# SUPPLEMENTAL REMEDIAL INVESTIGATION WORK PLAN

## 28-90 REVIEW AVENUE
## Queens, New York

***Prepared for:***

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**c/o Innovo Property Group**
**1370 Avenue of the Americas, 19th Floor**
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LANGAN

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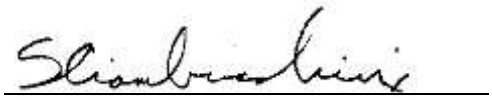
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**CERTIFICATION**

I, Steven A Ciambruschini, certify that I am currently a Qualified Environmental Professional as defined in 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation.



Steven A. Ciambruschini, P.G.

# 1.0 INTRODUCTION

This Supplemental Remedial Investigation Work Plan (SRIWP) was prepared on behalf of 28-90 Review Avenue Owner, LLC (the Requestor) for the property at 28-90 Review Avenue in the Long Island City neighborhood of Queens, New York (the Site). The Requestor intends to enroll into the New York State Brownfield Cleanup Program (BCP) as a volunteer and will implement this SRIWP pursuant to a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC). The scope of work included in the SRIWP was prepared in accordance with comments provided by NYSDEC in a 14 February 2019 BCP Pre-Application meeting. A BCP Application will be submitted concurrently with this SRIWP for NYSDEC review.

The objective of the Supplemental Remedial Investigation (SRI) is to further investigate potential on-site sources of non-aqueous phase liquid (NAPL), and to horizontally delineate NAPL identified in the 2018 RI to assess potential off-site NAPL migration at the southern and western property boundaries. This SRIWP was developed in accordance with the process and requirements identified in the NYSDEC Division of Environmental Remediation (DER)-10 *Technical Guidance for Site Investigation and Remediation* (May 2010) and the New York State Department of Health (NYSDOH) "Guidance for Evaluating Soil Vapor Intrusion in the State of New York, with updates" (October 2006).

# 2.0 SITE BACKGROUND

## 2.1 Site Description

The Site is located at 28-90 Review Avenue in the Long Island City section in Queens, New York and is identified as Block 294 and Lot 106 on the New York City Tax Map. Figure 1 shows the Site location. The Site is ±192,792 square feet and is bounded by an asphalt-paved parking lot to the north, 29th Street followed by an asphalt-paved parking lot associated with a 4 story storage facility to the east, at-grade railroad tracks associated with the Metropolitan Transportation Authority Long Island Rail Road (MTA LIRR) lines to the south, and the Dutch Kills Creek to the west. A map of the Site boundary is shown on Figure 6. The Site is currently developed with two single-story warehouse structures operated as automotive repair facilities, but which are mostly unoccupied. The remainder of the Site is comprised of asphalt-paved and asphalt milling-covered parking areas utilized by month-to-month tenants for vehicle storage, with several office trailers and storage containers present onsite. Vehicle storage ranges from passenger cars to tractor trailers.

Five structures have been recently demolished including two two-story structures; a single-story warehouse structure; a single-story office building; and, a former fueling station canopy.

## 2.2 Surrounding Property Land Use

According to records maintained online by New York City Open Accessible Space Information System (NYCOASIS), surrounding properties include multi-story industrial/manufacturing buildings, parking lots, and the Metropolitan Transit Authority (MTA) Long Island Rail Road (LIRR). The following is a summary of surrounding property usage:

| Direction | Adjacent Properties | | | Surrounding Properties |
|---|---|---|---|---|
| | Block No. | Lot No. | Description | |
| North | 294 | 120 | Asphalt-paved parking (28-20 Borden Avenue) | Borden Avenue followed by industrial/ manufacturing buildings |
| East | 294 | 150 | 29th Street followed by an asphalt-paved parking lot associated with a 4-story self-storage facility (29-00 Review Avenue) | Industrial/ manufacturing buildings |
| South | 294 | 1 | Metropolitan Transportation Authority Long Island Rail Road | Industrial Facilities followed by Newtown Creek |
| West | Dutch Kills Creek | | | MTA LIRR lines and industrial/ manufacturing buildings |

Public infrastructure (storm drains, sewers, and underground utility lines) exists within the street to the east of the Site. The only sensitive receptor (as defined in DER-10) located with a half mile of the Site is the Robert F. Wagner, Jr. Secondary School for Arts and Technology (approximately 2,000-feet northeast of the Site).

## 2.3 Site Physical Conditions

### 2.3.1 Topography

Based on the 8 March 2019 Topographic, Boundary, and Utility Survey issued by Langan, existing Site grades vary between about el 5 and el 10 feet (all elevations provided in this report are with respect to the North American Vertical Datum of 1988 [NAVD88]). Isolated Site areas with relatively higher elevations (up to approx. el 15.5) exist along the southern property line near the adjacent MTA LIRR tracks, and Site grades along the Dutch Kills Basin waterfront slope steeply down towards the water.

### 2.3.2 Geology

Based on test borings completed during Langan's 2019 Remedial Investigation and geotechnical investigations completed in 2017 and 2018, the Site is underlain by an 8 to 25 foot thick layer of historic fill generally consisting of fine to coarse sand with varying amounts of gravel, silt, clay, brick, concrete, asphalt, and wood fragments. Soil borings advanced as part of the 2019 RI terminated at the top of the clay confining unit to eliminate the potential for downward migration of contaminants within the overlying unconsolidated fill layer. As such, historic fill was observed during the 2019 RI extending from surface grade to between approximately 8- and 16-feet below grade surface (bgs).

Geotechnical investigations identified an about 1.5 to 20 foot-thick stratum of inferred former marsh deposit materials below the fill in all the borings, except in two locations the northeastern-most portion of the Site. This stratum was observed to generally consist of clay, silt, sand, and peat. During the RI, the top of the former marsh deposits (gray clay) was observed at depths of about 8 to 16 feet bgs at all locations, with the exception of LSB-4 and LSB-5. An 1859 historic topographical map of the Counties of Kings and Queens prepared by H. F. Walling indicates the Site was located within a marsh area adjacent to the Dutch Kills Basin. All soil borings advanced during the RI were terminated at the top of the clay layer; therefore, the thickness of the clay layer observed during the geotechnical investigation was not confirmed during the RI.

The USGS "Bedrock and Engineering Geologic Maps of New York County and Parts of Kings and Queens Counties, New York," indicates that the bedrock underlying the Site is part of the Hartland Formation. Geotechnical investigations identified the presence of mica schist bedrock in all borings, except two in the easternmost portion of the Site, between 58 and 74 feet below grade. Decomposed / weathered mica schist rock was encountered, in about half of the borings advanced as part of the geotechnical investigation at depths between 50 and 70 feet below grade. Competent bedrock was not encountered during the 2018 RI.

### 2.3.3 Hydrogeology

Groundwater flow is typically topographically influenced, as shallow groundwater tends to originate in areas of topographic highs and flows toward areas of topographic lows, such as rivers, stream valleys, ponds, and wetlands. A broader, interconnected hydrogeologic network often governs groundwater flow at depth or in the bedrock aquifer. Groundwater depth and flow direction are also subject to hydrogeologic and anthropogenic variables such as precipitation, evaporation, extent of vegetation cover, coverage by impervious surfaces, and subsurface structures. Other factors influencing groundwater include depth to bedrock, the presence of anthropogenic fill, and variability in local geology and groundwater sources or sinks. Groundwater in New York City is not used as a potable water source. Potable water provided to the City of New York is derived from surface impoundments in the Croton, Catskill, and Delaware watersheds.

Synoptic groundwater level measurements were collected on 26 November 2018. Depth to groundwater was measured between about 2.8 to 7.0 feet bgs during the RI. Based on an investigation completed at the Site in 2009 by Impact Environmental and the results of the 2018 RI, groundwater flow is to the northwest toward the Dutch Kills Creek.

### 2.3.4 Wetlands

The Site is bound to the west by the Dutch Kills Creek. The Dutch Kills Creek is mapped by the NYSDEC as Saline Surface Water (SD) and as a Tidal Wetland (LZ – littoral zone). The limits of the open water area associated with the Dutch Kills have been delineated based on the elevation of mean high water (MHW) and mean higher high water (MHHW). The elevation of MHW within the Dutch Kills adjacent to the project Site is reported to be 1.9 feet (NAVD88) according to Langan's Topographic, Boundary and Utility Survey dated 8 March 2019 and to the National Oceanic and Atmospheric Administration (NOAA) VDatum Version 3.7 Utility, while MHHW is reported to be 2.14 feet (NOAA Tide Station 8518699, Williamsburg Bridge NY). Mean high water and MHHW are bound by the existing vegetated embankment along the stream.

In a letter dated 5 December 2018, the NYSDEC provided a jurisdictional determination (NYSDEC ID No. 2-6304-01745/00002) that identified that the Site and proposed development were not within the jurisdiction of the NYSDEC under the Tidal Wetlands Act (Article 25 of the Environmental Conservation Law) or the Freshwater Wetlands Act (Article 24 of the Environmental Conservation Law). Based on this determination, no tidal or freshwater wetlands permits are required for the proposed Site redevelopment.

## 2.4 Proposed Development Plan

All onsite buildings will be demolished as part of the proposed Site redevelopment. The proposed future use of the Site will consist construction of a slab-on-grade four-story industrial building consisting of warehouse space, a truck shipping terminal, and office space with a first floor footprint of approximately 47,145 square feet located in the approximate center of the property and driving lanes located on all four sides of the building. Nine loading bays to accommodate tractor trailers will be located on the exterior parking structure on the western portion of the Site building. The approximately 53,660-square foot second floor will contain warehouse and office space, and 13 loading bays to accommodate tractor-trailers and/or straight trucks. The approximately 72,540-square foot third and fourth floors will include warehouse space which cantilevers above exterior parking ramps on the southern side of the building, office space, and 15 loading bays to accommodate straight trucks on each of the third and fourth floors. A series of ramps and exterior parking levels are proposed to be constructed along the western side of the proposed building and will consist of parking to accommodate the nine ground floor tractor trailer loading bays, an auto parking mezzanine with 69 parking spaces above the ground floor loading bays, a second auto parking mezzanine with 72 parking spaces above the first parking mezzanine and below the second floor loading bays, and second floor parking to accommodate nine tractor trailers and four straight trucks adjacent to the west of the second floor warehouse loading bays. The third and fourth floors of the exterior parking structure will each contain 15 loading bays to accommodate straight trucks. Trucking ramps and turnaround areas will be located on mezzanine levels between the second, third, and fourth floor loading bay levels.

## 2.5 Environmental History

According to Langan's review of previous environmental assessment and investigation reports prepared for the Site, and listed in the subsequent section, the Site was historically occupied by a Texaco petroleum bulk storage facility from approximately 1915 through 1970 and was subsequently converted for vehicle repair, storage, and refueling use. The Site is currently identified in the NYSDEC Petroleum Bulk Storage (PBS) database for the following:

| PBS Site No. 2-238643<br>Site Name: AA Trucking | | | | |
|---|---|---|---|---|
| Tank No. | Type | Status | Capacity (gal) | Contents |
| 001 | UST | Closed In Place - 4/28/1999 | 4000 | Diesel |
| 002 | UST | Closed In Place - 4/28/1999 | 4000 | Diesel |
| 003 | UST | Removed - 4/28/1999 | 4000 | Diesel |
| 004 | UST | Removed - 8/25/2017 | 5000 | No. 2 Fuel Oil |
| 005 | AST | Removed - 8/22/2017 | 275 | Lube Oil |
| 006 | AST | Removed - 1/29/2018 | 275 | Waste Oil |
| 007 | AST | Removed - 8/22/2017 | 275 | Lube Oil |
| 008 | AST | Removed - 4/28/1999 | 275 | Other |
| 009 | AST | Removed - Date Not Reported | 4000 | Diesel |
| 010 | AST | Removed - 1/29/2018 | 275 | Waste Oil |
| 011 | AST | Removed - 1/29/2018 | 275 | No. 2 Fuel Oil |
| 012 | AST | Removed - 1/29/2018 | 275 | No. 2 Fuel Oil |
| **PBS Site No. 2-612851<br>Site Name: Long Island City Truck Repair Corp.** | | | | |
| Tank No. | Type | Status | Capacity | Contents |
| 1 | AST | In Service | 250 | Waste Oil |

Historical documentation identifies the potential former presence of the following unregistered tanks:

| Type | Capacity | Contents |
|---|---|---|
| UST | Unknown | Gasoline |
| UST | Unknown | Unknown |
| UST | Unknown | Unknown |
| UST | Unknown | Unknown |
| AST | 275,000 | Crude Oil |
| AST | 275,000 | Fuel Oil |
| AST | 275,000 | Kerosene |
| AST | 275,000 | Naphtha |
| AST | 275,000 | Gasoline |
| AST | 275,000 | Gasoline |
| AST | 20,000 | Unknown |
| AST | 20,000 | Unknown |
| UST | 15,000 | Diesel |
| UST | 15,000 | Diesel |
| UST | 15,000 | Diesel |
| UST | 15,000 | Diesel |
| AST | 275 | Waste Oil |
| AST | 275 | Lube Oil |
| AST | 150 | Waste Oil |

Six closed NY Spills records and one open spill are associated with the Site. Four of the spills which occurred between 1994 and 2008 were limited in the volume of petroleum released and were administratively closed. NYSDEC Spill No. 9010146 was reported in December 1990 when petroleum impacts were observed in soil and floating product (NAPL) was identified on groundwater on the eastern portion of the Site. Following additional investigation and approximately one year of product monitoring and recovery via bailing, the spill was administratively closed in November 1991. NYSDEC Spill No. 0807459 was reported in 2008 when petroleum was identified on groundwater during completion of an environmental investigation. Following completion of a second investigation and three rounds of quarterly groundwater monitoring, the spill was administratively closed in 2010 based on analytical results which revealed concentrations of gasoline related compounds remained marginally above the NYSDEC standards. Langan completed a remedial investigation (RI) November 2018, the results of which identified the presence of NAPL and elevated concentrations of SVOCs and VOCs in soil in soil and groundwater above the applicable NYSDEC criteria. Based on field observations and analytical results of soil, groundwater, and soil vapor samples collected, Spill No. 1809113 was reported to NYSDEC on 29 November 2018. Details regarding the RI are provided in Section 2.7.

## 2.6 Previous Environmental Reports

Previous environmental correspondence, environmental site assessment reports, and environmental investigation reports were provided for review prior to field investigation activities completed as part of the December 2018 RI. Environmental correspondence, assessments, and investigation reports provided for review are listed below and are summarized in detail in Section 3.3 of the February 2019 RI Report.

- *Subsurface Investigation,* prepared by Tyree Brothers Environmental Services, Inc. (Tyree), dated May 1990
- *Monitoring Well Installation and Tank Tightness Testing Summary Letter*, prepared by Tyree, dated 1 October 1990
- *Various Correspondence Between Tyree and NYSDEC, dated May 1990 through November 1991*
- *Remote Sensing Survey Ground Penetrating Radar Investigation*, prepared by Impact Environmental (Impact), dated 28 July 1999
- *Tank Closure Affidavit*, prepared by The Franklin Company, dated 11 May 1999

- *Tank Closure Affidavit*, prepared by Alvin Petroleum Systems, Inc., dated 5 August 1999
- *Phase I ESA*, prepared by Tyree, dated September 2001
- *Subsurface Investigation*, prepared by Impact, dated 2 October 2008
- *Investigation Summary Report*, prepared by Impact, dated 24 June 2009
- *Quarterly Monitoring Report*, prepared by Impact, dated 12 March 2010
- *Quarterly Monitoring Report*, prepared by Impact, dated 11 June 2010
- *Quarterly Monitoring Report*, prepared by Impact, dated 10 September 2010
- *Groundwater Monitoring Well Decommissioning Letter*, prepared by Impact, dated 9 August 2011
- *Summary of Remediation Completed*, prepared by Impact, dated 16 January 2012
- *Phase I ESA*, prepared by Impact, dated 25 June 2014
- *Draft Phase I ESA*, prepared by Partner, dated 23 September 2015
- *Phase I ESA*, prepared by Partner, dated 8 June 2016
- *Draft Phase I ESA*, prepared by ATC Group Services LLC, dated 8 June 2017
- *Draft Remedial Investigation Report*, Langan, dated 8 February 2019

Findings of the February 2019 Draft RI are included in Section 2.7 of this SRIWP. A figure showing all previous soil and groundwater sampling locations and existing, abandoned/removed and suspected USTs is provided as Figure 6, and results of historic soil sampling are provided in Table 2. Summaries of environmental findings of these reports (not including the February 2019 RIR) are provided below:

**Spill No. 9010146 – Tyree Brothers Environmental Services, Inc. (1990-1991)**

Four soil borings (B-1 through B-4) and two groundwater monitoring wells (W-1 and W-2) were installed on the eastern portion of the Site to evaluate subsurface impacts associated with three active 4,000-gallon diesel (formerly gasoline) underground storage tanks (USTs), and on the

southern portion of the Site to evaluate in the area of the former 275,000-gallon Texaco Terminal aboveground storage tanks (ASTs).

- Soil analytical results detected benzene, toluene, ethylbenzene, and xylenes (collectively referred to as BTEX) at concentrations up to 70,530 parts-per-billion (ppb) and recoverable petroleum hydrocarbons at concentrations up to 56,432 ppb. The highest BTEX and recoverable petroleum hydrocarbons were detected in soil boring B-1, advanced adjacent to the active 4,000-gallon USTs.
- Groundwater monitoring well W-1 (collocated with B-1) contained approximately 3 inches of light non-aqueous phase liquid (LNAPL) that was sampled and determined to be consistent with No. 2 fuel oil or diesel fuel.
- The observation of LNAPL in W-1 described above was reported to NYSDEC and Spill No.9010146 was assigned on 18 December 1990.
- The three 4,000-gallon USTs were tightness tested on 2 June 1990 and passed; however, it was reported that a leaking diesel pump had been repaired/replaced prior to the tank tightness testing.
- Four additional groundwater monitoring wells (W-3 through W-6) were installed in June 1990. Monitoring well gauging records revealed that up to 12-inches of LNAPL was detected in W-1 (adjacent to the 4,000-gallon USTs) and up to 0.875-inch of LNAPL was detected in W-3 (inferred to be downgradient of the USTs).
- Approximately 8-gallons of free-phase product had been removed from the wells via bailing as of 27 August 1990.
- NYSDEC administratively closed Spill No. 9010146 on 8 November 1991 based on ongoing NAPL recovery, review of monitoring well gauging results that showed a declining trend in LNAPL thickness, and results of quarterly groundwater monitoring which were not provided to Langan for review.
- An affidavit prepared by The Franklin Company dated 11 May 1999 documented the closure-in-place of three 4,000-gallon diesel USTs by filling to capacity with an unspecified inert material.

**Spill No. 0807459 – Impact Environmental (1999-2012)**

Impact Environmental completed a geophysical investigation in 1999 to locate potential undocumented USTs. The investigation located subsurface metallic anomalies consistent with potential USTs adjacent to a former site building on the northeast portion of the Site. An affidavit prepared by Alvin Petroleum Systems, Inc. dated 5 August 1999 documented the closure-in-place

of two 550-gallon USTs via filling to capacity with concrete. It is unclear if these USTs are related to those identified by the geophysical survey completed by Impact.

