARA 313 (TRI reporting)

Not regulated.

### Other federal regulations

#### Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

#### Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

**Clean Water Act (CWA)  
Section 112(r) (40 CFR  
68.130)** Hazardous substance  
Priority pollutant  
Bioaccumulative chemical of concern  
Toxic pollutant

**Safe Drinking Water Act  
(SDWA)** Not regulated.

#### US state regulations

##### US. Massachusetts RTK - Substance List

Dieldrin (CAS 60-57-1)

##### US. New Jersey Worker and Community Right-to-Know Act

Dieldrin (CAS 60-57-1) 500 LBS

##### US. Pennsylvania RTK - Hazardous Substances

Dieldrin (CAS 60-57-1)

##### US. Rhode Island RTK

Dieldrin (CAS 60-57-1)

##### US. California Proposition 65

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

##### US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

Dieldrin (CAS 60-57-1) Listed: July 1, 1988

#### International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

\*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

#### 16. Other information, including date of preparation or last revision

**Issue date** 09-27-2014  
**Version #** 01  
**NFPA ratings** Health: 3  
Flammability: 0  
Instability: 0

**Disclaimer**

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded SDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Safety Data Sheet (SDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an SDS for a solution or mixture the user should refer to the SDS for every component of the solution or mixture. Chem Service warrants that this SDS is based upon the most current information available to Chem Service at the time it was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. This SDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

Copyright © 2000-2014 Chem Service, Inc. All rights reserved except that this SDS may be printed for the use of a customer or prospective customer of Chem Service, Inc provided the entire SDS is printed. The SDS may not be placed in any database or otherwise stored or distributed in electronic or any other form.

This product is furnished FOR LABORATORY USE ONLY.

# Heptachlor Epoxide

## SAFETY DATA SHEET

Version 5.5  
Revision Date 04/24/2015  
Print Date 04/21/2016

---

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

Product name : Heptachlor epoxide

Product Number : PS700  
Brand : Supelco  
Index-No. : 602-063-00-5

CAS-No. : 1024-57-3

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

Identified uses : Laboratory chemicals, Manufacture of substances

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

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

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

**1.4 Emergency telephone number**

Emergency Phone # : (314) 776-6555

---

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

Acute toxicity, Oral (Category 2), H300  
Carcinogenicity (Category 2), H351  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

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

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

Pictogram



Signal word

Danger

Hazard statement(s)

H300 Fatal if swallowed.  
H351 Suspected of causing cancer.  
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.  
P202 Do not handle until all safety precautions have been read and understood.  
P264 Wash skin thoroughly after handling.  
P270 Do not eat, drink or smoke when using this product.  
P273 Avoid release to the environment.

P281	Use personal protective equipment as required.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P321	Specific treatment (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Synonyms : Heptachlor epoxide

Formula : C<sub>10</sub>H<sub>5</sub>Cl<sub>7</sub>O

Molecular weight : 389.32 g/mol

CAS-No. : 1024-57-3

EC-No. : 213-831-0

Index-No. : 602-063-00-5

#### Hazardous components

Component	Classification	Concentration
<b>Heptachlor epoxide</b>		
	Acute Tox. 2; Carc. 2; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H300, H351, H373, H410	<= 100 %

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

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice

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

#### If inhaled

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

#### In case of skin contact

Wash off with soap and plenty of water. 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.

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

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

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

No data available

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

#### Suitable extinguishing media

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

- 5.2 Special hazards arising from the substance or mixture**  
Carbon oxides, Hydrogen chloride gas
- 5.3 Advice for firefighters**  
Wear self-contained breathing apparatus for firefighting if necessary.
- 5.4 Further information**  
No data available

## 6. ACCIDENTAL RELEASE MEASURES

- 6.1 Personal precautions, protective equipment and emergency procedures**  
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.  
For personal protection see section 8.
- 6.2 Environmental precautions**  
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
- 6.3 Methods and materials for containment and cleaning up**  
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**  
For disposal see section 13.

## 7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**  
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.  
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**  
Keep container tightly closed in a dry and well-ventilated place.
- 7.3 Specific end use(s)**  
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Heptachlor epoxide	1024-57-3	TWA	0.05 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		

### 8.2 Exposure controls

#### Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

#### Personal protective equipment

##### Eye/face 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 protection

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



Full contact  
Material: Nitrile rubber  
Minimum layer thickness: 0.11 mm  
Break through time: 480 min  
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact  
Material: Nitrile rubber  
Minimum layer thickness: 0.11 mm  
Break through time: 480 min  
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

### **Body Protection**

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

### **Respiratory protection**

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

### **Control of environmental exposure**

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

---

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

- |   |                                     |
|---|-------------------------------------|
| a) Appearance                                   | Form: solid                         |
| b) Odour  | No data available                   |
| c) Odour Threshold                              | No data available                   |
| d) pH   | No data available                   |
| e) Melting point/freezing point                 | 157.0 - 161.0 °C (314.6 - 321.8 °F) |
| f) Initial boiling point and boiling range      | No data available                   |
| g) Flash point                                  | No data available                   |
| h) Evaporation rate                             | No data available                   |
| i) Flammability (solid, gas)                    | No data available                   |
| j) Upper/lower flammability or explosive limits | No data available                   |
| k) Vapour pressure                              | No data available                   |
| l) Vapour density                               | No data available                   |
| m) Relative density                             | No data available                   |
| n) Water solubility                             | No data available                   |
| o) Partition coefficient: n-octanol/water       | log Pow: 5.40                       |

- |                              |                   |
|------------------------------|-------------------|
| p) Auto-ignition temperature | No data available |
| q) Decomposition temperature | No data available |
| r) Viscosity                 | No data available |
| s) Explosive properties      | No data available |
| t) Oxidizing properties      | No data available |

## 9.2 Other safety information

Bulk density	1,100 kg/m <sup>3</sup>
--------------	-------------------------

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

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

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - 15.0 mg/kg

Inhalation: No data available

Dermal: No data available

LD50 Intracerebral - Mouse - 8 mg/kg

Remarks: Behavioral: Convulsions or effect on seizure threshold.