Additional subsurface investigation, quarterly groundwater monitoring and LNAPL recovery was completed at the Site by Impact between 2008 and 2012. The 2008 Subsurface Investigation included installation of six soil borings (SP-1 through SP-6) and six one-inch diameter groundwater monitoring wells (GW-1 through GW-6). Observations of LNAPL in all groundwater monitoring wells installed and the detection of gasoline related VOCs in groundwater samples was reported to NYSDEC, and Spill No. 0807459 was assigned on 2 October 2008. Findings of the 2008 Subsurface Investigation included:

- Six soil borings (SP-1 through SP-6) were advanced to a depth of approximately 16-feet below grade.
- Soil sample analytical results were compared to the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 Recommended Soil Cleanup Objectives (RSCOs).
- VOCs were not detected in any of the soil samples collected at concentrations exceeding the TAGM 4046 RSCOs.
- Low levels of SVOCs were detected in all soil samples at concentrations above the TAGM 4046 RSCOs.
- Measurable NAPL was detected in all groundwater monitoring wells ranging in thickness from 0.9-feet to 1.4-feet.
- Low levels of gasoline related VOCs were detected in groundwater at concentrations marginally exceeding the Division of Water Technical and Operational Guidance Series 1.1.1 (TOGS) Ambient Water Quality Standards and Limitations.

Additional environmental investigation was completed at the Site in 2009 in accordance with the NYSDEC-approved Remedial Investigation Work Plan (RIWP) dated 14 November 2008 to determine the extent of petroleum impacts and groundwater flow direction. Findings as documented in the 2009 Investigation Summary Report prepared by Impact included:

- Six soil borings and six four-inch diameter monitoring wells (MW-SP-1 through MW-SP-6) were installed to depths of up to 20-feet below grade.
- Elevated PID field screening results were identified in all soil borings completed, and strong petroleum odors and dark staining were also observed.
- Soil samples collected from between 5- and 12-feet below grade revealed limited detections of VOCs and SVOCs above TAGM 4046 RSCOs.

- All previously installed groundwater monitoring wells and the additional six groundwater monitoring wells installed as part of the 2009 investigation were gauged and LNAPL was not detected in any of the wells, with the exception of MW-7H which contained 0.01-foot of NAPL.
- Groundwater samples collected from MW-SP-1 through MW-SP-6 detected gasoline-related VOCs at concentrations exceeding the NYSDEC GWQS.
- Petroleum fingerprint analysis revealed that groundwater impacts were consistent with a combination of heavy fuel oil and gasoline.
- Based on the findings of the supplemental investigation, Monitored Natural Attenuation (MNA) was proposed.

Quarterly groundwater monitoring was performed between 2010 and 2011, including NAPL removal via a sump skimmer in MW-7H and via bailing at other locations where NAPL was observed. Based on the quarterly monitoring reports submitted, NYSDEC administratively closed Spill No. 0807459 on 27 September 2010. Impact prepared a letter dated 9 August 2011 which documented the decommissioning of all on-site monitoring wells.

**Phase I Environmental Site Assessments - Multiple (2001-2017)**

Multiple Phase I ESAs have been prepared for the property between 2001 and 2017. The most recent Phase I ESA dated 8 June 2017 was prepared by ATC on behalf of TA Realty LLC. No Recognized Environmental Conditions (RECs) or Controlled Recognized Environmental Conditions (CRECs) were identified in the 2017 ATC Phase I ESA. The following Historical Recognized Environmental Conditions (HRECs) were identified:

- Historical Site use as a petroleum bulk storage facility containing one 275,000-gallon crude oil AST, one 275,000-gallon kerosene AST, one 275,000-gallon naptha AST, and two 275,000-gallon gasoline ASTs was observed between 1920 and 1970. Site use at the time of the Phase I ESA as a trucking, auto repair, and storage facility was first identified on historical resources in 1970. Historical site use was identified by ATC as an HREC.
- NYSDEC Spill cases 0807459, 9600032, 9311731, 9010146, and 0803348 were assigned to the property and had been administratively closed between 1990 and 2010. Based on the closed regulatory status of these spills, ATC identified these closed spills as an HREC.
- Two closed-in-place 4,000-gallon diesel USTs, one closed-removed 4,000-gallon diesel UST, and one in-service 5,000-gallon No. 2 fuel oil UST were identified in the NY UST database. The 5,000-gallon No. 2 fuel oil UST was determined to be an AST that was no longer in use and was improperly registered with NYSDEC. Based on the investigations and remedial actions completed in the vicinity of the closed-in-place 4,000-gallon USTs

and the closed-removed 4,000-gallon UST and issuance of a Spill Closure letter by NYSDEC in 2010, ATC identified these USTs as a HREC.

## 2.7 Draft Remedial Investigation Report (Langan, February 2019) and Areas of Concern

Langan completed a remedial investigation (RI) in accordance with the Remedial Investigation Work Plan (RIWP) dated September 2018 and submitted to the New York City Office of Environmental Remediation (NYCOER) for acceptance into the NYC Voluntary Cleanup Program (VCP). Based on field observations and analytical results of soil, groundwater, and soil vapor samples collected, Spill No. 1809113 was reported to NYSDEC on 29 November 2018. A detailed discussion of subsurface impacts identified in soil, groundwater, and soil vapor are presented in the February 2019 Draft RIR. The RI consisted of the following:

- A geophysical survey to identify potential USTs, underground structures, and utilities;
- Advancement of 25 soil borings to depths that ranged between approximately 12 and 16 feet below ground surface (bgs); and collection of 43 soil samples (including 2 quality assurance/quality control [QA/QC] duplicate samples);
- Installation of 14 groundwater monitoring wells and collection of 15 groundwater samples (including 1 QA/QC duplicate sample); and,
- Installation of 12 temporary soil vapor sampling probes and collection of 10 soil vapor samples (including 1 duplicate sample).

Based on the findings of previous environmental reports, seven potential AOCs were identified and investigated during Langan RI as listed below. Detailed descriptions of each AOC and the investigations completed to evaluate subsurface impacts in these AOCs are included in the 2019 RIR prepared by Langan. Locations of the AOCs are shown on Figure 4 of the February 2019 Draft RIR and Figure 6 of this SRIWP.

| ***Areas of Concern*** | ***Rationale*** |
|---|---|
| *AOC-1: Former Gasoline Filling Area* | The May 1990 Subsurface Investigation Report prepared by Tyree documents the presence of three 4,000-gallon diesel USTs which reportedly previously contained gasoline, a former terminal loading rack, and pump island located on the eastern portion of the Site. Up to 12 inches of NAPL detected in monitoring wells in this vicinity resulted in the assignment of Spill No. 9010146 by NYSDEC, which was administratively closed following NAPL recovery and measured declining NAPL thickness over time. Additionally, four USTs were reportedly closed-in-place in 1999; however, no closure documentation of laboratory analytical results was provided. |
| *AOC-2: Former Gasoline AST Area* | Based on Langan's review of historical Sanborn Fire Insurance Maps, two 275,000-gallon gasoline ASTs were shown on the southeastern portion of the Site from 1936 through 1970. |
| *AOC-3: Former Gasoline Truck Filling Area* | A gasoline filling island canopy is shown on historical Sanborn Fire Insurance Maps on the east-central portion of the Site between 1936 and 1970, when the Site was occupied by the Texaco petroleum bulk storage facility. |
| *AOC-4: Former Heavy Petroleum Distillate AST Area* | Four 275,000-gallon ASTs containing crude oil, Navy fuel oil, kerosene, and naphtha are shown on historical Sanborn Fire Insurance Maps in the southern portion of the Site between 1936 and 1970, when the Site was occupied by the Texaco petroleum bulk storage facility. |
| *AOC-5: Former Pump House Area* | A pump house containing two horizontal steam boilers is shown on historical Sanborn Fire Insurance Maps in the southwestern portion of the Site between 1936 and 1970. The pump house is shown located at the end of a pipe gallery that is constructed adjacent to the six 275,000-gallon ASTs and continues to a building associated with four 15,000-gallon USTs with unspecified contents. |

| ***Areas of Concern*** | ***Rationale*** |
|---|---|
| *AOC-6: Former Garage Area* | A garage is shown on historical Sanborn Fire Insurance Maps in the central portion of the Site between 1936 and 1970. This building remains on-Site in more recent maps; however, it is labeled for unspecified commercial use. Unreported releases associated with vehicle repair and the storage of hazardous substances typically associated with vehicle maintenance may have adversely affected soil, groundwater, and/or soil vapor in this area. |
| *AOC-7: Historical Operations as a Trucking Terminal* | Following the historical Site use as the Texaco petroleum bulk storage facility, the Site was used as a trucking terminal between 1979 and 2006 according to historical Sanborn Fire Insurance Maps. Unreported releases associated with truck terminal operations including the storage and use of petroleum products or degreasers may have adversely affected soil, groundwater, and/or soil vapor. |

Soil borings, groundwater monitoring wells, and temporary soil vapor sampling probes were installed and soil, groundwater, and soil vapor samples were collected to evaluate each of the AOCs listed above. Findings of the February 2019 Draft RIR included evidence of petroleum impacts in soil, groundwater, and soil vapor including field observations of NAPL, odor, and elevated PID readings. Field observations of NAPL in soil and groundwater are summarized in the table below and are described in detail in Sections 5.3 through 5.5 of the February 2019 Draft RI. Locations where NAPL was observed in soil and/or groundwater during the RI are shown on Figure 5 of this SRIWP.

| **Location** | **Depth To Water** | **Maximum PID Reading** | **Staining/Odors Observed** | **NAPL Observed** |
|---|---|---|---|---|
| LSB-2/ LMW-1 | 7 feet bgs | 49.3 ppm at 6 feet bgs | Odors | 10 to 12 feet bgs |
| | 5.6 feet bgs (LMW-1) | 15,000 ppm (LMW-1) | Odors | 0.1-foot LNAPL (LMW-1) |
| LSB-5/ LMW-4 | 6 feet bgs | 160.8 ppm at 12 feet bgs | Odors | 10 to 12 feet bgs |
| | 6.58 feet bgs (LMW-4) | 15,000 ppm (LMW-4) | Odors | 0.18-foot LNAPL 0.2-foot DNAPL (LMW-4) |
| LSB-6/ | 6 feet bgs | 60.6 ppm at 12 feet bgs | Odors | 7 to 7.5 feet bgs |

| Location | Depth To Water | Maximum PID Reading | Staining/Odors Observed | NAPL Observed |
|---|---|---|---|---|
| LMW-5 | 6.10 feet bgs (LMW-5) | 63.3 ppm (LMW-5) | Odors | 0.1-foot (LMW-5) |
| LSB-10/ LMW-8 | 7.5 feet bgs | 231.5 ppm at 10.5 feet bgs | Odors | 8 to 10 feet bgs |
| | 7.0 feet bgs (LMW-8) | 4.3 ppm (LMW-3) | Odors | None |
| LSB-13/ LMW-10 | 6 feet bgs | 92.6 ppm at 9 feet bgs | Staining and Odors | 7 to 9 feet bgs |
| | 6.20 feet bgs (LMW-10) | 3.3 ppm (LMW-10) | None | None |
| LSB-16 | 6 feet bgs | 105.4 ppm at 6 feet bgs | Staining and Odors | 4 to 6 feet bgs |
| LSB-18/ LMW-12 | 4 feet bgs | 1,335 ppm at 4.5 feet bgs | Odors | None |
| | 2.90 feet bgs (LMW-12) | --- | Odors | 0.1-foot LNAPL (LMW-12) |
| LSB-22 | 7 feet bgs | 370.6 ppm at 10 feet bgs | Staining and Odors | None |
| LSB-23 | 6 feet bgs | 40.9 ppm at 11 feet bgs | Odors | 11 to 13 feet bgs |
| LSB-24 | 4 feet bgs | 75.0 ppm at 8 feet bgs | Staining and Odors | None |
| LSB-25 | 10 feet bgs | 0.7 ppm at 12 feet bgs | None | 12 feet bgs |

*NOTES: ND – Not Detected; bgs – Below Grade Surface and/or below monitoring well top of casing; ppm – parts-per-million*
*--- Due to equipment malfunction at the time of groundwater sample collection, a PID reading at the monitoring wellhead was not completed.*

Soil, groundwater, and soil vapor sample analytical results are discussed in detail in Sections 5.3 through 5.5 of the February 2019 Draft RI and are summarized below:

*Soil:*

Laboratory analytical results of soil samples collected during the RI were compared to 6 NYCRR Part 375 Restricted Use SCOs for Commercial and/or Industrial site use. Soil sample analytical results are included on Figure 2; exceedances of the Restricted Use SCOs included:

- **SVOCs** in three shallow soil samples and in five deeper soil samples exceeded the criteria for Restricted Use SCOs for Industrial Use. Of these samples, SVOCs were also detected at concentrations exceeding the Restricted Use SCOs for Commercial Use, but below Industrial Use, in one of the shallow soil samples and in two of the deeper soil samples.
- **PCBs** were detected at concentrations exceeding Restricted Use SCOs for Commercial Use in one sample.
- **Metals** were detected at concentrations exceeding Restricted Use SCOs for Commercial and/or Industrial Use in 17 soil samples. Specifically, metals were detected at

concentrations exceeding Restricted Use SCOs for Commercial Use, but below Restricted Use SCOs for Industrial Use in three soil samples. In nine soil samples multiple compounds were detected at concentrations that exceeded Restricted Use SCOs for both Commercial and Industrial Use. Additionally, in five soil samples, concentrations were detected which exceeded Restricted Use SCOs for Industrial Use where no additional compounds exceeded any Restricted Use SCOs for Commercial Use.

*Groundwater:*

Laboratory analytical results of groundwater samples collected as part of the RI were compared to the New York State 6 NYCRR Part 703.5 Class GA Groundwater Quality Standards and Division of Water Technical and Operational Guidance Series 1.1.1 (TOGS), collectively referred to as the groundwater quality standards (GWQS). Groundwater analytical results are summarized on Figure 3. The following exceedances of the GWQS were detected:

- **VOCs** typically associated with gasoline impacts were detected at concentrations exceeding the GWQS in six monitoring well locations.
- **SVOCs** were detected at concentrations exceeding the GWQS in four monitoring wells locations.
- **Pesticides** including chlordane were detected in one groundwater sample location at a concentration exceeding the GWQS.
- **Total Metals** were detected at concentrations exceeding the GWQS in all groundwater samples collected.
- **Dissolved Metals** were detected at concentrations exceeding the GWQS in 13 groundwater monitoring well locations.

*Soil Vapor:*

Soil vapor sample results were compared to the New York State Department of Health (NYSDOH) Final Guidance for Evaluation of Soil Vapor Intrusion Matrices A through C dated October 2006 and revised in May 2017. Soil vapor results are included on Figure 4 and revealed the presence of chlorinated VOCs included in Matrices A through C as discussed below:

- **Matrix A CVOCs** carbon tetrachloride and trichloroethylene (TCE) were detected in LSV-2. Carbon tetrachloride, 1,1-dichloroethylene, cis-1,2-dichloroethylene, and TCE were not detected in any other samples collected.
- **Matrix B CVOCs** were detected in eight soil vapor samples including 1,1,1-trichloroethane in LSV-2 and LSV-3 and tetrachloroethylene (PCE) in LSV-2 through LSV-9. PCE, 1,1,1-trichloroethane, and methylene chloride were not detected in any other samples collected.

- The **Matrix C CVOC** vinyl chloride was detected in LSV-10. Vinyl chloride was not detected in any other samples collected.

All CVOCs listed above were detected at concentrations below the recommended threshold for monitoring established within the NYSDOH Soil Vapor Intrusion Matrices with the exception of vinyl chloride in LSV-10.

The presence of VOCs commonly associated with petroleum impacts which were identified above the GWQS in groundwater were also detected in all soil vapor samples including benzene, toluene, ethylbenzene, xylenes (collectively referred to as BTEX), and 1,2,4-trimethylbenzene. Ethylbenzene, o-xylene, m&p-xyelene, and toluene were detected in all samples collected; the highest concentration of each compound was detected in LSV-10. Benzene was detected in samples LSV-2 through LSV-9; the highest concentration was detected in LSV-9. 1,2,4-trimethylbenzene was detected in samples LSV-2 through LSV-10; the highest concentration was detected in LSV-10.

Based on the findings of the February 2019 Draft RI summarized above, the presence of NAPL both in soil and groundwater is attributed to historical site operations including a major oil storage facility (MOSF), automotive garage, gasoline filling station, and a trucking terminal.

Historical site operations have impacted the subsurface at the Site, most notably groundwater in which elevated concentrations of BTEX and breakdown products as well as the presence of NAPL were documented during the RI. Concentrations of gasoline-related VOCs above the GWQS were detected in five monitoring wells in the eastern, central, and southern portions of the Site; one in AOC-1, three in the vicinity of the former bulk petroleum storage ASTs associated with AOC-2 and AOC-4; and one in the vicinity of the former garage in AOC-6. Elevated concentrations of VOCs above the Commercial RUSCOs were not detected in soil, suggesting that the petroleum in soil is weathered where not present as NAPL as discussed above. Elevated concentrations of SVOCs and metals exceeding the Commercial and Industrial RUSCOs are likely indicative of the quality of fill historically placed at the Site; however, these SVOCs impacts may also be attributed to historical petroleum-related site operations.

The chlorinated VOC vinyl chloride was detected in AOC-2 in the southern portion of the Site at a concentration above the recommended threshold for monitoring established within the NYSDOH Soil Vapor Intrusion Matrices. PCE was detected only marginally below the recommended threshold for monitoring established within the NYSDOH Soil Vapor Intrusion Matrices in the central and northern portions of the Site.

## 3.0 SCOPE OF WORK

The objective of this SRIWP is to investigate and characterize "the nature and extent of the contamination at and/or emanating from the brownfield site," per Environmental Conservation Law (ECL) Article 27, Title 14 (Brownfield Cleanup Program) and to address potential data gaps in the 2018 RI as per the NYSDEC Pre-Application meeting held on 14 February 2019. The field investigation will include the tasks listed below to supplement the data and findings of previous investigations and the February 2019 RIR. The rationale for each sampling location and analytical parameters for each proposed sample are provided in Table 1 and the locations of the proposed borings and monitoring wells is shown on Figure 6.

Geophysical Survey

- Langan will coordinate with a private utility markout contractor to complete a full geophysical survey throughout the areas of the Site that were determined to be inaccessible during the geophysical surveys previously completed in June and July 2017, including building interiors, to identify if any subsurface anomalies exist and to assess for the presence of subsurface structures, piping, and underground storage tanks which may contribute to the presence or migration of contamination. Exterior portions of the Site will be cleared of vehicles and debris and access to building interiors will be arranged by Ownership for geophysical survey access.