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

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

Limited evidence of carcinogenicity in animal studies

- IARC: 2B - Group 2B: Possibly carcinogenic to humans (Heptachlor epoxide)
- NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
- OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**

No data available

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: PB9450000

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

Blood -

---

**12. ECOLOGICAL INFORMATION**

**12.1 Toxicity**

Toxicity to fish LC50 - *Oncorhynchus mykiss* (rainbow trout) - 0.02 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates LC50 - *Daphnia magna* (Water flea) - 0.24 mg/l - 48 h

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

Bioaccumulation *Pimephales promelas* (fathead minnow) - 32 d - 0.0013 mg/l

Bioconcentration factor (BCF): 14,400

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

---

**13. DISPOSAL CONSIDERATIONS**

**13.1 Waste treatment methods**

**Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

UN number: 2811      Class: 6.1      Packing group: II  
Proper shipping name: Toxic solids, organic, n.o.s. (Heptachlor epoxide)  
Reportable Quantity (RQ): 1 lbs  
Marine pollutant: yes  
Poison Inhalation Hazard: No

### IMDG

UN number: 2811      Class: 6.1      Packing group: II      EMS-No: F-A, S-A  
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Heptachlor epoxide)

### IATA

UN number: 2811      Class: 6.1      Packing group: II  
Proper shipping name: Toxic solid, organic, n.o.s. (Heptachlor epoxide)

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

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

### SARA 313 Components

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

### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
Heptachlor epoxide	1024-57-3	1994-04-01

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Heptachlor epoxide	1024-57-3	1994-04-01

### New Jersey Right To Know Components

	CAS-No.	Revision Date
Heptachlor epoxide	1024-57-3	1994-04-01

### California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Heptachlor epoxide	1024-57-3	2007-09-28

---

## 16. OTHER INFORMATION

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

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H300	Fatal if swallowed.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

**HMIS Rating**

Health hazard: 4  
Chronic Health Hazard: \*  
Flammability: 0  
Physical Hazard 0

**NFPA Rating**

Health hazard: 3  
Fire Hazard: 0  
Reactivity Hazard: 0

**Further information**

Copyright 2015 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only.  
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 Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

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

Version: 5.5

Revision Date: 04/24/2015


Print Date: 04/21/2016

# **ATTACHMENT B**

## **Job Hazard Analysis Forms**

JHA Title: Heavy Equipment Operation

BrightFields, Inc. JOB HAZARD ANALYSIS (JHA) FORM

Developed By: Maggie Atterbury	Date: 12/9/16	Work Location: Various
Revised By: Dan Hartnett	Date: 12/16/16	
Approved By: 	Date: 2/22/17	
This JHA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions made in the field have been written on this JHA.		

REQUIRED PPE: Leather work gloves; hard hat; hearing protection; highly visible clothing such as orange coveralls or reflective safety vest; safety glasses; safety shoes (steel-toed boots with ankle support).
REQUIRED AND/OR RECOMMENDED TOOLS AND EQUIPMENT: None.
REQUIRED PERMITS: None.

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
1. Conduct walk-around inspection of equipment.	<p>1a. Exposure to extreme temperatures and/or biological hazards such as poisonous plants or insects.</p> <p>1b. Slips/trips/ falls could occur while walking on uneven surfaces.</p> <p>1c. Caught in pinch point or crushed by machine.</p>	<p>1a1. Wear the required PPE (listed above).</p> <p>1a2. Check the weather prior to commencing all sampling activities. Utilize sun screen. Dress in layers if cold weather is expected. Take scheduled breaks to avoid heat exhaustion or hypothermia.</p> <p>1a3. Utilize bug repellent and poison ivy block if working in vegetated areas. Watch for animals and insects.</p> <p>1b1. Wear the required PPE (listed above). Steel toed boots should have ankle support.</p> <p>1b2. Be aware of surroundings. Watch for unexpected hazards on the ground in addition to overhead hazards (e.g., low-hanging branches).</p> <p>1c1. Wear leather work gloves when in contact with machine parts.</p> <p>1c2. Avoid putting extremities in or near pinch points.</p>
2. Entering cab	<p>2a. Slips/trips/ falls could occur while entering cab.</p> <p>2b. Injury due to contact with sharp object or caught in pinch point.</p>	<p>2a1. Wear the required PPE (listed above). Steel toed boots should have adequate tread and ankle support.</p> <p>2a2. Be aware of surroundings. Watch for unexpected hazards on the ground in addition to overhead hazards (e.g., low-hanging branches).</p> <p>2a3. Make sure handrails are installed and secured.</p> <p>2b1. Wear leather work gloves when in contact with machine parts.</p> <p>2b2. Avoid putting extremities in or near pinch points.</p>
3. General Operation	<p>3a. Electrical shock.</p> <p>3b. Discomfort due to poor posture for an extended time.</p> <p>3c. Injury/Damage to persons or property.</p> <p>3d. Equipment failure.</p> <p>3e. Overturning or collision.</p>	<p>3a1. Always check for overhead power lines and ensure adequate clearance.</p> <p>3b1. Use proper posture when sitting cab.</p> <p>3b2. Take breaks as needed to avoid sitting for an extended period of time.</p> <p>3c1. Watch for unexpected hazards on the ground in addition to overhead hazards (e.g., low-hanging branches).</p> <p>3c2. Be aware people and property within project area.</p> <p>3c3. Maintain eye contact with workers in close vicinity of the machine.</p> <p>3c4. Check to see that area is clear of personnel and or obstructions prior to moving.</p> <p>3d1. Conduct an inspection of equipment and controls prior to operation.</p> <p>3d2. Address warnings and indicators as specified by the manufacturer.</p> <p>3e1. Avoid fast swings, hoists, or sudden braking.</p> <p>3e2. Be aware of the lifting capacity of the machine and use caution when moving loads.</p>