Soil Borings and Sampling

- Advancement of up to 20 soil borings will be completed at the Site to horizontally delineate NAPL to the west and south of the areas investigated during the November 2018 RI and to evaluate potential remedial options based on subsurface conditions. All soil borings will be advanced to the top of the clay layer, which is anticipated to be encountered between 8 and 16 feet below sidewalk grade.
- Discrete soil samples will be collected from the two-foot interval above the groundwater interface, the two-foot interval above the top of the clay layer, and the most impacted two-foot interval if NAPL is observed.
- Soil samples will be submitted for laboratory analysis of NYSDEC Commisioner's Policy CP-51-specified VOCs and SVOCs to evaluate for impacts from fuel oil and gasoline, in addition to total lead. Samples will also be collected for perfluoroalkyl substances (PFAS) and 1,4-dioxane analysis in accordance with typical NYSDEC BCP requirements.
- Following the completion of delineation sampling, additional soil borings will be advanced within the areas of observed NAPL, and soil sample analyses will be performed to assist

with the selection of the site remedy. Up to 15 soil samples will be submitted for the analysis of moisture content, bulk density, total organic carbon (TOC), and extractable petroleum hydrocarbons (EPH). Up to 20 soil samples collected from the two-foot interval above the groundwater table, from the two-foot interval in which NAPL is observed, and from any interval with a notable change in lithology will be submitted to a geotechnical testing laboratory for grain size analysis for the assessment of remedial options; one sample will also be collected from the clay layer to evaluate via grain size analysis.

Groundwater Monitoring Well Installation and Sampling

- Six of the soil borings will be completed as permanent monitoring wells to allow for the collection of groundwater samples for laboratory analysis. The monitoring wells will be installed by a licensed well driller. The monitoring wells will be constructed using 2-inch diameter 0.020-slot screen for the purposes of collecting groundwater samples to assess Site groundwater conditions.
- Prior to completion of groundwater sample collection, all 14 previously installed monitoring wells and the six newly installed monitoring wells will be gauged for the presence of LNAPL and DNAPL. If detected, NAPL samples will be collected from up to 10 locations for fingerprinting, viscosity, boiling point, and density analyses. LNAPL, if encountered, will also be sampled for lead speciation analysis.
- One week following development of the permanent groundwater monitoring wells, groundwater samples will be collected via USEPA low-flow sampling methods for analysis of CP-51 VOCs and SVOCs. Samples will also be collected for PFAs and 1,4-dioxane analyses in accordance with typical NYSDEC BCP requirements.
- Groundwater samples will be collected from up to six monitoring wells located within the areas of observed NAPL for the analysis of TOC, total dissolved solids (TDS), sulfate, chloride, nitrate, extractable petroleum hydrocarbons (EPH), and alkalinity for the assessment of remedial options.
- Following the completion of groundwater sampling, Langan will perform aquifer testing at up to eight monitoring well locations to evaluate hydraulic conductivity at the Site for remedial option assessment. Rising head slug tests will be performed and the data will be evaluated in order to determine the hydraulic conductivity of the water bearing units.

Modifications to this scope of work may be required: 1) due to site operations, equipment or restrictions; 2) if unexpected contamination is detected and additional analytical data is needed to characterize the Site; and 3) to confirm that impacts are adequately characterized and delineated in compliance with the Brownfield Law, regulations, and applicable investigation

guidance documents (e.g., DER-10). NYSDEC and NYSDOH will be contacted to obtain approval for these modifications.

The field investigation will be completed in accordance with the procedures specified in Langan's Health and Safety Plan (HASP) and Quality Assurance Project Plan (QAPP) provided in Appendices A and B, respectively. A Community Air Monitoring Plan will be implemented during this investigation (see Section 3.6.2).

Names, contact information, and roles of the principal personnel who will participate in the investigation, including laboratory subcontractor, are listed below. Resumes for each Langan employee are provided in the QAPP (Appendix B).

| Personnel | Investigation Role | Contact Information |
|---|---|---|
| Steven A. Ciambruschini, PG, LEP<br>Langan | Qualified Environmental Professional | Phone – 973-560-4982<br>Email – sciambruschini@langan.com |
| TBD<br>Langan | Remedial Engineer | Phone – TBD<br>Email – TBD |
| Chris McMahon, CHMM<br>Langan | Project Manager | Phone – 973-560-4861<br>Email – cmcmahon@langan.com |
| Tony Moffa, CHMM<br>Langan | Langan Health & Safety Officer | Phone – 215-491-6500<br>Email – tmoffa@langan.com |
| Matthew Oleske<br>Langan | Field Team Leader | Phone – 973-560-4273<br>Email – moleske@langan.com |
| Heather Nunn<br>Langan | Quality Assurance Officer | Phone – 215-491-6569<br>Email – hnunn@langan.com |
| Emily Strake<br>Langan | Data Validator/Program Quality Assurance Monitor | Phone – 215-491-6526<br>Email – estrake@langan.com |
| Lidya Gulizia<br>York Analytical | Laboratory | Phone – 203-325-1371 x 833<br>Email – lgulizia@yorklab.com |

## 3.1 Geophysical Survey

A geophysical contractor will complete a full geophysical survey of the remaining two-thirds of the proposed development Site that have not been previously investigated via completion of a geophysical survey to clear the proposed SRIWP boring locations and identify potential subsurface utilities and structures, including USTs, prior to commencing subsurface work. The geophysical survey may be completed using a range of geophysical instruments, including electromagnetic and utility line locator instruments, and ground-penetrating radar (GPR). The results of the survey may necessitate relocation of the proposed boring locations shown on Figure 6. As the geophysical surveys previously completed in June and July 2017 were limited to proposed soil boring locations and accessible portions of the Site to scan for subsurface metallic anomalies indicative of potential USTs, the geophysical survey proposed to be completed

as part of this Supplemental Remedial Investigation will be focused on previously inaccessible areas of the proposed development site.

## 3.2 Soil Investigation

### 3.2.1 Drilling and Logging

An environmental drilling subcontractor will advance up to 20 soil borings to further delineate the presence of NAPL on the southern property boundary and western portion of the Site to evaluate the horizontal extents of NAPL impacts. Following the completion of delineation sampling, an additional 10 soil borings will be advanced within the areas of observed NAPL impacts to assess soil conditions and potential remedial alternatives.

Soil borings completed as groundwater monitoring wells will be advanced to the top of a confining (clay) layer, which is anticipated to be between about 8 and 16 feet bgs, based on the findings of the February 2019 RI Report. A Langan field engineer, scientist, or geologist will document the work, screen the soil samples for environmental impacts, and collect soil samples for laboratory analyses per Section 3.2.2. Soil will be screened continuously to the boring termination depth for total organic vapor (TOV) concentration using a PID equipped with a 10.6 electron volt (eV) bulb, and for visual and olfactory indications of environmental impacts (e.g., staining and odor). Soil descriptions will be recorded in boring logs.

Non-disposable, down-hole drilling equipment and sampling apparatus will be decontaminated between locations with Alconox® (or similar) and water where grossly impacted material is identified. Following sampling, each soil boring will be backfilled with granulated bentonite below the groundwater interface and/or clean sand in the vadose zone.

### 3.2.2 Soil Sampling and Analysis

Discrete soil samples will be collected from the two-foot interval above the groundwater interface, the two-foot interval above the top of the confining clay layer, and from the most impacted two-foot interval where NAPL is observed. Soil samples will be submitted for laboratory analysis of NYSDEC Commissioner's Policy CP-51-specified VOCs and SVOCs to evaluate for impacts from fuel oil and gasoline, in addition to total lead. Samples will also be collected for PFAs and 1,4-dioxane analysis in accordance with typical NYSDEC BCP requirements.

Although not explicitly requested by NYSDEC, additional soil sampling will be completed and soil samples will be collected from within the areas of observed NAPL impacts to assist with the selection of the site remedy. Up to 15 soil samples will be submitted for the analysis of moisture

content, bulk density, total organic carbon (TOC), and extractable petroleum hydrocarbons (EPH). Up to 20 soil samples collected from the two-foot depth interval above the groundwater table, from the two-foot interval in which NAPL is observed, and from any interval with a notable change in lithology will be submitted to a geotechnical testing laboratory for grain size analysis for the assessment of remedial options; one sample will also be collected from the confining clay layer for submission to a geotechnical laboratory for grain size analysis.

Soil samples will be collected in laboratory-supplied containers and will be sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to Alpha Analytical, Inc. (Alpha), a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory.

QA/QC procedures are described in the QAPP provided as Appendix B.

## 3.3 Groundwater Investigation

### 3.3.1 Monitoring Well Installation

Six of the proposed soil boring locations will be converted into groundwater monitoring wells. Groundwater monitoring wells will be installed by a licensed well driller. During well installation, soil conditions will be screened, logged, and sampled as described above in Section 3.2.

The proposed monitoring wells will be constructed using 2-inch-diameter polyvinyl chloride (PVC) riser pipe attached to 10- to 15-foot long, schedule-40, 0.020-inch slotted, 2-inch-diameter PVC screen. Each monitoring well will be installed so that the well screen straddles the observed water table and extends below the top of the confining (clay) layer. The well annulus around the screen will be backfilled with clean sand to about 2 feet above the top of the screen. A minimum 2-foot bentonite seal will be installed above the sand, and the borehole annulus will be backfilled with non-impacted soil cuttings and/or clean sand. The wells will be finished with flush-mounted metal manhole covers set in concrete.

Following installation, the wells will be developed by surging a surge block, a weighted bailer, or surge pumping techniques across the well screen to agitate and remove fine particles. The surge block, bailer, or submersible pump will be surged across the submerged well screen in 2- to 3-foot increments for approximately 2 minutes per increment. After surging, the well will be purged via pumping until the water becomes clear. The well will then be allowed to sit for a minimum of one week before sampling.

### 3.3.2 Groundwater Sampling and Analysis

Prior to completion of groundwater sample collection, all 14 previously installed monitoring wells and the six newly installed monitoring wells will be gauged for the presence of LNAPL and DNAPL. If detected, NAPL samples will be collected from up to 10 locations for fingerprinting, viscosity, boiling point, and density analyses. LNAPL, if encountered, will also be sampled for lead speciation analysis.

One week following development of the permanent groundwater monitoring wells, groundwater samples will be collected via USEPA low-flow sampling methods for analysis of CP-51 list VOCs and SVOCs. Samples will be also collected for PFAs and 1,4-dioxane analyses in accordance with typical NYSDEC BCP requirements. Groundwater samples will be collected form up to six monitoring wells within the areas of observed NAPL impacts for the analysis of TOC, total dissolved solids (TDS), sulfate, chloride, nitrate, extractable petroleum hydrocarbons (EPH), and alkalinity for the assessment of remedial options.

Groundwater samples will be collected into laboratory-supplied containers and will be sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to a NYSDOH ELAP-certified analytical laboratory. QA/QC procedures are described in the QAPP provided as Appendix B.

Following completion of the groundwater sampling, Langan will perform aquifer testing at up to eight monitoring well locations to evaluate hydraulic conductivity at the Site for remedial option assessment. Rising head slug tests will be performed and the data will be evaluated in order to determine the hydraulic conductivity of the water bearing units.

### 3.3.3 Monitoring Well Survey and Synoptic Gauging

Langan will survey vertical location of the monitoring wells, including ground surface elevation, outer casing elevation, and inner casing elevation. This data will be used with the groundwater well gauging data to prepare a sample location plan and a groundwater contour map depicting the elevation of the water table across the Site. Vertical control will be established by surveying performed relative to North American Vertical Datum of 1988 (NAVD88) by a New York State-licensed land surveyor. Elevations of the top of monitoring well casings and protective well casings will be surveyed to the nearest 0.01 foot. A synoptic gauging event will be performed to document static water levels. All accessible wells will be gauging during this event.

QA/QC procedures to be followed are described in the QAPP provided as Appendix B.

### 3.4 Data Management and Validation

Alpha, a NYSDOH ELAP-approved laboratory, will analyze soil, groundwater, soil vapor and ambient air samples. Laboratory analyses will be conducted in accordance with USEPA SW-846 methods and NYSDEC Analytical Services Protocol (ASP) B deliverable format. Environmental data will be reported electronically using the database software application EQuIS as part of NYSDEC's Environmental Information Management System (EIMS).

Table 1 summarizes the anticipated samples and analytical methodology. QA/QC procedures required by the NYSDEC ASP and SW-846 methods, including initial and continuing instrument calibrations, surrogate compound spikes, and analysis of other samples (blanks, laboratory control samples, and matrix spikes/matrix spike duplicates) will be followed in accordance with the QAPP (Appendix B). The laboratory will provide pre-cleaned and preserved sample bottles in accordance with the SW-846 methods. Where there are differences in the SW-846 and NYSDEC ASP requirements, the NYSDEC ASP shall take precedence.

Data validation will be performed in accordance with the USEPA validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of QC sample results (both qualitative and quantitative).
- Verification of sample results (both positive hits and non-detects).
- Recalculation of 10 percent of all investigative sample results.
- Preparation of Data Usability Summary Reports (DUSR).

The DUSRs will be prepared and then reviewed by the Program Quality Assurance Monitor before issuance. The DUSRs will provide a detailed assessment of each sample delivery group (SDG) and present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and Chain of Custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. Additional details on the DUSRs are provided in the QAPP in Appendix B.

### 3.5 Management of Investigation-Derived Waste

Investigation-derived wastes (IDW) (i.e., grossly-contaminated soil cuttings and purge water) will be containerized and staged on-site, pending proper disposal at an off-site facility. Soil cuttings with no apparent staining, odors, or elevated PID readings will be used to backfill boring holes. Soil to be disposed off-site will be placed in 55-gallon, United Nations/Department of Transportation (UN/DOT)-approved drums. Decontamination fluids, if necessary, will be placed

in UN/DOT-approved fluid drums with closed tops. All drums will be properly labeled, sealed, and characterized as necessary. If SRI analytical data is insufficient to gain disposal facility acceptance, waste characterization samples will be analyzed for parameters that are typically required by disposal facilities, such as TCL VOCs, SVOCs, metals, PCBs, pesticides, herbicides, Toxicity Characteristic Leaching Procedure (TCLP) VOCs, TCLP SVOCs, TCLP metals, Resource Conservation and Recovery Act (RCRA) characteristics including ignitability, corrosivity and reactivity, and paint filter. Additional sampling and analyses may be required based on the selected disposal facility. Waste characterization samples will be submitted to York for analysis in accordance with the QAPP provided in Appendix B. Management of IDW will comply with NYSDEC DER-10 3.3(e).

## 3.6 Air Monitoring

Air monitoring will be conducted for site personnel and the community (Community Air Monitoring Program [CAMP]). Fugitive particulate (dust) generation that could affect site personnel or the public is not expected because intrusive work is limited to boring, monitoring well, and soil vapor point installation, which does not disturb large volumes of soil.

Dust emissions will be monitored using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10). Organic odors will be monitored with a PID. Dust and odor suppression measures (e.g., water misting, odor suppressant) will be implemented as required. All PIDs used will be equipped with a 10.6 eV bulb.

### 3.6.1 Personnel Air Monitoring

Langan will conduct air monitoring of the breathing zone periodically during drilling and sampling activities to evaluate health and safety protection for the field personnel. Initially, ambient air monitoring will be performed within the work area. Langan will monitor VOCs with a PID (MultiRAE 3000 or similar) in accordance with the HASP (Appendix A). If air monitoring during intrusive operations identifies the presence of VOCs, on-site personnel will follow the guidelines outlined in the HASP regarding action levels, permissible exposure, engineering controls, and personal protective equipment. If the VOC action level is exceeded, work will cease and the work location will be evacuated. Monitoring will be continued until the levels drop to safe limits. At that time, work can resume with continued monitoring. If high levels persist, field activities will be halted and the work relocated to another area. If dust emissions are observed, work will stop and dust suppression measures will be used.

### 3.6.2 Community Air Monitoring Plan

In addition to air monitoring in the worker breathing zone, Langan will conduct community air monitoring in compliance with the NYSDOH Generic CAMP. CAMP deployment will comply with NYSDEC DER-10 Appendix 1A and Appendix 1B.

Langan will conduct periodic monitoring for VOCs during non-intrusive work such as the collection of groundwater samples. Periodic monitoring may include obtaining measurements upon arrival at a location, when opening a monitoring well cap, when bailing/purging a well, and upon departure from a location.

Langan will also conduct monitoring for VOCs during ground-intrusive work (i.e., soil boring advancement and monitoring well installation). Langan will measure upwind concentrations at the start of each workday to establish background concentrations. Langan will monitor VOCs at the downwind perimeter of the work zone, which will be established at a point on the Site where the general public or site employees may be present. Monitoring for VOCs will be conducted with a PID. Dust emissions will be monitored using real-time monitoring equipment capable of measuring PM-10 (e.g., DustTrak). If dust emissions are observed, work will stop and dust suppression measures will be used. Community air monitoring requirements will be conducted until it is determined that the Site is not a source of organic vapors.

## 3.7 Qualitative Human Health Exposure Assessment

A Qualitative Human Health Exposure Assessment (QHHEA) will be conducted in accordance with Appendix 3B of the NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation. The assessment will be submitted in the Remedial Investigation Report (RIR).

# 4.0 REMEDIAL INVESTIGATION REPORT

## 4.1 Daily Field Reports

Daily reports will be prepared and submitted to the NYSDEC, NYCOER (if requested), and NYSDOH (if requested) project managers by the end of each day following the reporting period and will include:

- An update of progress made during the reporting day
- Photographic documentation of the activities completed during the reporting day
- Identification of samples collected during the reporting day

- Locations and references to a site map for completed activities
- A summary of any and all complaints with relevant details, including contact information
- A summary of CAMP findings, including elevated concentrations and response actions, if any
- An explanation of notable site conditions
- A list of anticipated work for the following reporting day

Daily reports are not intended to notify the NYSDEC of emergencies (e.g., accidents, spills), request changes to the SRIWP, or communicate other sensitive or time-critical information. However, such conditions will also be included in the daily reports. Emergency conditions and changes to the SRIWP will be communicated directly to the NYSDEC Project Manager.

### 4.2 Supplemental Remedial Investigation Report

Following completion of the SRI and receipt of analytical data, an Supplemental RIR will be prepared in accordance with the applicable requirements of DER-10 Section 3.14. The report will include:

- A summary of the site history and previous investigations
- A description of site conditions
- Sampling methodology and field observations
- An evaluation of the results and findings
- Conclusions and recommendations for any further assessment (if warranted)

The report will summarize the nature and extent of contamination at each area of concern and identify unacceptable exposure pathways (as determined through a Qualitative Human Health Exposure Assessment).

The report will include soil boring and well construction logs, sampling logs, tabulated analytical results, figures, and laboratory data packages. The tabulated analytical results will be organized in table format and include sample location, media sampled, sample depth, field/laboratory identification numbers, analytical results and the applicable Standards, Criteria, and Guidance (SCGs) pertaining to the Site and contaminants of concern for comparison. The report will include scaled figures showing the locations of soil borings, monitoring wells, and sub-slab and soil vapor points, sample concentrations above SCGs for each media, groundwater elevation contours and flow direction, and, if appropriate, groundwater contaminant concentration contours.

The Supplemental RIR will be provided in an electronic format to the NYSDEC.

## 5.0 SCHEDULE

The table below presents an estimated schedule for the proposed SRI and reporting. If the schedule changes, it will be updated and submitted to NYSDEC.

| Activity | Weeks (following approval of RIWP) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Coordinate Geophysical Survey, Driller and Laboratory | | | | | | | | | | | | |
| Perform Geophysical Survey | | | | | | | | | | | | |
| Advance Soil Borings and Collect Soil Samples | | | | | | | | | | | | |
| Install Monitoring Wells and Collect Groundwater Samples | | | | | | | | | | | | |
| Receipt of Laboratory Results | | | | | | | | | | | | |
| Data Validation | | | | | | | | | | | | |
| EQuIS™ Electronic Data Deliverable | | | | | | | | | | | | |
| Preparation and Submission of Supplemental RIR | | | | | | | | | | | | |

# TABLES

# Table 1

**PROPOSED SAMPLING SUMMARY**

**PROPOSED 28-90 REVIEW AVENUE DEVELOPMENT**

Queens, New York

| Matrix | Sample Depth (ft bgs) | Sample Location | Analysis |
|---|---|---|---|
| Soil | 2-ft interval above the groundwater interface [1] | LSB-25 | VOCs<br>SVOCs<br>Total Lead<br>PFAs<br>1,4-dioxane |
| | | LSB-26 | |
| | | LSB-27 | |
| | | LSB-28 | |
| | | LSB-29 | |
| | | LSB-30 | |
| | | LSB-31 | |
| | | LSB-32 | |
| | | LSB-33 | |
| | | LSB-34 | |
| | | LSB-35 | |
| | | LSB-36 | |
| | | LSB-37 | |
| | | LSB-38 | |
| | | LSB-39 | |
| | | LSB-40 | |
| | | LSB-41 | |
| | | LSB-42 | |
| | | LSB-43 | |
| | | LSB-44 | |
| | | LSB-45 | |
| | 2-ft interval above the clay layer [2] | LSB-25 | |
| | | LSB-26 | |
| | | LSB-27 | |
| | | LSB-28 | |
| | | LSB-29 | |
| | | LSB-30 | |
| | | LSB-31 | |
| | | LSB-32 | |
| | | LSB-33 | |
| | | LSB-34 | |
| | | LSB-35 | |
| | | LSB-36 | |
| | | LSB-37 | |
| | | LSB-38 | |
| | | LSB-39 | |
| | | LSB-40 | |
| | | LSB-41 | |
| | | LSB-42 | |
| | | LSB-43 | |
| | | LSB-44 | |
| | | LSB-45 | |

# Table 1

**PROPOSED SAMPLING SUMMARY**

**PROPOSED 28-90 REVIEW AVENUE DEVELOPMENT**

Queens, New York

| | | | |
|---|---|---|---|
| Soil | Most impacted 2-ft interval where NAPL is observed | LSB-25 | VOCs<br>SVOCs<br>Total Lead<br>PFAs<br>1,4-dioxane |
| | | LSB-26 | |
| | | LSB-27 | |
| | | LSB-28 | |
| | | LSB-29 | |
| | | LSB-30 | |
| | | LSB-31 | |
| | | LSB-32 | |
| | | LSB-33 | |
| | | LSB-34 | |
| | | LSB-35 | |
| | | LSB-36 | |
| | | LSB-37 | |
| | | LSB-38 | |
| | | LSB-39 | |
| | | LSB-40 | |
| | | LSB-41 | |
| | | LSB-42 | |
| | | LSB-43 | |
| | | LSB-44 | |
| | | LSB-45 | |
| | Most impacted 2-ft interval where NAPL is observed | TBD based on field observations within the delineated area(s) | Moisture Content<br>Bulk Density<br>TOC<br>EPH |
| | 2-ft interval above the groundwater table, from the two-foot interval in which DNAPL is observed, and from any interval with a notable change in lithology | TBD based on field observations within the delineated area(s) | Grain Size |

# Table 1

**PROPOSED SAMPLING SUMMARY**

**PROPOSED 28-90 REVIEW AVENUE DEVELOPMENT**

Queens, New York

| | | | |
|---|---|---|---|
| Groundwater | --- | LMW-15 | VOCs<br>SVOCs<br>PFAs<br>1,4-dioxane |
| | | LMW-16 | |
| | | LMW-17 | |
| | | LMW-18 | |
| | | LMW-19 | |
| | | LMW-20 | |
| | | TBD based on field observations within the delineated area(s) | NAPL Fingerprint<br>Viscosity<br>Boiling Point<br>Density<br>Lead Speciation (If LNAPL) |
| | | | TOC<br>TDS<br>Sulfate<br>Chloride<br>Nitrate<br>EPH<br>Alkalinity |

NOTES:

1 - The groundwater interface is located between 5- and 8-feet below ground surface throughout the site.

2 - The top of the clay layer is encountered between 8- and 16-feet below ground surface throughout the site.

**TABLE 2**
**SUMMARY OF HISTORICAL SOIL ANALYTICAL RESULTS**
**28-90 Review Avenue**
Queens, New York

| Sample ID: | | NYSDEC Subpart 375-6 Remedial Program Soil Cleanup Objectives | | | | | SP-1 | | SP-2 | | SP-3 | | SP-4 | | SP-5 | | SP-6 | | MW-SP-1 | | MW-SP-2 | | MW-SP-5 | | MW-SP-6 | | MW-SP-1 | | MW-SP-2 | | MW-SP-3 | | MW-SP-4 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | CAS Number | Unrestricted Use | Residential | Restricted-Residential | Commercial | Industrial | 10/2/2008 | | 10/2/2008 | | 10/2/2008 | | 10/2/2008 | | 10/2/2008 | | 10/2/2008 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | |
| Sample Depth/VOC Sample Depth (ft bgs): | | | | | | | 6-7' | | 6-8' | | 7-9' | | 8-9' | | 9-10' | | 4-5' | | 5' | | 5' | | 8' | | 7' | | 10' | | 17' | | 5' | | 10' | |
| Units: | | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q |
| ***Volatile Organics, NJDEP/TCL/Part 375 List*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,1,1-Trichloroethane | 71-55-6 | 0.68 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | — | 35 | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,1,2,2-Tetrachloroethylene | 127-18-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113) | 76-13-1 | — | 100 | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,1,2-Trichloroethane | 79-00-5 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,1-Dichloroethane | 75-34-3 | 0.27 | 19 | 26 | 240 | 480 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,1-Dichloroethylene | 75-35-4 | 0.33 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,1-Dichloropropylene | 563-58-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,2,3-Trichlorobenzene | 87-61-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,2,3-Trichloropropane | 96-18-4 | — | 80 | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,2,4-Trichlorobenzene | 120-82-1 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 3.6 | 47 | 52 | 190 | 380 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.233 | | 0.005 | U |
| 1,2-Dibromo-3-chloropropane | 96-12-8 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,2-Dibromoethane | 106-93-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,2-Dichlorobenzene | 95-50-1 | 1.1 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,2-Dichloroethane | 107-06-2 | 0.02 | 2.3 | 3.1 | 30 | 60 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | *0.025* | *U* | 0.005 | U |
| 1,2-Dichloropropane | 78-87-5 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,3,5-Trimethylbenzene | 108-67-8 | 8.4 | 47 | 52 | 190 | 380 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.107 | | 0.005 | U |
| 1,3-Dichlorobenzene | 541-73-1 | 2.4 | 17 | 49 | 280 | 560 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,3-Dichloropropane | 142-28-9 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,4-Dichlorobenzene | 106-46-7 | 1.8 | 9.8 | 13 | 130 | 250 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 1,4-Dioxane | 123-91-1 | 0.1 | 9.8 | 13 | 130 | 250 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 2,2-Dichloropropane | 594-20-7 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 2-Butanone | 78-93-3 | 0.12 | 100 | 100 | 500 | 1,000 | 0.0177 | | 0.005 | U | 0.005 | U | 0.0317 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | **0.266** | |
| 2-Chlorotoluene | 95-49-8 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 2-Hexanone | 591-78-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.00926 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 4-Chlorotoluene | 106-43-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| 4-Methyl-2-pentanone | 108-10-1 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Acetone | 67-64-1 | 0.05 | 100 | 100 | 500 | 1,000 | **0.075** | | 0.005 | U | 0.005 | U | **0.129** | | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | **0.107** | | 0.005 | U |
| Acrylonitrile | 107-13-1 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Benzene | 71-43-2 | 0.06 | 2.9 | 4.8 | 44 | 89 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.0314 | | 0.0129 | |
| Bromobenzene | 108-86-1 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Bromochloromethane | 74-97-5 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Bromodichloromethane | 75-27-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Bromoform | 75-25-2 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Bromomethane | 74-83-9 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Carbon disulfide | 75-15-0 | — | 100 | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Carbon tetrachloride | 56-23-5 | 0.76 | 1.4 | 2.4 | 22 | 44 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Chlorobenzene | 108-90-7 | 1.1 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Chloroethane | 75-00-3 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Chloroform | 67-66-3 | 0.37 | 10 | 49 | 350 | 700 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Chloromethane | 74-87-3 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| cis-1,2-Dichloroethylene | 156-59-2 | 0.25 | 59 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| cis-1,3-Dichloropropylene | 10061-01-5 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Dibromochloromethane | 124-48-1 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Dibromomethane | 74-95-3 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Dichlorodifluoromethane | 75-71-8 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Ethyl Benzene | 100-41-4 | 1 | 30 | 41 | 390 | 780 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.418 | | 0.005 | U |
| Hexachlorobutadiene | 87-68-3 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Isopropylbenzene | 98-82-8 | — | 100 | — | — | — | 0.0491 | | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.722 | | 2.59 | |
| Methyl tert-butyl ether (MTBE) | 1634-04-4 | 0.93 | 62 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Methylene chloride | 75-09-2 | 0.05 | 51 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| n-Butylbenzene | 104-51-8 | 12 | 100 | 100 | 500 | 1,000 | 0.0439 | | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.0124 | | 0.005 | U | 0.005 | U | 0.561 | | 1.392 | |
| n-Propylbenzene | 103-65-1 | 3.9 | 100 | 100 | 500 | 1,000 | 0.0663 | | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 1.758 | | **4.356** | |
| Naphthalene | 91-20-3 | 12 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| p-Isopropyltoluene | 99-87-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.111 | | 0.077 | |
| sec-Butylbenzene | 135-98-8 | 11 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.203 | | 0.837 | |
| Styrene | 100-42-5 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| tert-Butylbenzene | 98-06-6 | 5.9 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Tetrachloroethylene | 127-18-4 | 1.3 | 5.5 | 19 | 150 | 300 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Toluene | 108-88-3 | 0.7 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| trans-1,2-Dichloroethylene | 156-60-5 | 0.19 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| trans-1,3-Dichloropropylene | 10061-02-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Trichloroethylene | 79-01-6 | 0.47 | 10 | 21 | 200 | 400 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Trichlorofluoromethane | 75-69-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Vinyl Acetate | 108-05-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.025 | U | 0.005 | U |
| Vinyl Chloride | 75-01-4 | 0.02 | 0.21 | 0.9 | 13 | 27 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | *0.025* | *U* | 0.005 | U |
| Xylenes, Total | 1330-20-7 | 0.26 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | 0.005 | U | **0.3** | | 0.005 | U |

# TABLE 2
## SUMMARY OF HISTORICAL SOIL ANALYTICAL RESULTS
## 28-90 Review Avenue
Queens, New York

| Sample ID: | | NYSDEC Subpart 375-6 Remedial Program Soil Cleanup Objectives | | | | | SP-1 | | SP-2 | | SP-3 | | SP-4 | | SP-5 | | SP-6 | | MW-SP-1 | | MW-SP-2 | | MW-SP-5 | | MW-SP-6 | | MW-SP-1 | | MW-SP-2 | | MW-SP-3 | | MW-SP-4 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | CAS Number | Unrestricted Use | Residential | Restricted-Residential | Commercial | Industrial | 10/2/2008 | | 10/2/2008 | | 10/2/2008 | | 10/2/2008 | | 10/2/2008 | | 10/2/2008 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | | 6/24/2009 | |
| Sample Depth/VOC Sample Depth (ft bgs): | | | | | | | 6-7' | | 6-8' | | 7-9' | | 8-9' | | 9-10' | | 4-5' | | 5' | | 5' | | 8' | | 7' | | 10' | | 17' | | 5' | | 10' | |
| Units: | | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q |
| ***Semi-Volatiles, NJDEP/TCL/Part 375 List*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,4-Dinitrotoluene | 121-14-2 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| 2,6-Dinitrotoluene | 606-20-2 | — | 1.03 | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| 2-Chloronaphthalene | 91-58-7 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| 2-Methylnaphthalene | 91-57-6 | — | 0.41 | — | — | — | 0.33 | U | **0.58** | | 0.33 | U | 0.66 | U | 0.33 | U | **6.963** | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | **4.61** | | 0.332 | U |
| 2-Nitroaniline | 88-74-4 | — | — | — | — | — | 0.33 | U | 0.33 | U | 1.049 | | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| 3,3'-Dichlorobenzidine | 91-94-1 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| 3-Nitroaniline | 99-09-2 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| 4-Chloroaniline | 106-47-8 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.504 | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| 4-Bromophenyl phenyl ether | 101-55-3 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| 4-Chlorophenyl phenyl ether | 7005-72-3 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| 4-Chloro-3-methylphenol | 59-50-7 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| 4-Nitroaniline | 100-01-6 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Acenaphthene | 83-32-9 | 20 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.399 | | 0.332 | U |
| Acenaphthylene | 208-96-8 | 100 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Analine | 62-53-3 | — | 48 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Anthracene | 120-12-7 | 100 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | 1.075 | | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.407 | | 0.332 | U |
| Benzo(a)anthracene | 56-55-3 | 1 | 1 | 1 | 5.6 | 11 | 0.33 | U | 0.33 | U | 0.33 | U | **1.146** | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.483 | | 0.332 | U |
| Benzo(a)pyrene | 50-32-8 | 1 | 1 | 1 | 1 | 1.1 | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.372 | | 0.332 | U |
| Benzo(b)fluoranthene | 205-99-2 | 1 | 1 | 1 | 5.6 | 11 | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.761 | | 0.385 | |
| Benzo(g,h,i)perylene | 191-24-2 | 100 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Benzo(k)fluoranthene | 207-08-9 | 0.8 | 1 | 3.9 | 56 | 110 | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Benzyl alcohol | 100-51-6 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Benzyl butyl phthalate | 85-68-7 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Bis(2-chloroethoxy)methane | 111-91-1 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.917 | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Bis(2-chloroethyl)ether | 111-44-4 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Bis(2-chloroisopropyl)ether | 108-60-1 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | — | 50 | — | — | — | 0.4 | | 0.33 | U | 0.668 | | 0.66 | U | 0.33 | U | 0.338 | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Chrysene | 218-01-9 | 1 | 1 | 3.9 | 56 | 110 | 0.33 | U | 0.33 | U | 0.33 | U | **1.357** | | 0.33 | U | 0.33 | U | 0.33 | U | 0.581 | | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.54 | | 0.332 | U |
| Dibenzo(a,h)anthracene | 53-70-3 | 0.33 | 0.33 | 0.33 | 0.56 | 1.1 | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.66* | *U* | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.334* | *U* | *0.33* | *U* | *0.332* | *U* |
| Dibenzofuran | 132-64-9 | 7 | 14 | 59 | 350 | 1,000 | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Diethyl phthalate | 84-66-2 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Dimethyl phthalate | 131-11-3 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Di-n-butyl phthalate | 84-74-2 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Di-n-octyl phthalate | 117-84-0 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Fluoranthene | 206-44-0 | 100 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | 0.33 | U | 1.444 | | 0.361 | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 1.8 | | 0.332 | U |
| Fluorene | 86-73-7 | 30 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | 0.33 | U | 0.719 | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.599 | | 0.332 | U |
| Hexachlorobenzene | 118-74-1 | 0.33 | 0.33 | 1.2 | 6 | 12 | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.66* | *U* | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.33* | *U* | *0.334* | *U* | *0.33* | *U* | *0.332* | *U* |
| Hexachlorocyclopentadiene | 77-47-4 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | 0.5 | 0.5 | 0.5 | 5.6 | 11 | 0.33 | U | 0.33 | U | 0.33 | U | *0.66* | *U* | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Isophorone | 78-59-1 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | 0.607 | | 0.948 | | 0.33 | U | 1.709 | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Naphthalene | 91-20-3 | 12 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.661 | | 0.33 | U | 0.66 | U | 0.33 | U | 6.83 | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 2.77 | | 0.351 | |
| Nitrobenzene | 98-95-3 | — | 3.7 | 15 | 69 | 140 | 0.418 | | 0.33 | U | 0.354 | | 0.66 | U | 0.33 | U | **5.198** | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| N-nitroso-di-n-propylamine | 621-64-7 | — | — | — | — | — | 0.33 | U | 0.33 | U | 0.33 | U | 0.66 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| N-Nitrosodiphenylamine | 86-30-6 | — | — | — | — | — | 0.33 | U | 0.33 | U | 1.643 | | 5.917 | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 0.33 | U | 0.332 | U |
| Phenanthrene | 85-01-8 | 100 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | 0.33 | U | 2.538 | | 0.344 | | 0.55 | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 2.119 | | 0.332 | U |
| Pyrene | 129-00-0 | 100 | 100 | 100 | 500 | 1,000 | 0.636 | | 0.478 | | 1.298 | | 17.922 | | 1.16 | | 1.159 | | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.33 | U | 0.334 | U | 1.419 | | 0.332 | U |
| ***Total Petroleum Hydrocarbons*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TPH | -- | — | — | — | — | — | 142 | | 72.6 | | 16,900 | | 11,300 | | 81.6 | | 1,860 | | | | | | | | | | 410 | | 440 | | 1800 | | 940 | |

**Notes:**

Soil Cleanup Objectives are taken from the NYSDEC Subpart 375-6 Remedial Program SCOs (Revised Brownfields) criteria are from the NYSDEC Soil Cleanup Objective Tables 375-6.8(a) and 375-6.8(b), last revised 14 December 2006 and the NYSDEC CP-51 Soil Cleanup Guidance dated 21 October 2010.

ft bgs - feet below ground surface

NA: Not analyzed

U: The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

J: The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

D: Compound analyzed at a secondary dilution factor.

B: analyte found in the analysis batch blank

*: Analytical results for these compounds are reported by the laboratory as both VOCs and SVOCs. NYSDEC only provides SCOs for these compounds as VOCs; therefore, the SVOC analytical reuslts for these compounds are screened against the VOC SCOs

Total Chromium is compared to the Hexavalent Chromium SCOs for screening purposes.

*Italicized* results indicate Reporting Limits (RL) greater than or equal to the most stringent criteria.