		<p>3e3. Keep machine as level as possible during operation.</p>
<p>4. Exiting cab</p>	<p>4a. Slips/trips/ falls could occur while exiting cab.</p> <p>4b. Injury due to contact with sharp object or caught in pinch point.</p>	<p>4a1. Wear the required PPE (listed above). Steel toed boots should have adequate tread and ankle support.</p> <p>4a2. Be aware of surroundings. Watch for unexpected hazards on the ground in addition to overhead hazards (e.g., low-hanging branches).</p> <p>4a3. Make sure handrails are installed and secured.</p> <p>4b1. Wear leather work gloves when in contact with machine parts.</p> <p>4b2. Avoid putting extremities in or near pinch points.</p>
<p>On-Site Edits</p>		

HAZARD CATEGORIES: 1) Exposure, 2) Caught/Crushed, 3) Contact, 4) Ergonomics, 5) Falls, and 6) Energy Sources



Excavation and Trenching

BrightFields, Inc. JOB HAZARD ANALYSIS (JHA) FORM

Developed By: Dan Hartnett	Date: 2/9/17
Revised By:	Date:
Approved By: <i>JMB</i>	Date: <i>2/22/17</i>

Work Location: Various
This JHA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions made in the field have been written on this JHA.

REQUIRED PPE: Hard Hat, High Vis/Reflective Clothing, Long Pants, Steel Toe Boots, Eye Protection, Ear Protection *suggested if noise levels exceed 85db*

REQUIRED AND/OR RECOMMENDED TOOLS AND EQUIPMENT: Hydraulic Excavator, Fire Extinguisher

REQUIRED PERMITS: *One Call Utility Location/Markout*

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
1. Inspect Equipment and work area	<p><u>1a.</u> Slips/Trips/Falls</p> <p><u>1b.</u> Pinch points/Fall hazards</p> <p><u>1c.</u> Damaged or broken equipment</p> <p><u>1d.</u> Poor/ Difficult work conditions</p>	<p><u>1a1.</u> Be mindful of terrain and weather conditions when inspecting the machine. Perform the inspection upon receiving the equipment and at the start of each day.</p> <p><u>1a2.</u> Use 3 points of contact when entering and exiting the equipment.</p> <p><u>1b.</u> Ensure the machine is turned off and that all buckets/arms are in the down position or locked with a safety bar in place.</p> <p><u>1c.</u> Take pictures of the machine upon receipt of the machine and check that all damage is documented and assessed prior to operation.</p> <p><u>1d.</u> Inspect work area prior to getting into machine. Check for muddy conditions or unsafe conditions that may hinder machine performance or safe operation.</p>
2. Entering the machine and starting the machine.	<p><u>2a.</u> Falling/ slipping</p> <p><u>2b.</u> Improper starting of the machine</p> <p><u>2c.</u> Moving machine prior to warming</p>	<p><u>2a.</u> Use 3 points of contact when entering the machine especially in wet or cold conditions. The tracks can often be slippery from water, ice, and mud.</p> <p><u>2b.</u> Be sure to climb all the way into the machine to start the machine. Do not start while standing outside of the cab. Ensure that the hydraulic lock bar is in the down and locked position prior to starting the ignition key.</p> <p><u>2c.</u> If operating in cold conditions start the machine and give it time to warm up in a low idle mode approximately 10 minutes. Once the machine has warmed up test the controls and functions to check that all systems are functioning properly.</p>
3. Operating and moving the machine	<p><u>3a.</u> Crushing or hitting other objects</p> <p><u>3b.</u> Hitting utilities</p>	<p><u>3a.</u> Stay aware of your surroundings at all times including the number of people onsite, objects around your machine. Use the mirrors, back up cameras, and if possible, a spotter to assist with navigating a site. Keep a safe distance of at least 5ft from other vehicles and machines onsite when possible. Never allow workers to walk under a suspended load.</p> <p><u>3b.</u> Utilities can be located underground and overhead. Prior to excavating be sure to pay attention to any overhead hazards that may be difficult to see or judge. Mark utilities with flagging when possible. Track with the arm in a down position when possible.</p>
4. Excavation operation	<p><u>4a.</u> Hitting underground utilities</p> <p><u>4b.</u> Machine falling/tipping/sliding into excavation</p>	<p><u>4a.</u> Prior to starting any excavation ensure that an up to date "Miss Utility" one call has been completed and that no utilities are present in your excavation area. <b>MISS UTILITY 1800-282-8555</b></p> <p><u>4b.</u> When possible it is best to keep the excavator squared up to the hole or trench to be dug. Avoid digging from the side of the tracks. Keep the machine on level ground with ¾ of the tracks on solid ground so as to avoid tipping towards the excavation. If using a machine that is smaller than a 313 keep the grading blade towards the hole so that it can be set down for stabilizing the machine during excavation activities.</p>