**TABLE 2**
**SUMMARY OF HISTORICAL SOIL ANALYTICAL RESULTS**
**28-90 Review Avenue**
Queens, New York

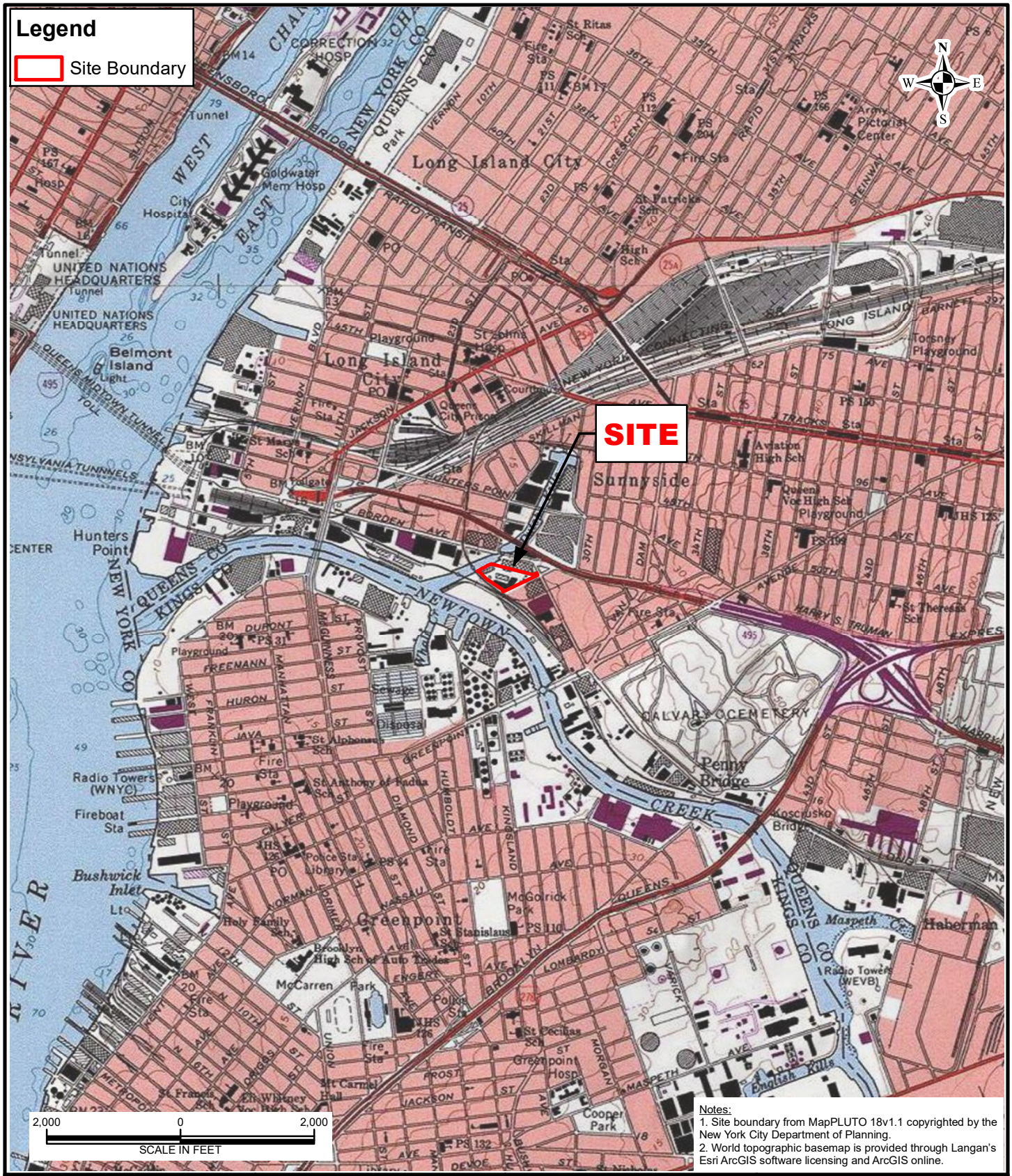
| Sample ID: | CAS Number | NYSDEC Subpart 375-6 Remedial Program Soil Cleanup Objectives | | | | | MW-SP-5 | | MW-SP-6 | | B-1 | | B-2 | | B-3 | | B-4 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | | | | | | | 6/24/2009 | | 6/24/2009 | | 5/2/1990 | | 5/2/1990 | | 5/2/1990 | | 5/3/1990 | |
| Sample Depth/VOC Sample Depth (ft bgs): | | | | | | | 12' | | 12' | | 7-9' | | 7-9' | | 5-7' | | | |
| Units: | | Unrestricted Use mg/kg | Residential mg/kg | Restricted-Residential mg/kg | Commercial mg/kg | Industrial mg/kg | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q | mg/kg | Q |
| ***Volatile Organics, NJDEP/TCL/Part 375 List*** | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,1,1-Trichloroethane | 71-55-6 | 0.68 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.00003 | U | 0.00003 | U | 0.00003 | U | 0.00003 | U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | — | 35 | — | — | — | 0.005 | U | 0.005 | U | 0.00003 | U | 0.00003 | U | 0.00003 | U | 0.00003 | U |
| 1,1,2,2-Tetrachloroethylene | 127-18-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113) | 76-13-1 | — | 100 | — | — | — | NT | | NT | | NT | | NT | | NT | | NT | |
| 1,1,2-Trichloroethane | 79-00-5 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.00003 | U | 0.00003 | U | 0.00003 | U | 0.00003 | U |
| 1,1-Dichloroethane | 75-34-3 | 0.27 | 19 | 26 | 240 | 480 | 0.005 | U | 0.005 | U | 0.00013 | U | 0.00013 | U | 0.00013 | U | 0.00013 | U |
| 1,1-Dichloroethylene | 75-35-4 | 0.33 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,1-Dichloropropylene | 563-58-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,2,3-Trichlorobenzene | 87-61-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,2,3-Trichloropropane | 96-18-4 | — | 80 | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,2,4-Trichlorobenzene | 120-82-1 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,2,4-Trimethylbenzene | 95-63-6 | 3.6 | 47 | 52 | 190 | 380 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,2-Dibromo-3-chloropropane | 96-12-8 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,2-Dibromoethane | 106-93-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,2-Dichlorobenzene | 95-50-1 | 1.1 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.00015 | U | 0.00015 | U | 0.00015 | U | 0.00015 | U |
| 1,2-Dichloroethane | 107-06-2 | 0.02 | 2.3 | 3.1 | 30 | 60 | 0.005 | U | 0.005 | U | 0.005 | | 0.005 | | 0.005 | | | |
| 1,2-Dichloropropane | 78-87-5 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.00004 | U | 0.00004 | U | 0.00004 | U | 0.00004 | U |
| 1,3,5-Trimethylbenzene | 108-67-8 | 8.4 | 47 | 52 | 190 | 380 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,3-Dichlorobenzene | 541-73-1 | 2.4 | 17 | 49 | 280 | 560 | 0.005 | U | 0.005 | U | 0.00032 | U | 0.00032 | U | 0.00032 | U | 0.00032 | U |
| 1,3-Dichloropropane | 142-28-9 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 1,4-Dichlorobenzene | 106-46-7 | 1.8 | 9.8 | 13 | 130 | 250 | 0.005 | U | 0.005 | U | 0.00024 | U | 0.00024 | U | 0.00024 | U | 0.00024 | U |
| 1,4-Dioxane | 123-91-1 | 0.1 | 9.8 | 13 | 130 | 250 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 2,2-Dichloropropane | 594-20-7 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 2-Butanone | 78-93-3 | 0.12 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.0108 | | NT | | NT | | NT | | NT | |
| 2-Chlorotoluene | 95-49-8 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 2-Hexanone | 591-78-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 4-Chlorotoluene | 106-43-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| 4-Methyl-2-pentanone | 108-10-1 | — | — | — | — | — | NT | | NT | | NT | | NT | | NT | | NT | |
| Acetone | 67-64-1 | 0.05 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Acrylonitrile | 107-13-1 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Benzene | 71-43-2 | 0.06 | 2.9 | 4.8 | 44 | 89 | 0.005 | U | 0.005 | U | **0.859** | | 0.0002 | U | 0.0002 | U | 0.0002 | U |
| Bromobenzene | 108-86-1 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Bromochloromethane | 74-97-5 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Bromodichloromethane | 75-27-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.0001 | U | 0.0001 | U | 0.0001 | U | 0.0001 | U |
| Bromoform | 75-25-2 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.0002 | U | 0.0002 | U | 0.0002 | U | 0.0002 | U |
| Bromomethane | 74-83-9 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.00118 | U | 0.00118 | U | 0.00118 | U | 0.00118 | U |
| Carbon disulfide | 75-15-0 | — | 100 | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Carbon tetrachloride | 56-23-5 | 0.76 | 1.4 | 2.4 | 22 | 44 | 0.005 | U | 0.005 | U | 0.00012 | U | 0.00012 | U | 0.00012 | U | 0.00012 | U |
| Chlorobenzene | 108-90-7 | 1.1 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Chloroethane | 75-00-3 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.00052 | U | 0.00052 | U | 0.00052 | U | 0.00052 | U |
| Chloroform | 67-66-3 | 0.37 | 10 | 49 | 350 | 700 | 0.005 | U | 0.005 | U | 0.005 | | 0.017 | | 0.005 | | 0.00005 | U |
| Chloromethane | 74-87-3 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.00008 | U | 0.00008 | U | 0.00008 | U | 0.00008 | U |
| cis-1,2-Dichloroethylene | 156-59-2 | 0.25 | 59 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| cis-1,3-Dichloropropylene | 10061-01-5 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.00034 | U | 0.00034 | U | 0.00034 | U | 0.00034 | U |
| Dibromochloromethane | 124-48-1 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.00009 | U | 0.00009 | U | 0.00009 | U | 0.00009 | U |
| Dibromomethane | 74-95-3 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Dichlorodifluoromethane | 75-71-8 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Ethyl Benzene | 100-41-4 | 1 | 30 | 41 | 390 | 780 | 0.005 | U | 0.005 | U | **10.372** | | 0.112 | | 0.078 | | 0.075 | |
| Hexachlorobutadiene | 87-68-3 | — | — | — | — | — | NT | | NT | | NT | | NT | | NT | | NT | |
| Isopropylbenzene | 98-82-8 | — | 100 | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Methyl tert-butyl ether (MTBE) | 1634-04-4 | 0.93 | 62 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Methylene chloride | 75-09-2 | 0.05 | 51 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.00025 | U | **0.146** | | 0.00025 | U | 0.00025 | U |
| n-Butylbenzene | 104-51-8 | 12 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| n-Propylbenzene | 103-65-1 | 3.9 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Naphthalene | 91-20-3 | 12 | 100 | 100 | 500 | 1,000 | NT | | NT | | NT | | NT | | NT | | NT | |
| p-Isopropyltoluene | 99-87-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| sec-Butylbenzene | 135-98-8 | 11 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Styrene | 100-42-5 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| tert-Butylbenzene | 98-06-6 | 5.9 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Tetrachloroethylene | 127-18-4 | 1.3 | 5.5 | 19 | 150 | 300 | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Toluene | 108-88-3 | 0.7 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | **6.371** | | 0.207 | | 0.342 | | 0.309 | |
| trans-1,2-Dichloroethylene | 156-60-5 | 0.19 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | 0.0001 | U | 0.0001 | U | 0.0001 | U | 0.0001 | U |
| trans-1,3-Dichloropropylene | 10061-02-6 | — | — | — | — | — | 0.005 | U | 0.005 | U | 0.00034 | U | 0.00034 | U | 0.00034 | U | 0.00034 | U |
| Trichloroethylene | 79-01-6 | 0.47 | 10 | 21 | 200 | 400 | 0.005 | U | 0.005 | U | 0.00003 | U | 0.00003 | U | 0.00003 | U | 0.00003 | U |
| Trichlorofluoromethane | 75-69-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Vinyl Acetate | 108-05-4 | — | — | — | — | — | 0.005 | U | 0.005 | U | NT | | NT | | NT | | NT | |
| Vinyl Chloride | 75-01-4 | 0.02 | 0.21 | 0.9 | 13 | 27 | 0.005 | U | 0.005 | U | 0.00018 | U | 0.00018 | U | 0.00018 | U | 0.00018 | U |
| Xylenes, Total | 1330-20-7 | 0.26 | 100 | 100 | 500 | 1,000 | 0.005 | U | 0.005 | U | **52.928** | | 0.095 | | **0.288** | | **0.439** | |

**TABLE 2**
**SUMMARY OF HISTORICAL SOIL ANALYTICAL RESULTS**
**28-90 Review Avenue**
Queens, New York

| Sample ID:<br>Sample Date:<br>Sample Depth/VOC Sample Depth (ft bgs):<br>Units: | CAS Number | NYSDEC Subpart 375-6 Remedial Program Soil Cleanup Objectives | | | | | MW-SP-5<br>6/24/2009<br>12'<br>mg/kg | Q | MW-SP-6<br>6/24/2009<br>12'<br>mg/kg | Q | B-1<br>5/2/1990<br>7-9'<br>mg/kg | Q | B-2<br>5/2/1990<br>7-9'<br>mg/kg | Q | B-3<br>5/2/1990<br>5-7'<br>mg/kg | Q | B-4<br>5/3/1990<br>mg/kg | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Unrestricted Use<br>mg/kg | Residential<br>mg/kg | Restricted-Residential<br>mg/kg | Commercial<br>mg/kg | Industrial<br>mg/kg | | | | | | | | | | | | |
| ***Semi-Volatiles, NJDEP/TCL/Part 375 List*** | | | | | | | | | | | | | | | | | | |
| 2,4-Dinitrotoluene | 121-14-2 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| 2,6-Dinitrotoluene | 606-20-2 | — | 1.03 | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| 2-Chloronaphthalene | 91-58-7 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| 2-Methylnaphthalene | 91-57-6 | — | 0.41 | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| 2-Nitroaniline | 88-74-4 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| 3,3'-Dichlorobenzidine | 91-94-1 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| 3-Nitroaniline | 99-09-2 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| 4-Chloroaniline | 106-47-8 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| 4-Bromophenyl phenyl ether | 101-55-3 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| 4-Chlorophenyl phenyl ether | 7005-72-3 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| 4-Chloro-3-methylphenol | 59-50-7 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| 4-Nitroaniline | 100-01-6 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Acenaphthene | 83-32-9 | 20 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Acenaphthylene | 208-96-8 | 100 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Analine | 62-53-3 | — | 48 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Anthracene | 120-12-7 | 100 | 100 | 100 | 500 | 1,000 | 0.591 | | 0.33 | U | NT | | NT | | NT | | NT | |
| Benzo(a)anthracene | 56-55-3 | 1 | 1 | 1 | 5.6 | 11 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Benzo(a)pyrene | 50-32-8 | 1 | 1 | 1 | 1 | 1.1 | 0.564 | | 0.33 | U | NT | | NT | | NT | | NT | |
| Benzo(b)fluoranthene | 205-99-2 | 1 | 1 | 1 | 5.6 | 11 | 0.781 | | 0.33 | U | NT | | NT | | NT | | NT | |
| Benzo(g,h,i)perylene | 191-24-2 | 100 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Benzo(k)fluoranthene | 207-08-9 | 0.8 | 1 | 3.9 | 56 | 110 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Benzyl alcohol | 100-51-6 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Benzyl butyl phthalate | 85-68-7 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Bis(2-chloroethoxy)methane | 111-91-1 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Bis(2-chloroethyl)ether | 111-44-4 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Bis(2-chloroisopropyl)ether | 108-60-1 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | — | 50 | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Chrysene | 218-01-9 | 1 | 1 | 3.9 | 56 | 110 | 0.605 | | 0.33 | U | NT | | NT | | NT | | NT | |
| Dibenzo(a,h)anthracene | 53-70-3 | 0.33 | 0.33 | 0.33 | 0.56 | 1.1 | *0.33* | *U* | *0.33* | *U* | NT | | NT | | NT | | NT | |
| Dibenzofuran | 132-64-9 | 7 | 14 | 59 | 350 | 1,000 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Diethyl phthalate | 84-66-2 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Dimethyl phthalate | 131-11-3 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Di-n-butyl phthalate | 84-74-2 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Di-n-octyl phthalate | 117-84-0 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Fluoranthene | 206-44-0 | 100 | 100 | 100 | 500 | 1,000 | 1.066 | | 0.33 | U | NT | | NT | | NT | | NT | |
| Fluorene | 86-73-7 | 30 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Hexachlorobenzene | 118-74-1 | 0.33 | 0.33 | 1.2 | 6 | 12 | *0.33* | *U* | *0.33* | *U* | NT | | NT | | NT | | NT | |
| Hexachlorocyclopentadiene | 77-47-4 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | 0.5 | 0.5 | 0.5 | 5.6 | 11 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Isophorone | 78-59-1 | — | 100 | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Naphthalene | 91-20-3 | 12 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Nitrobenzene | 98-95-3 | — | 3.7 | 15 | 69 | 140 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| N-nitroso-di-n-propylamine | 621-64-7 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| N-Nitrosodiphenylamine | 86-30-6 | — | — | — | — | — | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Phenanthrene | 85-01-8 | 100 | 100 | 100 | 500 | 1,000 | 0.33 | U | 0.33 | U | NT | | NT | | NT | | NT | |
| Pyrene | 129-00-0 | 100 | 100 | 100 | 500 | 1,000 | 1.507 | | 0.33 | U | NT | | NT | | NT | | NT | |
| ***Total Petroleum Hydrocarbons*** | | | | | | | | | | | | | | | | | | |
| TPH | -- | — | — | — | — | — | 270 | | 540 | | 56432 | | 624.3 | | 176.7 | | 626.9 | |

**Notes:**
Soil Cleanup Objectives are taken from the NYSDEC Subpart 375-6 Remedial Program SCOs (Revised Brownfields) criteria are from the NYSDEC Soil Cleanup Objective Tables 375-6.8(
ft bgs - feet below ground surface
NA: Not analyzed
U: The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.
J: The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
D: Compound analyzed at a secondary dilution factor.
B: analyte found in the analysis batch blank
*: Analytical results for these compounds are reported by the laboratory as both VOCs and SVOCs. NYSDEC only provides SCOs for these compounds as VOCs; therefore, the SVOC an
Total Chromium is compared to the Hexavalent Chromium SCOs for screening purposes.
*Italicized* results indicate Reporting Limits (RL) greater than or equal to the most stringent criteria.

# FIGURES




LANGAN
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Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
28-90 REVIEW AVENUE
BLOCK No. 294, LOT No. 106
LONG ISLAND CITY
QUEENS COUNTY NEW YORK

Drawing Title
SITE LOCATION MAP

| | |
|---|---|
| Project No. | 100652601 |
| Date | 3/21/2019 |
| Scale | 1"=2,000' |
| Drawn By | AR |
| Last Revised | 3/21/2019 |
| Figure | 1 |

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Path: \\langan.com\data\PAR\data6\100652601\ArcGIS\ArcMap_Documents\2019-03 - SRIWP\Figure 1 - Site Location Map.mxd Date: 3/21/2019 User: ibaker Time: 10:39:16 AM

| Location ID: | LSB-1A | | LSB-1B | |
|---|---|---|---|---|
| Sample ID | 18K0921-06 | | 18K0921-07 | |
| Sample Date: | 11/21/2018 | | 11/21/2018 | |
| Sampling Depth (ft bgs): | 0.5'-2.5' | | 10'12' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | | | | |
| Acetone | 0.027 | | **0.13** | |
| **SVOCs** | | | | |
| Benzo(a)anthracene | **5.58** | D | **2.25** | D |
| Benzo(a)pyrene | **6.02** | D | **1.27** | D |
| Benzo(b)fluoranthene | **5.12** | D | **1.43** | D |
| Benzo(k)fluoranthene | **4.81** | D | 0.728 | D |
| Chrysene | **5.59** | D | **2.43** | D |
| Dibenzo(a,h)anthracene | **1.16** | D | 0.254 | D |
| Indeno(1,2,3-cd)pyrene | **3.1** | D | **0.553** | D |
| **Pesticides** | | | | |
| 4,4'-DDD | 0.00202 | U | **0.245** | D |
| 4,4'-DDT | 0.00202 | U | **0.146** | D |
| **PCBs** | | | | |
| Aroclor 1260 | 0.0294 | | **1.29** | |
| Total PCBs | 0.0294 | | **1.29** | |
| **TAL Metals** | | | | |
| Arsenic | 1.84 | U | **36.4** | |
| Cadmium | 0.609 | | **144** | |
| Chromium, Total | **21** | | **704** | |
| Chromium, Trivalent | 21 | | **704** | |
| Copper | 38.1 | | **1,310** | |
| Iron | **20,700** | | **35,700** | |
| Lead | **173** | | **1,090** | |
| Mercury | **0.287** | | **2.91** | |
| Nickel | 17.7 | | **630** | |
| Silver | 0.613 | U | **37.2** | |
| Vanadium | 23 | | **114** | |
| Zinc | **162** | | **2,750** | |

| Location ID: | LSB-3A | | LSB-3B | |
|---|---|---|---|---|
| Sample ID | 18K0921-08 | | 18K0921-09 | |
| Sample Date: | 11/21/2018 | | 11/21/2018 | |
| Sampling Depth (ft bgs): | 0'-2' | | 11'-13' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | | | | |
| Acetone | 0.0041 | U | **0.1** | |
| **SVOCs** | | | | |
| Benzo(a)anthracene | 0.0455 | U | **3.5** | D |
| Benzo(a)pyrene | 0.0455 | U | **2.66** | D |
| Benzo(b)fluoranthene | 0.0455 | U | **1.41** | D |
| Benzo(k)fluoranthene | 0.0455 | U | **1.31** | D |
| Chrysene | 0.0559 | JD | **3.68** | D |
| Dibenzo(a,h)anthracene | 0.0455 | U | **0.373** | D |
| Indeno(1,2,3-cd)pyrene | 0.0455 | U | **0.994** | D |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Arsenic | 1.64 | U | **58.7** | |
| Chromium, Total | **13.4** | | **30.9** | |
| Chromium, Trivalent | 13.4 | | **30.9** | |
| Copper | 24.8 | | **427** | |
| Iron | **12,000** | | **16,300** | |
| Lead | 12.3 | | **466** | |
| Mercury | 0.0328 | U | **4.77** | |
| Nickel | 26.9 | | **77.4** | |
| Zinc | 34.6 | | **510** | |

| Location ID: | LSB-7A | | LSB-7B | |
|---|---|---|---|---|
| Sample ID | 18K0823-07 | | 18K0823-08 | |
| Sample Date: | 11/20/2018 | | 11/20/2018 | |
| Sampling Depth (ft bgs): | 1'-3' | | 13'-15' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | No Exceedances | | No Exceedances | |
| **SVOCs** | | | | |
| Benzo(a)anthracene | 0.096 | D | **7.8** | D |
| Benzo(a)pyrene | 0.153 | D | **8.31** | D |
| Benzo(b)fluoranthene | 0.142 | D | **6.44** | D |
| Benzo(k)fluoranthene | 0.0526 | JD | **5.5** | D |
| Chrysene | 0.246 | D | **8.88** | D |
| Dibenzo(a,h)anthracene | 0.0945 | JD | **1.33** | D |
| Indeno(1,2,3-cd)pyrene | 0.0838 | JD | **3.86** | D |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Arsenic | **17.6** | | **14.3** | |
| Chromium, Total | **6.76** | | **12.4** | |
| Copper | 26.7 | | **224** | |
| Iron | **14,300** | | **14,600** | |
| Lead | 42.7 | | **557** | |
| Mercury | 0.0342 | U | **2.76** | |
| Zinc | 16.2 | | **312** | |

| Location ID: | LSB-8A | | LSB-8B | |
|---|---|---|---|---|
| Sample ID | 18K0823-05 | | 18K0823-06 | |
| Sample Date: | 11/20/2018 | | 11/20/2018 | |
| Sampling Depth (ft bgs): | 0'-2' | | 13'-15' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | No Exceedances | | No Exceedances | |
| **SVOCs** | No Exceedances | | No Exceedances | |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Arsenic | 10.6 | | **13** | |
| Barium | 310 | | **538** | |
| Cadmium | **16.2** | | **20.6** | |
| Chromium, Total | **12.2** | | **15.8** | |
| Cobalt | **36.5** | | **30.8** | |
| Copper | **74.9** | | **75.9** | |
| Iron | **12,400** | | **12,100** | |
| Lead | **396** | | **550** | |
| Mercury | 0.033 | U | **0.29** | |
| Nickel | **40.1** | | **48.1** | |
| Zinc | **348** | | **563** | |

| Location ID: | LSB-11A | | LSB-11B | |
|---|---|---|---|---|
| Sample ID | 18K0823-03 | | 18K0823-04 | |
| Sample Date: | 11/20/2018 | | 11/20/2018 | |
| Sampling Depth (ft bgs): | 0'-2' | | 7'-9' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | | | | |
| Acetone | **0.1** | | 0.014 | |
| **SVOCs** | No Exceedances | | No Exceedances | |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Chromium, Total | **12** | | **15.5** | |
| Copper | 48.8 | | **50** | |
| Iron | **11,400** | | **8,830** | |
| Mercury | 0.0612 | | **0.39** | |
| Selenium | **8.34** | | **11.2** | |

| Location ID: | LSB-12A | | LSB-12B | |
|---|---|---|---|---|
| Sample ID | 18K0823-01 | | 18K0823-02 | |
| Sample Date: | 11/20/2018 | | 11/20/2018 | |
| Sampling Depth (ft bgs): | 1'-3' | | 8'-10' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | | | | |
| Acetone | 0.0057 | U | **0.067** | |
| Methylene Chloride | 0.0078 | J | **0.066** | |
| **SVOCs** | No Exceedances | | No Exceedances | |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Arsenic | 8.9 | | **19.2** | |
| Chromium, Total | **5.1** | | **5.84** | |
| Iron | **6,920** | | **6,700** | |
| Mercury | **0.287** | | 0.125 | |

| Location ID: | LSB-14A | | LSB-14B | | DUP-1 | |
|---|---|---|---|---|---|---|
| Sample ID | 18K0780-05 | | 18K0780-06 | | 18K0780-18 | |
| Sample Date: | 11/19/2018 | | 11/19/2018 | | 11/19/2018 | |
| Sampling Depth (ft bgs): | 0.5'-2.5' | | 5'-7' | | 5'-7' | |
| Units: | mg/Kg | Q | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | No Exceedances | | No Exceedances | | No Exceedances | |
| **SVOCs** | No Exceedances | | No Exceedances | | No Exceedances | |
| **Pesticides** | No Exceedances | | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | | | |
| Chromium, Total | **23.1** | | **9.32** | | **15.1** | |
| Chromium, Hexavalent | **1.47** | | 0.618 | U | 0.579 | U |
| Copper | 20.4 | | **54.4** | | **111** | |
| Iron | **7,740** | | **10,400** | | **10,800** | |
| Lead | 25.4 | | **122** | | **220** | |
| Mercury | 0.0858 | | **0.318** | | **1.25** | |
| Zinc | 55.4 | | 88.6 | | **150** | |

| Location ID: | LSB-16A | | LSB-16B | |
|---|---|---|---|---|
| Sample ID | 18K0780-03 | | 18K0780-04 | |
| Sample Date: | 11/19/2018 | | 11/19/2018 | |
| Sampling Depth (ft bgs): | 1'-3' | | 4'-6' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | | | | |
| Benzene | 0.0023 | U | **0.064** | |
| **SVOCs** | | | | |
| 2-Methylnaphthalene | 0.0969 | D | **1.23** | D |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Chromium, Total | **15** | | **6.61** | |
| Copper | **128** | | 29.7 | |
| Iron | **13,800** | | **14,800** | |
| Lead | **122** | | 39.8 | |
| Mercury | **0.345** | | **0.224** | |
| Zinc | **148** | | 8.46 | |

| Location ID: | LSB-19A | | LSB-19B | |
|---|---|---|---|---|
| Sample ID | 18K0780-16 | | 18K0780-17 | |
| Sample Date: | 11/19/2018 | | 11/19/2018 | |
| Sampling Depth (ft bgs): | 0'-2' | | 4'-6' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | No Exceedances | | No Exceedances | |
| **SVOCs** | No Exceedances | | No Exceedances | |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Arsenic | 11.7 | | **23.4** | |
| Chromium, Total | **3.15** | | **83.5** | |
| Chromium, Trivalent | 3.15 | | **83.5** | |
| Copper | 21.6 | | **389** | |
| Iron | **4,760** | | **26,000** | |
| Lead | 22.3 | | **398** | |
| Mercury | 0.0624 | | **1.96** | |
| Silver | 0.574 | U | **5.82** | |
| Zinc | 11.6 | | **257** | |

| Location ID: | LSB-20A | | LSB-20B | |
|---|---|---|---|---|
| Sample ID | 18K0823-14 | | 18K0823-15 | |
| Sample Date: | 11/20/2018 | | 11/20/2018 | |
| Sampling Depth (ft bgs): | 0.5'-2.5' | | 4'-6' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | | | | |
| n-Butylbenzene | 0.1 | | **41** | D |
| n-Propylbenzene | 0.087 | | **216** | D |
| sec-Butylbenzene | 0.081 | | **23** | D |
| **SVOCs** | | | | |
| 2-Methylnaphthalene | **0.908** | D | 0.128 | D |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Chromium, Total | **7.9** | | **13.7** | |
| Copper | **250** | | **264** | |
| Iron | **10,900** | | **14,000** | |
| Lead | **63.2** | | **1,340** | |
| Mercury | **0.222** | | **9.46** | |
| Silver | 0.542 | U | **3.65** | |
| Zinc | 42.5 | | **332** | |

| Location ID: | LSB-17A | | LSB-17B | |
|---|---|---|---|---|
| Sample ID | 18K0823-09 | | 18K0823-10 | |
| Sample Date: | 11/20/2018 | | 11/20/2018 | |
| Sampling Depth (ft bgs): | 0.5'-2.5' | | 14'-16' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | | | | |
| Methylene Chloride | 0.0056 | U | **0.057** | |
| **SVOCs** | | | | |
| Benzo(a)anthracene | **4.02** | D | **6.24** | D |
| Benzo(a)pyrene | **3.73** | D | **6.69** | D |
| Benzo(b)fluoranthene | **2.94** | D | **5.01** | D |
| Benzo(k)fluoranthene | **2.21** | D | **4.25** | D |
| Chrysene | **4.19** | D | **5.88** | D |
| Dibenzo(a,h)anthracene | **0.54** | D | **1.04** | D |
| Indeno(1,2,3-cd)pyrene | **1.85** | D | **3.25** | D |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Arsenic | **20.7** | | **19.2** | |
| Barium | 149 | | **360** | |
| Chromium, Total | **19.4** | | **20.4** | |
| Copper | **249** | | **305** | |
| Iron | **18,800** | | **19,300** | |
| Lead | **430** | | **1,330** | |
| Mercury | **0.873** | | **10.8** | |
| Nickel | **37** | | **35.4** | |
| Zinc | **471** | | **659** | |

| Location ID: | LSB-18A | | LSB-18B | | LSB-18C | |
|---|---|---|---|---|---|---|
| Sample ID | 18K0780-13 | | 18K0780-14 | | 18K0780-15 | |
| Sample Date: | 11/19/2018 | | 11/19/2018 | | 11/19/2018 | |
| Sampling Depth (ft bgs): | 0.5'-2.5' | | 2.5'-4.5' | | 7'-9' | |
| Units: | mg/Kg | Q | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | | | | | | |
| Acetone | 0.027 | | **0.08** | | **0.17** | |
| **SVOCs** | No Exceedances | | No Exceedances | | No Exceedances | |
| **Pesticides** | No Exceedances | | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | | | |
| Chromium, Total | **13.4** | | **5.38** | | **14** | |
| Iron | **13,300** | | **17,200** | | **18,400** | |
| Lead | 35 | | **94.3** | | **235** | |
| Mercury | 0.143 | | **1.44** | | **0.645** | |
| Zinc | 65.6 | | 55 | | **134** | |

| Location ID: | LSB-4A | | LSB-4B | | Dup-2 | |
|---|---|---|---|---|---|---|
| Sample ID | 18K0921-10 | | 18K0921-11 | | 18K0921-12 | |
| Sample Date: | 11/21/2018 | | 11/21/2018 | | 11/21/2018 | |
| Sampling Depth (ft bgs): | 2'-4' | | 14'-16' | | 14'-16' | |
| Units: | mg/Kg | Q | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | No Exceedances | | No Exceedances | | No Exceedances | |
| **SVOCs** | | | | | | |
| 2-Methylnaphthalene | 0.0632 | JD | **0.425** | D | 0.387 | D |
| **Pesticides** | No Exceedances | | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | | | |
| Arsenic | 7.19 | | **21.7** | | **30.1** | |
| Cadmium | 0.34 | U | **21.5** | | **48.5** | |
| Chromium, Total | **5.28** | | **8.62** | | **13** | |
| Copper | 25.1 | | **141** | | **240** | |
| Iron | **6920** | | **7,260** | | **9,760** | |
| Lead | **83.4** | | 60 | | **88.3** | |
| Nickel | 13.3 | | **157** | | **219** | |
| Zinc | 45.4 | | **624** | | **1,050** | |

| Location ID: | LSB-2A | | LSB-2B | |
|---|---|---|---|---|
| Sample ID | 18K0921-04 | | 18K0921-05 | |
| Sample Date: | 11/21/2018 | | 11/21/2018 | |
| Sampling Depth (ft bgs): | 0'-2' | | 10'-12' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | | | | |
| Acetone | **0.063** | | 7.7 | U |
| **SVOCs** | | | | |
| Benzo(a)anthracene | 0.158 | D | **1.94** | D |
| Benzo(a)pyrene | 0.112 | D | **1.54** | D |
| Chrysene | 0.148 | D | **2.6** | D |
| Indeno(1,2,3-cd)pyrene | 0.0751 | JD | **0.519** | JD |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Arsenic | 5.06 | | **24.9** | |
| Chromium, Total | **23.7** | | **18** | |
| Copper | 30.2 | | **532** | |
| Iron | **15,000** | | **44,100** | |
| Lead | 61.9 | | **1340** | |
| Mercury | **0.223** | | 3.17 | |
| Nickel | **44.4** | | 15.3 | |
| Zinc | 73.1 | | **539** | |

| Location ID: | LSB-5A | | LSB-5B | |
|---|---|---|---|---|
| Sample ID | 18K0921-02 | | 18K0921-03 | |
| Sample Date: | 11/21/2018 | | 11/21/2018 | |
| Sampling Depth (ft bgs): | 1.5'-3.5' | | 10'-12' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | No Exceedances | | No Exceedances | |
| **SVOCs** | No Exceedances | | No Exceedances | |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Chromium, Total | **13.4** | | **25.5** | |
| Copper | **90.3** | | 33.2 | |
| Iron | **12,900** | | **22,600** | |
| Lead | **133** | | **67** | |
| Mercury | **0.288** | | **0.354** | |
| Zinc | **130** | | 87.5 | |

| Location ID: | LSB-9A | | LSB-9B | |
|---|---|---|---|---|
| Sample ID | 18K0780-09 | | 18K0780-10 | |
| Sample Date: | 11/19/2018 | | 11/19/2018 | |
| Sampling Depth (ft bgs): | 0.5'-2.5' | | 6'-8' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | | | | |
| n-Propylbenzene | 0.0029 | U | **7.9** | D |
| **SVOCs** | No Exceedances | | No Exceedances | |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Chromium, Total | **12.8** | | **22** | |
| Copper | **59.3** | | **181** | |
| Iron | **10,700** | | **30,700** | |
| Lead | **128** | | **430** | |
| Mercury | **2.18** | | **6.3** | |
| Nickel | **37.9** | | 15.7 | |
| Zinc | **176** | | **261** | |

| Location ID: | LSB-6A | | LSB-6B | |
|---|---|---|---|---|
| Sample ID | 18K0823-11 | | 18K0823-12 | |
| Sample Date: | 11/20/2018 | | 11/20/2018 | |
| Sampling Depth (ft bgs): | 0.25'-2.25' | | 10.5'-12.5' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | | | | |
| Methylene Chloride | 0.0054 | U | **0.074** | |
| **SVOCs** | No Exceedances | | No Exceedances | |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Arsenic | 12.8 | | **19.2** | |
| Chromium, Total | **57.9** | | **85.2** | |
| Copper | **129** | | **113** | |
| Iron | **15,000** | | **12,800** | |
| Lead | **110** | | **1,600** | |
| Mercury | **0.402** | | **3.47** | |
| Nickel | **41.7** | | 20.8 | |
| Selenium | **6.91** | | 3.16 | U |
| Zinc | **144** | | **495** | |

| Location ID: | LSB-10A | | LSB-10B | |
|---|---|---|---|---|
| Sample ID | 18K0780-11 | | 18K0780-12 | |
| Sample Date: | 11/19/2018 | | 11/19/2018 | |
| Sampling Depth (ft bgs): | 0.5'-2.5' | | 8'-10' | |
| Units: | mg/Kg | Q | mg/Kg | Q |
| **VOCs** | No Exceedances | | No Exceedances | |
| **SVOCs** | No Exceedances | | No Exceedances | |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Barium | 113 | | **372** | |
| Chromium, Total | **17** | | **18.9** | |
| Copper | 31.8 | | **93.3** | |
| Iron | **10,000** | | **80,600** | |
| Lead | **132** | | **893** | |
| Mercury | **0.243** | | **18** | |
| Zinc | **196** | | **328** | |

| Location ID: | LSB-13A | | LSB-13B | |
|---|---|---|---|---|
| Sample ID | 18K0780-07 | | 18K0780-08 | |
| Sample Date: | 11/19/2018 | | 11/19/2018 | |
| Sampling Depth (ft bgs): | 0.5'-2.5' | | 7'-9' | |
| Units: | mg/kg | Q | mg/kg | Q |
| **VOCs** | | | | |
| Acetone | 0.042 | | **0.091** | |
| **SVOCs** | No Exceedances | | No Exceedances | |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Arsenic | 10.1 | | **15** | |
| Chromium, Total | **49.5** | | **21.7** | |
| Chromium, Trivalent | **49.5** | | 21.7 | |
| Copper | **181** | | **275** | |
| Iron | **16,600** | | **20,700** | |
| Lead | **204** | | **1,160** | |
| Mercury | **0.681** | | **12.1** | |
| Nickel | **37.8** | | **42.3** | |
| Zinc | **159** | | **557** | |