	<p><u>4c.</u> Spilling material/Overloading the bucket</p>	<p><u>4c.</u> During excavation activities attempt to keep the arm in a mid range position to get the most power for digging. Do not fully extend the arm with a fully loaded bucket of material especially over the side of the tracks.</p>
<p>5. Excavation and Trench</p>	<p><u>5a.</u> Falling or getting trapped</p> <p><u>5b.</u> Collapse, sloughing sides in an excavation</p> <p><u>5c.</u> Collapse in a trench</p> <p><u>5d.</u> Hazardous Atmospheres</p>	<p><u>5a.</u> Clearing identify, mark out, or fence off the excavation area so that all workers are aware of the location and do not accidentally walk into the area.</p> <p><u>5b.</u> When opening up a larger excavation be sure to keep in mind the soil type. Clay and silt soils are more stable than sand soils. During excavation activities attempt to pile the soil at a safe distance from the edges of the excavation to avoid adding extra weight near the walls. Open the excavation up with sloping and if necessary add safety benches for excavations that become too large for only slopes. Slopes should extend no more than 20' in elevation and should be at an approximate slope of 1 to 1-1/2.</p> <p><u>5c.</u> A trench can be especially dangerous because there is limited access. Once a trench becomes deeper than 4ft a ladder should be used for access by workers. For deeper trenches a trench box should be put in place to support the walls from collapsing. Loose material should be piled away from the sides to avoid falling into the trench.</p> <p><u>5d.</u> When working with potentially contaminated soils be sure to properly check the atmosphere with a 4 gas meter or PID meter prior to entering a trench to perform work.</p>
<p>6. Backfilling</p>	<p><u>6a.</u> Crush hazard</p> <p><u>6b.</u> Poor compaction</p>	<p><u>6a.</u> Prior to placing soil back into the excavation ensure that no people or equipment remains in the excavation.</p> <p><u>6b.</u> It is important to attempt to backfill any excavation or trench in compacted lifts. Place soil in loose lifts of 12 to 18 inches depending upon site requirements and tamp with the bucket or other appropriate means. Be sure to remove as much water and non soil material as possible to get the greatest amount of compaction.</p>
<p>7. Cleaning, Parking, and exiting machine</p>	<p><u>7a.</u> Frozen tracks, stuck machine</p> <p><u>7b.</u> crush hazard, damage to equipment</p> <p><u>7c.</u> slips/trips/falls</p>	<p><u>7a.</u> Whenever the tracks are filled with mud, dirt, or debris be sure to clean them at the end of the day. This is especially important during the winter when the tracks can freeze and be stuck in place the following morning.</p> <p><u>7b.</u> Always park the machine with the bucket on the ground and with the machine on as level and dry ground as is possible. Be sure to idle the machine down and place the hydraulic lock in the locked position prior to turning off the machine.</p> <p><u>7c.</u> Use 3 points of contact when exiting the machine. Lock the machine when complete at end of day.</p>
<p><b>HAZARD CATEGORIES:</b> 1) Exposure, 2) Caught/Crushed, 3) Contact, 4) Ergonomics, 5) Falls, and 6) Energy Sources</p>		

JHA Title: Picking Debris

BrightFields, Inc. JOB HAZARD ANALYSIS (JHA) FORM

Developed By: Chris Hartnett	Date: 1/17/2017	Work Location:  This JHA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions made in the field have been written on this JHA.
Revised By:	Date:	
Approved By: <i>JMB</i>	Date: 2/22/17	

REQUIRED PPE: Work Gloves, Work boots with safety toe, High Vis clothing or traffic vest, hard hat, safety glasses

REQUIRED AND/OR RECOMMENDED TOOLS AND EQUIPMENT: Shovel if necessary


REQUIRED PERMITS: N/A

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
1. Define work area with operator	<p><u>1a.</u> Slips, trips, falls</p> <p><u>1b.</u> Boom swing and blind spot</p>	<p><u>1a.</u> Disturbed ground contains voids and obstructions unusual to typical terrain. Worker should be aware of changing ground conditions</p> <p><u>1b.</u> Stop work and establish communication tactics and areas where worker will stand while picking. DO NOT approach equipment without operator's approval. Picker should be in area to front or left of excavator to keep visual contact.</p>
2. Picking Debris	<p><u>2a.</u> Equipment contact, pinch points</p> <p><u>2b.</u> impalement and injection</p> <p><u>2c.</u> Exhaustion, heat stroke</p> <p><u>2d.</u> Slips and falls</p> <p><u>2e.</u> What debris to pick</p>	<p><u>2a.</u> Do not approach debris until operator allows worker to do so, avoid walking between bucket and other objects to avoid getting pinched between the two</p> <p><u>2b.</u> Don proper PPE, grab debris larger than forearm, keeping proper ergonomics and grip techniques, pile debris in area that is out of work zone. Debris should be handled properly avoid grabbing sharp edges and pulling/prying on stuck debris</p> <p><u>2c.</u> Use shade to your advantage if possible, take water breaks when needed and apply sunscreen as needed.</p> <p><u>2d.</u> Avoid climbing up piles to pick debris, get excavator to bring buckets to ground level when possible. Mud will make area slippery, maintain footing when picking debris</p> <p><u>2e.</u> Pick debris larger than forearm in length and diameter. Communicate with operator when bucket load is free of debris or further actions are required.</p>
3. Removing Debris to Roll-off Can	<p><u>3a.</u> Employee or equipment contact</p> <p><u>3b.</u> Dumping debris on personnel or equipment</p> <p><u>3c.</u> Equipment Swing</p>	<p><u>3a.</u> With use of MTL, debris can be easily removed, operators need to communicate and keep from contacting each other</p> <p><u>3b.</u> counter bucket lift and dumping maneuvers to keep load level while dumping in roll-off can</p> <p><u>3c.</u> Load may be wider than bucket, be aware that turning and dumping may be restricted in certain conditions.</p>
On-Site Edits		

<b>HAZARD CATEGORIES: 1) Exposure, 2) Caught/Crushed, 3) Contact, 4) Ergonomics, 5) Falls, and 6) Energy Sources</b>		

JHA Title: Refueling Heavy Equipment

BrightFields, Inc. JOB HAZARD ANALYSIS (JHA) FORM

Developed By: Maggie Atterbury	Date: 12/9/16	Work Location: Various  This JHA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions made in the field have been written on this JHA.
Revised By: Dan Hartnett	Date: 12/16/16	
Approved By: 	Date: 2/22/17	

**REQUIRED PPE:** Leather work gloves; hard hat, hearing protection highly visible clothing such as orange coveralls or reflective safety vest; safety glasses; safety shoes (steel-toed boots with ankle support).