| Location ID: | LSB-15A | | LSB-15B | |
|---|---|---|---|---|
| Sample ID | 18K0780-01 | | 18K0780-02 | |
| Sample Date: | 11/19/2018 | | 11/19/2018 | |
| Sampling Depth (ft bgs): | 0.5'-2.5' | | 4'-6' | |
| Units: | mg/kg | Q | mg/kg | Q |
| **VOCs** | | | | |
| n-Propylbenzene | 0.0033 | J | **9.6** | D |
| **SVOCs** | | | | |
| 2-Methylnaphthalene | 0.369 | D | **1.39** | D |
| Benzo(a)anthracene | **2.08** | D | 0.0728 | JD |
| Benzo(a)pyrene | **3.22** | D | 0.0544 | JD |
| Benzo(b)fluoranthene | **1.94** | D | 0.0544 | JD |
| Benzo(k)fluoranthene | **1.68** | D | 0.0461 | U |
| Chrysene | **2.25** | D | 0.0757 | JD |
| Dibenzo(a,h)anthracene | **0.635** | D | 0.0461 | U |
| Indeno(1,2,3-cd)pyrene | **2.13** | D | 0.0461 | U |
| **Pesticides** | No Exceedances | | No Exceedances | |
| **PCBs** | No Exceedances | | No Exceedances | |
| **TAL Metals** | | | | |
| Chromium, Total | **19.3** | | **10.1** | |
| Copper | **183** | | 20.5 | |
| Iron | **17,500** | | **8,840** | |
| Lead | **140** | | 27.3 | |
| Mercury | **0.404** | | 0.0902 | |
| Nickel | 29 | | **34.5** | |
| Zinc | **218** | | 43.5 | |

| NYSDEC Subpart 375-6 Remedial Program Soil Cleanup Objectives | NYSDEC Subpart 375-6 Remedial Program Soil Cleanup Objectives | | | | |
|---|---|---|---|---|---|
| | Unrestricted Use | Protection of Public Health - Restricted Use SCOs | | | |
| | | Residential | Restricted-Residential | Commercial | Industrial |
| | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| **VOCs** | | | | | |
| Acetone | 0.05 | 100 | 100 | 500 | 1000 |
| Benzene | 0.06 | 2.9 | 4.8 | 44 | 89 |
| Methylene Chloride | 0.05 | 51 | 100 | 500 | 1,000 |
| n-Butylbenzene | 12 | 100 | 100 | 500 | 1,000 |
| n-Propylbenzene | 3.9 | 100 | 100 | 500 | 1000 |
| sec-Butylbenzene | 11 | 100 | 100 | 500 | 1000 |
| **SVOCs** | | | | | |
| 2-Methylnapthalene | --- | 0.41 | --- | --- | --- |
| Benzo(a)anthracene | 1 | 1 | 1 | 5.6 | 11 |
| Benzo(a)pyrene | 1 | 1 | 1 | 1 | 1.1 |
| Benzo(b)fluoranthene | 1 | 1 | 1 | 5.6 | 11 |
| Benzo(k)fluoranthene | 0.8 | 1 | 3.9 | 56 | 110 |
| Chrysene | 1 | 1 | 3.9 | 56 | 110 |
| Dibenzo(a,h)anthracene | 0.33 | 0.33 | 0.33 | 0.56 | 1.1 |
| Indeno(1,2,3-cd)pyrene | 0.5 | 0.5 | 0.5 | 5.6 | 11 |
| **Pesticides** | | | | | |
| 4,4'-DDD | 0.0033 | 2.6 | 13 | 92 | 180 |
| 4,4'-DDT | 0.0033 | 1.7 | 7.9 | 47 | 94 |
| **PCBs** | | | | | |
| Aroclor 1260 | 0.1 | 1 | 1 | 1 | 25 |
| Total PCBs | 0.1 | 1 | 1 | 1 | 25 |
| **TAL Metals** | | | | | |
| Arsenic | 13 | 16 | 16 | 16 | 16 |
| Barium | 350 | 350 | 400 | 400 | 10,000 |
| Cadmium | 2.5 | 2.5 | 4.3 | 9.3 | 60 |
| Chromium, Total | 1 | 22 | 110 | 400 | 800 |
| Chromium, Hexavalent | 1 | 22 | 110 | 400 | 800 |
| Chromium, Trivalent | 30 | 36 | 180 | 1,500 | 6,800 |
| Cobalt | --- | 30 | --- | --- | --- |
| Copper | 50 | 270 | 270 | 270 | 10,000 |
| Iron | --- | 2,000 | --- | --- | --- |
| Lead | 63 | 400 | 400 | 1,000 | 3,900 |
| Mercury | 0.18 | 0.81 | 0.81 | 2.8 | 5.7 |
| Nickel | 30 | 140 | 310 | 310 | 10,000 |
| Selenium | 3.9 | 36 | 180 | 1,500 | 6,800 |
| Silver | 2 | 36 | 180 | 1,500 | 6,800 |
| Vanadium | --- | 100 | --- | --- | --- |
| Zinc | 109 | 2,200 | 10,000 | 10,000 | 10,000 |

**Analytical Results Notes:**

NYSDEC Subpart 375-6 Remedial Program SCOs (Revised Brownfields) criteria are from the NYSDEC Soil Cleanup Objective Tables 375 -6.8(a) and 375-6.8(b), last revised 14 December 2006 and the NYSDEC CP-51 Soil Cleanup Guidance dated 21 October 2010.

ft bgs - feet below ground surface

U: The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration fo r results impacted by blank contamination.

J: The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

D: Compound analyzed at a secondary dilution factor.

B: Analyte found in the analysis batch blank.

*Italicized* results indicate Reporting Limits (RL) greater than or equal to the most stringent criteria.

Notes:
1. Basemap from "Draft Topographic, Boundary and Utility Survey" by Langan, dated 8/1/2018.
2. Historical sample locations digitized from figures provided in the reports referenced in the legend. Sample locations are considered to be approximate.
3. Former 275,000-gallon AST locations shown as detected during the geophysical investigation and as identified on historical Sanborn Fire Insurance Maps.
4. Areas of Concern (AOCs) digitized from figures provided in the reports referenced in the legend and 1936 Sanborn Fire Insurance Map.
5. Existing buildings digitized from "Draft Topographic, Boundary and Utility Survey" by Langan, dated 8/1/2018.
6. Former buildings digitized from "Survey of Property" by Scalice Land Surveying, dated 12/10/2015.
7. 2018 Remedial Investigation sample locations are approximate and based on geolocation with a Trimble Geo 7x Handheld GNSS System.
8. Soil boring locations LSB-21 through LSB-25 were advanced for visual observation only; no samples were collected for laboratory analysis.

## Legend

### Historical Sample Locations

- May 1990 Site Investigation Report (Tyree)
- October 1990 Site Investigation Report (Tyree)
- June 2009 Site Investigation Report (Impact)
- October 2008 Site Investigation Report (Impact)

### Remedial Investigation Sample Locations

- Soil Boring / Monitoring Well Location
- Soil Boring / Monitoring Well / Soil Vapor Point Location
- Soil Boring Location
- Soil Boring / Soil Vapor Point Location
- Area of Concern (AOC)
- Site Boundary
- Former 275,000-gallon AST
- Former Building Footprint
- Existing Building Footprint

0 50 100

SCALE IN FEET

### AOCs

- AOC-1: Former Gasoline Filling Area
- AOC-2: Former Gasoline ASTs Area
- AOC-3 Former Gasoline Truck Filling Area
- AOC-4: Former Heavy Petroleum Distillate AST Area
- AOC-5: Former Pump House Area
- AOC-6: Former Garage Area


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Langan International LLC
Collectively known as Langan


Project: 28-90 REVIEW AVENUE
BLOCK No. 294, LOT No. 106
LONG ISLAND CITY
QUEENS COUNTY NEW YORK

Drawing Title: 2018 REMEDIAL INVESTIGATION SOIL ANALYTICAL RESULTS

| | |
|---|---|
| Project No. | 100652601 |
| Date | 3/21/2018 |
| Scale | 1 " = 50 ' |
| Drawn By | ATR |
| Last Revised | 3/21/2019 |
| Figure | 2 |

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Path: \\langan.com\data\PAR\data6\100652601\ArcGIS\ArcMap_Documents\2019-03 - SRIWP\Figure 2 - Soil Analytical Results.mxd Date: 3/21/2019 User: ibaker Time: 10:42:58 AM

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| Location ID: | LMW-1 |
|---|---|
| Laboratory Sample Number | 18K0979-08 |
| Sample Date: | 11/26/2018 |
| Sample Depth (ft bgs): | 9 |
| Units: | ug/L Q |
| ***Volatile Organic Compounds (VOCs)*** | No Exceedances |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | No Exceedances |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Magnesium | **280,000** |
| Sodium | **4,110,000 D** |
| Selenium | **12.8 D** |
| ***Dissolved Metals*** | |
| Magnesium | **285,000** |
| Sodium | **2,860,000 D** |
| Selenium | **11.7 D** |

| Location ID: | LMW-4 |
|---|---|
| Laboratory Sample Number | 18K0979-04 |
| Sample Date: | 11/26/2018 |
| Sample Depth (ft bgs): | 11' |
| Units: | ug/L Q |
| ***Volatile Organic Compounds (VOCs)*** | No Exceedances |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | No Exceedances |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Iron | **1,560** |
| Iron and Manganese | **1,985** |
| Magnesium | **158,000** |
| Manganese | **425** |
| Sodium | **2,640,000 D** |
| ***Dissolved Metals*** | |
| Magnesium | **160,000** |
| Manganese | **417** |
| Sodium | **1,990,000 D** |

| Location ID: | LMW-3 | Dup-3 |
|---|---|---|
| Laboratory Sample Number | 18K0979-07 | 18K0979-12 |
| Sample Date: | 11/26/2018 | 11/26/2018 |
| Sample Depth (ft bgs): | 10' | |
| Units: | ug/L Q | ug/L Q |
| ***Volatile Organic Compounds (VOCs)*** | No Exceedances | No Exceedances |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | No Exceedances | No Exceedances |
| ***Pesticides*** | No Exceedances | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances | No Exceedances |
| ***TAL Metals*** | | |
| Magnesium | **501,000** | **510,000** |
| Sodium | **6,780,000 D** | **5,720,000 D** |
| ***Dissolved Metals*** | | |
| Magnesium | **503,000** | **503,000** |
| Sodium | **5,680,000 D** | **5,500,000 D** |
| Selenium | *11.1 U* | **17.7 D** |

| Location ID: | LMW-2 |
|---|---|
| Laboratory Sample Number | 18K0979-09 |
| Sample Date: | 11/26/2018 |
| Sample Depth (ft bgs): | 7' |
| Units: | ug/L Q |
| ***Volatile Organic Compounds (VOCs)*** | No Exceedances |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | |
| Benzo(a)anthracene | **0.0774** |
| Benzo(a)pyrene | **0.0645** |
| Chrysene | **0.103** |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Iron | **625** |
| Iron and Manganese | **665.8** |
| Magnesium | **629,000** |
| Sodium | **8,530,000 D** |
| ***Dissolved Metals*** | |
| Iron | **339** |
| Magnesium | **645,000** |

| Location ID: | LMW-6 |
|---|---|
| Laboratory Sample Number | 18K0979-06 |
| Sample Date: | 11/26/2018 |
| Sample Depth (ft bgs): | 9' |
| Units: | ug/L Q |
| ***Volatile Organic Compounds (VOCs)*** | No Exceedances |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | |
| Chrysene | **0.0571** |
| Benzo(a)pyrene | **0.0571** |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Magnesium | **210,000** |
| Sodium | **2,900,000 D** |
| ***Dissolved Metals*** | |
| Magnesium | **203,000** |
| Sodium | **2,170,000 D** |
| Selenium | **13.5 D** |

| Location ID: | LMW-9 |
|---|---|
| Laboratory Sample Number | 18K0979-03 |
| Sample Date: | 11/26/2018 |
| Sample Depth (ft bgs): | 9' |
| Units: | ug/L Q |
| ***Volatile Organic Compounds (VOCs)*** | No Exceedances |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | No Exceedances |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Iron | **1,240** |
| Iron and Manganese | **1,925** |
| Magnesium | **279,000** |
| Manganese | **685** |
| Sodium | **3,780,000 D** |
| ***Dissolved Metals*** | |
| Iron and Manganese | **678** |
| Magnesium | **282,000** |
| Manganese | **678** |
| Sodium | **3,240,000 D** |

| Location ID: | LMW-7 |
|---|---|
| Laboratory Sample Number | 18K0979-05 |
| Sample Date: | 11/26/2018 |
| Sample Depth (ft bgs): | 10' |
| Units: | ug/L Q |
| ***Volatile Organic Compounds (VOCs)*** | No Exceedances |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | |
| Benzo(a)anthracene | **0.0588** |
| Chrysene | **0.0706** |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Iron | **13,700** |
| Iron and Manganese | **14,349** |
| Magnesium | **50,700** |
| Manganese | **649** |
| Sodium | **729,000** |
| ***Dissolved Metals*** | |
| Iron and Manganese | **616** |
| Magnesium | **49,600** |
| Manganese | **616** |
| Sodium | **625,000** |

| Location ID: | LMW-13 |
|---|---|
| Laboratory Sample Number | 18K1020-04 |
| Sample Date: | 11/27/2018 |
| Sample Depth (ft bgs): | 8' |
| Units: | ug/L Q |
| ***Volatile Organic Compounds (VOCs)*** | No Exceedances |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | No Exceedances |
| ***Pesticide*** | |
| Chlordane | **0.11** |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Iron | **16,700** |
| Iron and Manganese | **17,485** |
| Magnesium | **107,000** |
| Manganese | **785** |
| Sodium | **1,130,000** |
| ***Dissolved Metals*** | No Exceedances |

| Location ID: | LMW-14 |
|---|---|
| Laboratory Sample Number | 18K1020-05 |
| Sample Date: | 11/27/2018 |
| Sample Depth (ft bgs): | 8' |
| Units: | ug/L Q |
| ***Volatile Organic Compound (VOCs)*** | |
| 1,2,4-Trimethylbenzene | **13.2 D** |
| Benzene | **50.1 D** |
| n-Butylbenzene | **77.1 D** |
| Ethylbenzene | **7.2 D** |
| Isopropyl Benzene | **282 D** |
| Propylbenzene-n | **469 D** |
| Sec-Butylbenzene | **52.8 D** |
| Toluene | **8.6 D** |
| 1,2-Xylene (o-Xylene) | **8.8 D** |
| m&p-Xylene | **34.8 D** |
| Xylene (mixed) | **43.6 D** |
| ***Semi-Volatile Organic Compound (SVOCs)*** | |
| Benzo(a)anthracene | **0.1** |
| Benzo(a)pyrene | **0.1** |
| Benzo(b)fluoranthene | **0.1** |
| Benzo(k)fluoranthene | **0.0889** |
| Chrysene | **0.122** |
| Indeno(1,2,3-cd)pyrene | **0.0778** |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Antimony | **6.7** |
| Arsenic | **40.7** |
| Iron | **16,800** |
| Iron and Manganese | **17,600** |
| Magnesium | **106,000** |
| Manganese | **800** |
| Selenium | **18.2 D** |
| Sodium | **1,130,000** |
| ***Dissolved Metals*** | |
| Iron | **882** |
| Iron and Manganese | **2,012** |
| Manganese | **1,130** |
| Sodium | **309,000** |

| Location ID: | LMW-5 |
|---|---|
| Laboratory Sample Number | 18K1020-02 |
| Sample Date: | 11/27/2018 |
| Sample Depth (ft bgs): | 10' |
| Units: | ug/L Q |
| ***Volatile Organic Compound (VOCs)*** | |
| 1,2,4-Trimethylbenzene | **11.4** |
| Benzene | **1.95** |
| Ethylbenzene | **5.18** |
| Toluene | **13.6** |
| 1,2-Xylene (o-Xylene) | **12.3** |
| m&p-Xylene | **37.4** |
| Xylene (mixed) | **49.8** |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | No Exceedances |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Iron | **6,880** |
| Iron and Manganese | **9,000** |
| Lead | **106** |
| Magnesium | **158,000** |
| Manganese | **2,120** |
| Sodium | **1,030,000** |
| ***Dissolved Metals*** | |
| Manganese | **488** |
| Sodium | **71,100** |

| Location ID: | LMW-8 |
|---|---|
| Laboratory Sample Number | 18K0979-02 |
| Sample Date: | 11/26/2018 |
| Sample Depth (ft bgs): | 10' |
| Units: | ug/L Q |
| ***Volatile Organic Compounds (VOCs)*** | |
| Benzene | **1.64 D** |
| Isopropyl Benzene | **6.24 D** |
| Propylbenzene-n | **6.66 D** |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | No Exceedances |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Iron | **4,160** |
| Iron and Manganese | **4,451** |
| Magnesium | **53,300** |
| Sodium | **640,000** |
| ***Dissolved Metals*** | |
| Magnesium | **53,300** |
| Sodium | **560,000** |

| Location ID: | LMW-10 |
|---|---|
| Laboratory Sample Number | 18K1020-01 |
| Sample Date: | 11/27/2018 |
| Sample Depth (ft bgs): | 10' |
| Units: | ug/L Q |
| ***Volatile Organic Compound (VOCs)*** | |
| Xylene (mixed) | **6.91** |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | No Exceedances |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Iron | **76,900** |
| Iron and Manganese | **78,180** |
| Magnesium | **111,000** |
| Manganese | **1,280** |
| Sodium | **1,100,00** |
| ***Dissolved Metals*** | |
| Sodium | **76,600** |

| Location ID: | LMW-11 |
|---|---|
| Laboratory Sample Number | 18K0979-01 |
| Sample Date: | 11/26/2018 |
| Sample Depth (ft bgs): | 9' |
| Units: | ug/L Q |
| ***Volatile Organic Compounds (VOCs)*** | |
| 1,2,4-Trimethylbenzene | **14 D** |
| Benzene | **119 D** |
| n-Butylbenzene | **46.6 D** |
| Ethylbenzene | **14.5 D** |
| Isopropyl Benzene | **125 D** |
| Propylbenzene-n | **320 D** |
| Sec-Butylbenzene | **29.8 D** |
| Toluene | **113 D** |
| 1,2-Xylene (o-Xylene) | **20.1 D** |
| m&p-Xylene | **49.1 D** |
| Xylene (mixed) | **69.2 D** |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | No Exceedances |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Iron | **15,900** |
| Iron and Manganese | **16,747** |
| Manganese | **847** |
| Sodium | **206,000** |
| ***Dissolved Metals*** | |
| Iron | **2,120** |
| Iron and Manganese | **2,945** |
| Manganese | **825** |
| Sodium | **179,000** |

| Location ID: | LMW-12 |
|---|---|
| Laboratory Sample Number | 18K1020-03 |
| Sample Date: | 11/27/2018 |
| Sample Depth (ft bgs): | 8' |
| Units: | ug/L Q |
| ***Volatile Organic Compounds (VOCs)*** | No Exceedances |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | |
| Propylbenzene-n | **5.89** |
| ***Pesticides*** | No Exceedances |
| ***Polychlorinated biphenyls (PCBs)*** | No Exceedances |
| ***TAL Metals*** | |
| Sodium | **26,600 D** |
| ***Dissolved Metals*** | |
| Sodium | **22,800** |

| Groundwater Quality Standards | ug/L |
|---|---|
| ***Volatile Organic Compounds (VOCs)*** | |
| 1,2,4-Trimethylbenzene | 5 |
| Benzene | 1 |
| n-Butylbenzene | 5 |
| Ethylbenzene | 5 |
| Isopropyl Benzene | 5 |
| Propylbenzene-n | 5 |
| Sec-Butylbenzene | 5 |
| Toluene | 5 |
| 1,2-Xylene (o-Xylene) | 5 |
| m&p-Xylene | 5 |
| Xylene (mixed) | 5 |
| ***Semi-Volatile Organic Compounds (SVOCs)*** | |
| Benzo(a)anthracene | 0.002 |
| Benzo(a)pyrene | 0 |
| Benzo(k)fluoranthene | 0.002 |
| Chrysene | 0.002 |
| Indeno(1,2,3-cd)pyrene | 0.002 |
| ***Pesticides*** | |
| Chlordane | 0.05 |
| ***Polychlorinated biphenyls (PCBs)*** | |
| ***TAL Metals*** | |
| Antimony | 3 |
| Arsenic | 25 |
| Iron | 300 |
| Iron and Manganese | 500 |
| Lead | 25 |
| Magnesium | 35,000 |
| Manganese | 300 |
| Sodium | 20,000 |
| ***Dissolved Metals*** | |
| Iron | 300 |
| Iron and Manganese | 500 |
| Magnesium | 35,000 |
| Manganese | 300 |
| Sodium | 20,000 |

**Analytical Results Notes:**

DEC establishes water quality standards and other criteria for many specific substances and are found in NYS regulation 6 NYCRR Part 703.5 (current through February 15, 2016). In the absence of established water quality standards, numeric guidance values are derived and compiled in Division of Water guidance TOGS 1.1.1 (updated June 2004).

ug/L: micrograms per liter

Exceedances of regulatory criteria are highlighted and **bold**.