**REQUIRED AND/OR RECOMMENDED TOOLS AND EQUIPMENT:** Fire extinguisher.

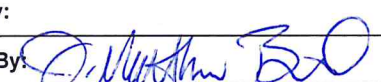
**REQUIRED PERMITS:** None.

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
1. Verify Fuel Content	<p>1a. Exposure to extreme temperatures and/or biological hazards such as poisonous plants or insects.</p> <p>1b. Slips/trips/ falls could occur while walking on uneven surfaces.</p> <p>1c. Caught/Crushed by heavy machinery.</p> <p>1d. Damage to machinery.</p>	<p>1a1. Wear the required PPE (listed above).</p> <p>1a2. Check the weather prior to commencing all project activities. Utilize sun screen. Dress in layers if cold weather is expected. Take scheduled breaks to avoid heat exhaustion or hypothermia.</p> <p>1a3. Utilize bug repellent if working in vegetated areas. Watch for animals and insects.</p> <p>1b1. Wear the required PPE (listed above). Steel toed boots should have ankle support.</p> <p>1b2. Be aware of surroundings. Watch for unexpected hazards on the ground in addition to overhead hazards (e.g., low-hanging branches).</p> <p>1c1. Wear the required PPE as listed above.</p> <p>1c2. Be aware of surroundings.</p> <p>1c3. Maintain a safe distance from heavy equipment and brush cutting machinery.</p> <p>1c4. Maintain eye contact with the machine operator.</p> <p>1c5. Verify that the machine has been shut down and the parking break is on prior to approaching.</p> <p>1d1. Verify that the machine has been shut down and fueling is required. Avoid overfilling fuel tank.</p>
2. Open access panel and remove fuel tank cap.	<p>2a. Exposure to extreme temperatures and/or biological hazards such as poisonous plants or insects.</p> <p>2b. Slips/falls could occur while standing on uneven surfaces.</p> <p>2c. Exposure to volatile vapors.</p> <p>2d. Equipment damage (fuel put into incorrect tank)</p>	<p>2a1. Wear the required PPE (listed above).</p> <p>2a2. Check the weather prior to commencing all project activities. Utilize sun screen. Dress in layers if cold weather is expected. Take scheduled breaks to avoid heat exhaustion or hypothermia.</p> <p>2a3. Utilize bug repellent if working in vegetated areas. Watch for animals and insects.</p> <p>2b1. Wear the required PPE (listed above). Steel toed boots should have ankle support.</p> <p>2b2. Be aware of surroundings. Watch for unexpected hazards on the ground in addition to overhead hazards (e.g., low-hanging branches).</p> <p>2c1. Wear the required PPE (listed above).</p> <p>2c2. Fuel machine in a well ventilated area.</p> <p>2c3. Do not put face near fuel tank.</p> <p>2c4. If vapors become too strong, stop fueling and retreat to a ventilated area.</p> <p>2d1. Ensure cap is green and has a picture of a diesel pump prior to inserting hose and dispensing fuel.</p>
3. Inserting fuel hose and dispensing fuel.	<p>3a. Exposure to extreme temperatures and/or biological hazards such as poisonous plants or insects.</p>	<p>3a1. Wear the required PPE (listed above).</p> <p>3a2. Check the weather prior to commencing all project activities. Utilize sun screen. Dress in layers if cold weather is expected. Take scheduled breaks to avoid heat exhaustion or hypothermia.</p> <p>3a3. Utilize bug repellent if working in vegetated areas. Watch for animals and insects.</p>

	<p>3b. Slips/ falls could occur while standing on uneven surfaces 3c. Exposure via dermal contact (splashing) or inhalation of vapors.</p> <p>3d. Explosion/ignition of flammable liquids or vapors.</p>	<p>3b1. Wear the required PPE (listed above). Steel toed boots should have ankle support. 3b2. Be aware of surroundings. Watch for unexpected hazards on the ground. 3c1. Wear the required PPE (listed above). 3c2. Fuel machine in a well ventilated area. 3c3. Do not put face near fuel tank. 3c4. If vapors become too strong, stop fueling and retreat to a ventilated area.</p> <p>3d1. Do not smoke or have open flame/sparks while fueling. 3d2. Have a fire extinguisher present when fueling.</p>
<p>4. Turning pump on/off.</p>	<p>4a. Exposure to extreme temperatures and/or biological hazards such as poisonous plants or insects.</p> <p>4b. Slips/ falls could occur while standing on uneven surfaces.</p> <p>4c. Electrical shock</p>	<p>4a1. Wear the required PPE (listed above). 4a2. Check the weather prior to commencing all project activities. Utilize sun screen. Dress in layers if cold weather is expected. Take scheduled breaks to avoid heat exhaustion or hypothermia. 4a3. Utilize bug repellent if working in vegetated areas. Watch for animals and insects.</p> <p>4b1. Wear the required PPE (listed above). Steel toed boots should have ankle support. 4b2. Be aware of surroundings. Watch for unexpected hazards on the ground.</p> <p>4c1. Ensure electrical connections are in good working condition. 4c2. Do not handle electrical components. 4c3. Follow manufacturer's specifications for operation.</p>
<p>5. Remove fuel hose from tank.</p>	<p>5a. Exposure to extreme temperatures and/or biological hazards such as poisonous plants or insects.</p> <p>5b. Slips/falls could occur while standing on uneven surfaces.</p> <p>5c. Exposure via dermal contact (splashing) or inhalation of vapors.</p>	<p>5a1. Wear the required PPE (listed above). 5a2. Check the weather prior to commencing all project activities. Utilize sun screen. Dress in layers if cold weather is expected. Take scheduled breaks to avoid heat exhaustion or hypothermia. 5a3. Utilize bug repellent if working in vegetated areas. Watch for animals and insects.</p> <p>5b1. Wear the required PPE (listed above). Steel toed boots should have ankle support. 5b2. Be aware of surroundings. Watch for unexpected hazards on the ground.</p> <p>5c1. Wear the required PPE (listed above). 5c2. Fuel machine in a well ventilated area. 5c3. Do not put face near fuel tank. 2c4. If vapors become too strong, stop fueling and retreat to a ventilated area.</p>
<p>6. Replace fuel tank cap and close access panel.</p>	<p>6a. Exposure to extreme temperatures and/or biological hazards such as poisonous plants or insects.</p> <p>6b. Slips/ falls could occur while standing on uneven surfaces.</p> <p>6c. Fingers could be pinched/crushed by spring loaded access panel door.</p>	<p>6a1. Wear the required PPE (listed above). 6a2. Check the weather prior to commencing all project activities. Utilize sun screen. Dress in layers if cold weather is expected. Take scheduled breaks to avoid heat exhaustion or hypothermia. 6a3. Utilize bug repellent if working in vegetated areas. Watch for animals and insects.</p> <p>6b1. Wear the required PPE (listed above). Steel toed boots should have ankle support. 6b2. Be aware of surroundings. Watch for unexpected hazards on the ground.</p> <p>6c1. Wear the required PPE (listed above). 6c2. Keep fingers clear from inside panel and from around access panel door. 6c3. Push access panel closed from the outside. Do not grasp edge of panel with fingers.</p>
<p>On-Site Edits</p>		
<p>HAZARD CATEGORIES: 1) Exposure, 2) Caught/Crushed, 3) Contact, 4) Ergonomics, 5) Falls, and 6) Energy Sources</p>		

JHA Title: Soil Excavation/ Loadout Oversight

BrightFields, Inc. JOB HAZARD ANALYSIS (JHA) FORM

Developed By: Maggie Atterbury	Date: 12/21/16	Work Location: Various
Revised By:	Date:	This JHA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions made in the field have been written on this JHA.
Approved By: 	Date: 12/21/16	

**REQUIRED PPE:** Hard hat; hearing protection; highly visible clothing such as orange coveralls or reflective safety vest; safety glasses; safety shoes (steel-toed boots with ankle support).

**REQUIRED AND/OR RECOMMENDED TOOLS AND EQUIPMENT:** None.

**REQUIRED PERMITS:** None.

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
1. Walking active project area	1a. Exposure to extreme temperatures and/or biological hazards such as poisonous plants or insects.  1b. Slips/trips/ falls could occur while walking on uneven surfaces.  1c. Caught/Crushed by heavy machinery.  1d. Struck by airborne debris.	1a1. Wear the required PPE (listed above). 1a2. Check the weather prior to commencing all sampling activities. Utilize sun screen if sunburn is possible. Dress in layers if cold weather is expected. Take scheduled breaks to avoid heat exhaustion or hypothermia. 1a3. Utilize bug repellent if working in vegetated areas. Watch for animals and insects.  1b1. Wear the required PPE (listed above). Steel toed boots should have ankle support. 1b2. Be aware of surroundings. Watch for unexpected hazards on the ground in addition to overhead hazards (e.g., low-hanging branches).  1c1. Wear the required PPE as listed above. 1c2. Be aware of surroundings. 1c3. Maintain a safe distance from heavy equipment and brush cutting machinery. 1c4. Maintain eye contact with the machine operator.  1d1. Wear the required PPE as listed above. 1d2. Be aware of surroundings. 1d3. Maintain a safe distance from heavy equipment.
2. Observing soil excavation and removal	2a. Exposure to extreme temperatures and/or biological hazards such as poisonous plants or insects.  2b. Slips/trips/ falls could occur while walking on uneven surfaces. Potential fall into excavated area.  2c. Caught/Crushed by heavy machinery.  2d. Struck by airborne debris.	2a1. Wear the required PPE (listed above). 2a2. Check the weather prior to commencing all sampling activities. Utilize sun screen if sunburn is possible. Dress in layers if cold weather is expected. Take scheduled breaks to avoid heat exhaustion or hypothermia. 2a3. Utilize bug repellent if working in vegetated areas. Watch for animals and insects.  2b1. Wear the required PPE (listed above). Steel toed boots should have ankle support. 2b2. Be aware of surroundings. Watch for unexpected hazards on the ground in addition to overhead hazards (e.g., low-hanging branches). 2b3. Remain a safe distance from area being excavated.  2c1. Wear the required PPE as listed above. 2c2. Be aware of surroundings. 2c3. Maintain a safe distance from heavy equipment. 2c4. Maintain eye contact with the machine operator.  2d1. Wear the required PPE as listed above. 2d2. Be aware of surroundings. 2d3. Maintain a safe distance from heavy equipment.

	<p>2e. Exposure to contaminated material</p>	<p>2e1. Review the site-specific Health and Safety Plan for potential contaminant and exposure routes.                  2e2. Wear the required PPE (listed above). If exposure routes are not minimized with the required PPE, implement additional PPE requirements and/or control measures.</p>
<p>3. Observing soil loading</p>	<p>3a. Exposure to extreme temperatures and/or biological hazards such as poisonous plants or insects.</p> <p>3b. Slips/trips/ falls could occur while walking on uneven surfaces.</p> <p>3c. Caught/Crushed by heavy machinery.</p> <p>3d. Struck by airborne debris.</p> <p>3e. Exposure to contaminated material</p>	<p>3a1. Wear the required PPE (listed above).                  3a2. Check the weather prior to commencing all sampling activities. Utilize sun screen if sunburn is possible. Dress in layers if cold weather is expected. Take scheduled breaks to avoid heat exhaustion or hypothermia.                  3a3. Utilize bug repellent if working in vegetated areas. Watch for animals and insects.</p> <p>3b1. Wear the required PPE (listed above). Steel toed boots should have ankle support.                  3b2. Be aware of surroundings. Watch for unexpected hazards on the ground in addition to overhead hazards (e.g., low-hanging branches).</p> <p>3c1. Wear the required PPE as listed above.                  3c2. Be aware of surroundings.                  3c3. Maintain a safe distance from heavy equipment.                  3c4. Maintain eye contact with the machine operator.</p> <p>3d1. Wear the required PPE as listed above.                  3d2. Be aware of surroundings.                  3d3. Maintain a safe distance from heavy equipment.</p> <p>3e1. Review the site-specific Health and Safety Plan for potential contaminant and exposure routes.                  3e2. Wear the required PPE (listed above). If exposure routes are not minimized with the required PPE, implement additional PPE requirements and/or control measures.</p>
<p>On-Site Edits</p>		

HAZARD CATEGORIES: 1) Exposure, 2) Caught/Crushed, 3) Contact, 4) Ergonomics, 5) Falls, and 6) Energy Sources



# **ATTACHMENT C**

## **Example Confined Space Entry Permit and Checklist**



**YES**    **NO**

نہا    نہا

**CLOTHING/EQUIPMENT**

Is special clothing required (boots, chemical suits, glasses, etc.)?

(If so, specify: \_\_\_\_\_)

نہا    نہا

Is special equipment required (e.g. rescue equipment, communications equipment)?

(if so, specify: \_\_\_\_\_)

نہا    نہا

Are special tools required (e.g., sparkproof)?

(If so, specify: \_\_\_\_\_)

**RESPIRATORY PROTECTION**

نہا    نہا

Are MSHA/NIOSH-approved respirators of the type required available at the work site?

نہا    نہا

Is respiratory protection required (.e.g. air-purifying, supplied air, self-contained breathing apparatus, etc.)?

(If so, specify: \_\_\_\_\_)

**TRAINING**

نہا    نہا

Have you been trained in proper use of a respirator?

نہا    نہا

Have you received first aid / CPR training?

نہا    نہا

Have you been trained in confined space entry and do you know what to look for?

**STANDBY / RESCUE**

نہا    نہا

Will there be a standby person on the outside in constant visual or auditory communication with the person on the inside?

نہا    نہا

Will the standby person be able to see and/or hear the person inside at all times?

نہا    نہا

Has the standby person(s) been trained in rescue procedures?

نہا    نہا

Will safety lines and harness be required to remove a person?

نہا    نہا

Are Company rescue procedures available to be followed in the event of an emergency?

نہا    نہا

Are you familiar with emergency rescue procedures?

نہا    نہا

Do you know who to notify and how in the event of an emergency?

**PERMIT**

نہا    نہا

(The permit is an authorization in writing that states that the space has been tested by a qualified person, that the space is safe for entry; what precautions, equipment, etc. are required; and what work is to be done?)

نہا    نہا

Has the confined space entry permit been issued?

نہا    نہا

Does the permit include a list of emergency telephone numbers?

**CONFINED SPACE ENTRY PERMIT**

**I. DESCRIPTION**

DATE: \_\_\_\_\_ TIME \_\_\_\_\_ LOCATION: \_\_\_\_\_  
 CLIENT: \_\_\_\_\_ WO# \_\_\_\_\_  
 DESCRIPTION OF CONFINED SPACE: \_\_\_\_\_  
 PURPOSE OF ENTRY: \_\_\_\_\_  
 DURATION OF ENTRY: \_\_\_\_\_  
 MODIFIED PERMIT CONFINED SPACE: YES \_\_\_\_\_ NO \_\_\_\_\_

**II. CONFINED SPACE HAZARDS (Reference HASP Task/Risk)**

---



---



---



---

**III. MEASURE USED TO ISOLATE SYSTEM AND PROTECT PERSONNEL**

<u>ITEM</u>	<u>YES</u>	<u>NO</u>	<u>ITEM</u>	<u>YES</u>	<u>NO</u>
Space drained and cleaned as much as possible			Portable electrical tools ground and Safe condition		
All lines blanked or valves closed and locked out			Monitoring Instruments calibrated and available		
Systems (electrical/mechanical/other) lock-out, tag-out protected			Communications available for entrants and attendants		
Space purged and ventilated to provide safe work conditions			Communications available for emergency assistance		
Area secure and posted			First aid kit available		
Respiratory protection required, if so, indicate type			Rescue Equipment Available (specify)		
Head, Eye, Skin, Foot protection required, if so, indicate type			Fire extinguisher available (specify)		
Low voltage or explosion-proof lighting provided (as necessary)			Welding/Cutting Permit required? Attach to CSE permit.		
Tripod, mechanical hoist available and utilized			Employees reviewed and signed HASP and permit		
Safety shower and eyewash available			<i>Other requirements (specify)</i>		
Attendant trained and properly equipped			Other:		
Rescue Harness and Lifelines available and utilized			Other:		

**IV. ACTION LEVEL FOR THIS ENTRY**

<u>Condition</u>	<u>Level D</u>	<u>Level C</u>	<u>Level B</u>
Oxygen			
LEL			
Toxics (organic)			
Toxics (inorganic)			

**V. MONITORING**

Monitoring conducted by (print name): \_\_\_\_\_

Monitoring will be conducted: Continuously ( ) or at \_\_\_\_\_ intervals.

Tests	Concentration / Time				
Oxygen					
LEL					
OVA					
HNU					
Monitox					
Draeger					
Other					
Other					

**VI. RESCUE AND EMERGENCY PHONE NUMBER**

Fire Department: \_\_\_\_\_ Police Department: \_\_\_\_\_

Ambulance: \_\_\_\_\_ Medical: \_\_\_\_\_

Special Rescue (as necessary): \_\_\_\_\_

Specify communications available and location: \_\_\_\_\_

**VII. DOCUMENTATION**

A. Entry team members (please print)

1.	2.
3.	4.

B. Permit Space Attendant (print and sign). \_\_\_\_\_

C. Entry Supervisor (print and Sign): \_\_\_\_\_

D. Permit reviewed and approved by (signature, date, and time): \_\_\_\_\_

E. Permit terminated by (signature, date and time): \_\_\_\_\_

F. Reason for termination: \_\_\_\_\_

G. Comments:

\_\_\_\_\_

*Note: The original of this permit must be available during entry operations then maintained in the project files upon completion. A copy of this permit must be forwarded to the Project Manager or Safety Officer upon completion of entry operation.*

# **ATTACHMENT D**

## **Health and Safety Plan Review Record**







# **ATTACHMENT E**

## **Environmental Monitoring Record**

# ATTACHMENT E

## ENVIRONMENTAL MONITORING RECORD

**INSTRUMENT:** \_\_\_\_\_

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

Contractor: \_\_\_\_\_

Project No.: \_\_\_\_\_

Wind Direction: \_\_\_\_\_ Speed: \_\_\_\_\_

Calibration Gas: \_\_\_\_\_ Concentration: \_\_\_\_\_ Span: \_\_\_\_\_

Site Background: \_\_\_\_\_ Action Level(s): \_\_\_\_\_

<u>Time</u>	<u>Monitoring Location</u>	<u>Reading</u>	<u>Action Taken*</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

### Corrective Action\*:

<u>Changes in PPE Level</u>	<u>Work Operation</u>	<u>Reason For Change</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\* Corrective actions taken must be documented whenever readings at or above action levels are reached.

Recorded By: \_\_\_\_\_  
Site Safety & Health Officer

Date: \_\_\_\_\_

# **ATTACHMENT F**

## **Accident Investigation Report**



---

Incident Analysis (Root cause explaining the cause(s) of the accident/incident/near miss):

---

---

---

---

---

What should have been done to avoid the accident/incident/near miss?

---

---

---

---

---

What corrective actions will be done in the future to avoid similar accident/incident/near miss?

---

---

---

---

---

Is this situation indicative to a larger safety problem?

---

---

---

---

---

Preventive Actions (Describe actions that will be taken to prevent recurrence):

---

---

---

---

---

---

---

---

---

---

Report Prepared By: \_\_\_\_\_ Date: \_\_\_\_\_

Employee signature \_\_\_\_\_ Date \_\_\_\_\_

SSHO signature \_\_\_\_\_ Date \_\_\_\_\_

**BELOW TO BE FILLED OUT BY THE SSHO OR OTHER DESIGNATED PERSON**

Have corrective actions been communicated to employees?

Yes  No

How were the corrective action communicated to employees?

---

---

---

---

By: \_\_\_\_\_ Date \_\_\_\_\_

# **ATTACHMENT G**

## **Directions and Map to Wilmington Hospital**

# **ATTACHMENT G**

## **DIRECTIONS TO WILMINGTON HOSPITAL IN THE EVENT OF AN EMERGENCY**

Wilmington Hospital  
14<sup>th</sup> and Washington Streets  
Wilmington, DE 19801

### **From West of the Christina River (near the Riverfront Shops)**

1. Head North to Beech Street
2. Turn Left onto Beech Street
3. Turn Right onto Maryland Avenue
4. Turn Left onto North Adams Street
5. Turn Right onto West 11<sup>th</sup> Street
6. Turn Left onto North Jefferson Street
7. Follow Red Sign to Emergency Room

### **From East of the Christina River**

1. Head North on South Walnut Street
2. Continue on North Walnut Street
3. Turn Left onto West 12<sup>th</sup> Street
4. Turn Right onto North Washington Street
5. Turn Left at Hospital Entrance and Follow Red Sign to  
Emergency Room

## DIRECTIONS TO WILMINGTON HOSPITAL




From the West Side of River:

1. Head North to Beech St
2. Turn left onto Beech St
3. Turn right onto Maryland Ave
4. Turn left onto N Adams St
5. Turn right onto W 11th St
6. Turn left onto N. Jefferson St.
7. Follow Red Sign to Emergency Room

From the East Side of River:

1. Head north on S Walnut St
2. Continue on N Walnut St
3. Turn left onto W 12th St
4. Turn right onto N. Washington St.
5. Turn left at Hospital Entrance and follow Red Sign to Emergency Room



-  Hospital Route
-  Christina River Bridge
-  Christina River Bridge Approaches

Source: ESRI - World Street Map;  
Proposed Christina River Bridge Alignment  
as of December 2017, provided by RK&K.

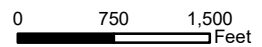


**BrightFields, Inc.**  
Environmental Evaluation  
Investigation, and Remediation

801 Industrial Street  
Wilmington, Delaware 19801  
302-656-9600  
302-656-9700 fax

Hospital Route  
Christina River Bridge Approaches  
Wilmington, Delaware

Drawn	By	Date	Scale:	File Name:
Checked	ALF	12/21/2017	1:18,000	AttGHospRte.mxd
Project #	0985.56.51		Attachment G	





# **ATTACHMENT H**

## **Stakeholders Contact List**

# **ATTACHMENT H**

## **LIST OF EMERGENCY TELEPHONE NUMBERS TO BE POSTED AND/OR PLACED IN THE GLOVE COMPARTMENT OF FIELD VEHICLES**

Once emergency response agencies have been notified, the Project Manager and Safety Officer will be notified immediately, if they are not already present.

<b>BrightFields, Inc., Environmental Consultant</b>		(302) 656-9600 or (800) 846-5248
<b>Environmental Project Manager (BrightFields):</b>	<b>Amanda Finnerty</b>	cell phone (302) 420-6125
<b>Safety Officer (BrightFields):</b>	<b>Nick Piane</b>	cell phone (302) 420-1711
<b>DNREC Project Officer</b>	<b>Robert Asreen</b>	(302) 395-2600
<b>Poison Control Center:</b>		(800) 722-7112
<b>National Response Center:</b>		(800) 424-8802
<b>DNREC Emergency Response</b>		(800) 662-8802