*Italicized* results indicate the Reporting Limit (RL) is greater than or equal to the most stringent criteria.

Q is the Qualifier Column with definitions as follows:

D: Result is from an analysis that required a dilution

B: Analyte found in the analysis batch blank.

U: Analyte not detected at or above the level indicated

Notes:

1. Basemap from "Draft Topographic, Boundary and Utility Survey" by Langan, dated 8/1/2018.
2. Historical sample locations digitized from figures provided in the reports referenced in the legend. Sample locations are considered to be approximate.
3. Former 275,000-gallon AST locations shown as detected during the geophysical investigation and as identified on historical Sanborn Fire Insurance Maps.
4. Areas of Concern (AOCs) digitized from figures provided in the reports referenced in the legend and 1936 Sanborn Fire Insurance Map.
5. Existing buildings digitized from "Draft Topographic, Boundary and Utility Survey" by Langan, dated 8/1/2018.
6. Former buildings digitized from "Survey of Property" by Scalice Land Surveying, dated 12/10/2015.
7. 2018 Remedial Investigation sample locations are approximate and based on geolocation with a Trimble Geo 7x Handheld GNSS System.

## Legend

### Historical Sample Locations

- May 1990 Site Investigation Report (Tyree)
- October 1990 Site Investigation Report (Tyree)
- June 2009 Site Investigation Report (Impact)
- October 2008 Site Investigation Report (Impact)

### Remedial Investigation Sample Locations

- Soil Boring / Monitoring Well Location
- Soil Boring / Monitoring Well / Soil Vapor Point Location
- Soil Boring Location
- Soil Boring / Soil Vapor Point Location
- Area of Concern (AOC)
- Site Boundary
- Former 275,000-gallon AST
- Former Building Footprint
- Existing Building Footprint

0 50 100

SCALE IN FEET

### AOCs

AOC-1: Former Gasoline Filling Area
AOC-2: Former Gasoline ASTs Area
AOC-3 Former Gasoline Truck Filling Area
AOC-4: Former Heavy Petroleum Distillate AST Area
AOC-5: Former Pump House Area
AOC-6: Former Garage Area


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Project
28-90 REVIEW AVENUE
BLOCK No. 294, LOT No. 106
LONG ISLAND CITY
QUEENS COUNTY NEW YORK

Drawing Title
2018 REMEDIAL INVESTIGATION GROUNDWATER ANALYTICAL RESULTS

| Project No. | Figure |
|---|---|
| 100652601 | 3 |
| Date: 3/21/2018 | |
| Scale: 1 " = 50 ' | |
| Drawn By: ATR | |
| Last Revised: 3/21/2019 | |

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Path: \\langan.com\data\PAR\data6\100652601\ArcGIS\ArcMap_Documents\2019-03 - SRIWP\Figure 3 - Groundwater Analytical Results.mxd Date: 3/21/2019 User: lbaker Time: 10:45:46 AM

| Location ID: | LSV-2 | |
|---|---|---|
| Sample ID | 18K1021-10 | |
| Sample Date: | 11/27/2018 | |
| Sample Depth (ft bgs) | 5' | |
| Units: | ug/m3 | Q |
| **Volatile Organic Compounds (VOCs)** | | |
| Carbon tetrachloride | 0.373 | D |
| Trichlorethene | 0.478 | D |
| Tetrachloroethene | 99.5 | D |
| 1,1,1-Trichloroethane | 6.15 | D |
| Vinyl chloride | 0.379 | U |
| Benzene | 13.2 | D |
| Ethylbenzene | 12.9 | D |
| Toluene | 58.6 | D |
| o-Xylene | 14.4 | D |
| p- & m- Xylenes | 45.4 | D |

| Location ID: | LSV-3 | |
|---|---|---|
| Sample ID | 18K1021-06 | |
| Sample Date: | 11/27/2018 | |
| Sample Depth (ft bgs) | 4' | |
| Units: | ug/m3 | Q |
| **Volatile Organic Compounds (VOCs)** | | |
| Carbon tetrachloride | 0.237 | U |
| Trichlorethene | 0.202 | U |
| Tetrachloroethene | 78 | D |
| 1,1,1-Trichloroethane | 4.62 | D |
| Vinyl chloride | 0.385 | U |
| Benzene | 14 | D |
| Ethylbenzene | 12.7 | D |
| Toluene | 119 | D |
| o-Xylene | 14.5 | D |
| p- & m- Xylenes | 49.4 | D |

| Location ID: | LSV-5 | |
|---|---|---|
| Sample ID | 18K1021-09 | |
| Sample Date: | 11/27/2018 | |
| Sample Depth (ft bgs) | 5' | |
| Units: | ug/m3 | Q |
| **Volatile Organic Compounds (VOCs)** | | |
| Carbon tetrachloride | 0.248 | U |
| Trichlorethene | 0.212 | U |
| Tetrachloroethene | 92.6 | D |
| 1,1,1-Trichloroethane | 0.86 | U |
| Vinyl chloride | 0.403 | U |
| Benzene | 7.75 | D |
| Ethylbenzene | 4.86 | D |
| Toluene | 31.7 | D |
| o-Xylene | 6.36 | D |
| p- & m- Xylenes | 22.1 | D |

| Location ID: | LSV-8 | | DUP-4 | |
|---|---|---|---|---|
| Sample ID | 18K1021-07 | | 18K1021-08 | |
| Sample Date: | 11/27/2018 | | 11/27/2018 | |
| Sample Depth (ft bgs) | 4' | | 4' | |
| Units: | ug/m3 | Q | ug/m3 | Q |
| **Volatile Organic Compounds (VOCs)** | | | | |
| Carbon tetrachloride | 0.224 | U | 0.24 | U |
| Trichlorethene | 0.192 | U | 0.205 | U |
| Tetrachloroethene | 4.64 | D | 4.04 | D |
| 1,1,1-Trichloroethane | 0.778 | U | 0.834 | U |
| Vinyl chloride | 0.365 | U | 0.391 | U |
| Benzene | 8.84 | D | 10.6 | D |
| Ethylbenzene | 5.26 | D | 8.5 | D |
| Toluene | 34 | D | 51.5 | D |
| o-Xylene | 5.39 | D | 9.1 | D |
| p- & m- Xylenes | 19.3 | D | 31.9 | D |

| Location ID: | LSV-9 | |
|---|---|---|
| Sample ID | 18K1021-03 | |
| Sample Date: | 11/27/2018 | |
| Sample Depth (ft bgs) | 5' | |
| Units: | ug/m3 | Q |
| **Volatile Organic Compounds (VOCs)** | | |
| Carbon tetrachloride | 0.249 | U |
| Trichlorethene | 0.213 | U |
| Tetrachloroethene | 13.7 | D |
| 1,1,1-Trichloroethane | 0.864 | U |
| Vinyl chloride | 0.405 | U |
| Benzene | 25.9 | D |
| Ethylbenzene | 9.76 | D |
| Toluene | 58.7 | D |
| o-Xylene | 9.97 | D |
| p- & m- Xylenes | 33 | D |

| Location ID: | LSV-11 | |
|---|---|---|
| Sample ID | 18K1021-02 | |
| Sample Date: | 11/27/2018 | |
| Sample Depth (ft bgs) | 5' | |
| Units: | ug/m3 | Q |
| **Volatile Organic Compounds (VOCs)** | | |
| Carbon tetrachloride | 2.27 | U |
| Trichlorethene | 1.94 | U |
| Tetrachloroethene | 2.44 | U |
| 1,1,1-Trichloroethane | 7.86 | U |
| Vinyl chloride | 3.68 | U |
| Benzene | 4.6 | U |
| Ethylbenzene | 163 | D |
| Toluene | 353 | D |
| o-Xylene | 98.2 | D |
| p- & m- Xylenes | 414 | D |

| Location ID: | LSV-10 | |
|---|---|---|
| Sample ID | 18K1021-01 | |
| Sample Date: | 11/27/2018 | |
| Sample Depth (ft bgs) | 4' | |
| Units: | ug/m3 | Q |
| **Volatile Organic Compounds (VOCs)** | | |
| Carbon tetrachloride | 2.38 | U |
| Trichlorethene | 2.03 | U |
| Tetrachloroethene | 2.56 | U |
| 1,1,1-Trichloroethane | 8.24 | U |
| Vinyl chloride | 41.3 | D |
| Benzene | 4.83 | U |
| Ethylbenzene | 2280 | D |
| Toluene | 1630 | D |
| o-Xylene | 2400 | D |
| p- & m- Xylenes | 5660 | D |

| Location ID: | LSV-4 | |
|---|---|---|
| Sample ID | 18K1021-11 | |
| Sample Date: | 11/27/2018 | |
| Sample Depth (ft bgs) | 4' | |
| Units: | ug/m3 | Q |
| **Volatile Organic Compounds (VOCs)** | | |
| Carbon tetrachloride | 0.246 | U |
| Trichlorethene | 0.21 | U |
| Tetrachloroethene | 18.7 | D |
| 1,1,1-Trichloroethane | 0.853 | U |
| Vinyl chloride | 0.4 | U |
| Benzene | 3.6 | D |
| Ethylbenzene | 3.33 | D |
| Toluene | 9.78 | D |
| o-Xylene | 6.11 | D |
| p- & m- Xylenes | 17 | D |

| Location ID: | LSV-7 | |
|---|---|---|
| Sample ID | 18K1021-04 | |
| Sample Date: | 11/27/2018 | |
| Sample Depth (ft bgs) | 5.5' | |
| Units: | ug/m3 | Q |
| **Volatile Organic Compounds (VOCs)** | | |
| Carbon tetrachloride | 0.242 | U |
| Trichlorethene | 0.207 | U |
| Tetrachloroethene | 48.5 | D |
| 1,1,1-Trichloroethane | 0.84 | U |
| Vinyl chloride | 0.394 | U |
| Benzene | 24.7 | D |
| Ethylbenzene | 14.5 | D |
| Toluene | 87.7 | D |
| o-Xylene | 14.3 | D |
| p- & m- Xylenes | 54 | D |

| Location ID: | LSV-6 | |
|---|---|---|
| Sample ID | 18K1021-05 | |
| Sample Date: | 11/27/2018 | |
| Sample Depth (ft bgs) | 5' | |
| Units: | ug/m3 | Q |
| **Volatile Organic Compounds (VOCs)** | | |
| Carbon tetrachloride | 0.241 | U |
| Trichlorethene | 0.206 | U |
| Tetrachloroethene | 33.4 | D |
| 1,1,1-Trichloroethane | 0.837 | U |
| Vinyl chloride | 0.392 | U |
| Benzene | 23.9 | D |
| Ethylbenzene | 15.1 | D |
| Toluene | 104 | D |
| o-Xylene | 15.9 | D |
| p- & m- Xylenes | 58.1 | D |

**Analytical Results Notes:**
ug/m3: microgram/cubic meter
Q is the Qualifier Column with definitions as follows:
U: The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL
D: Result is from an analysis that required a dilution

## Legend

**Historical Sample Locations**

- May 1990 Site Investigation Report (Tyree)
- October 1990 Site Investigation Report (Tyree)
- June 2009 Site Investigation Report (Impact)
- October 2008 Site Investigation Report (Impact)

**Remedial Investigation Sample Locations**

- Soil Boring / Monitoring Well Location
- Soil Boring / Monitoring Well / Soil Vapor Point Location
- Soil Boring Location
- Soil Boring / Soil Vapor Point Location
- Soil Vapor Sample Not Collected Due to Field Conditions
- Area of Concern (AOC)
- Site Boundary
- Former 275,000-gallon AST
- Former Building Footprint
- Existing Building Footprint

Notes:
1. Basemap from "Draft Topographic, Boundary and Utility Survey" by Langan, dated 8/1/2018.
2. Historical sample locations digitized from figures provided in the reports referenced in the legend. Sample locations are considered to be approximate.
3. Former 275,000-gallon AST locations shown as detected during the geophysical investigation and as identified on historical Sanborn Fire Insurance Maps.
4. Proposed building footprint digitized from "S-100 Foundation Plan" prepared by Ware MalComb dated 7/30/2018.
5. Existing buildings digitized from "Draft Topographic, Boundary and Utility Survey" by Langan, dated 8/1/2018.
6. Former buildings digitized from "Survey of Property" by Scalice Land Surveying, dated 12/10/2015.
7. 2018 Remedial Investigation sample locations are approximate and based on geolocation with a Trimble Geo 7x Handheld GNSS System.

| AOCs |
|---|
| AOC-1: Former Gasoline Filling Area |
| AOC-2: Former Gasoline ASTs Area |
| AOC-3 Former Gasoline Truck Filling Area |
| AOC-4: Former Heavy Petroleum Distillate AST Area |
| AOC-5: Former Pump House Area |
| AOC-6: Former Garage Area |

60 0 60
SCALE IN FEET


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Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

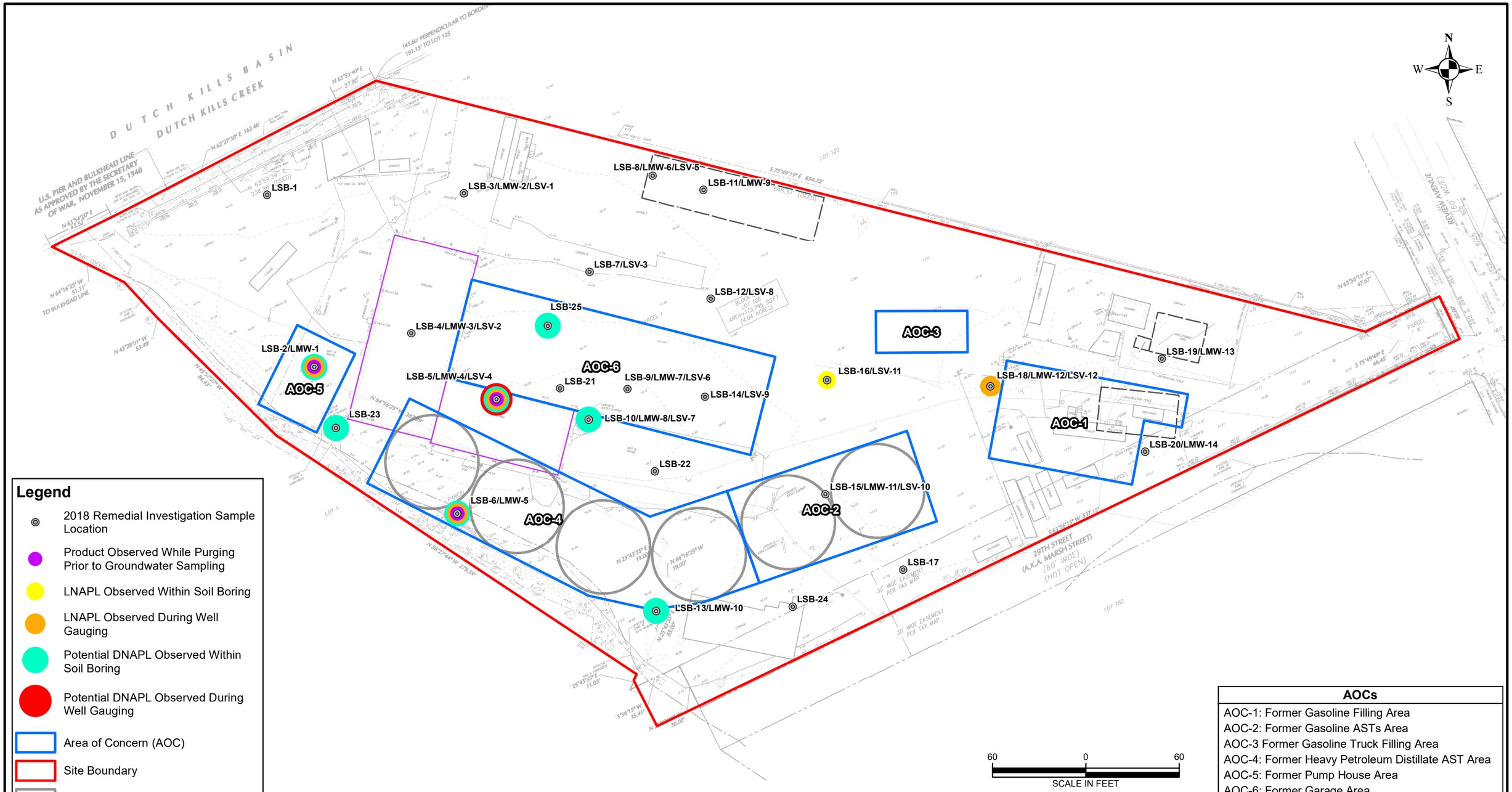

Project
28-90 REVIEW AVENUE
BLOCK No. 294, LOT No. 106
LONG ISLAND CITY
QUEENS COUNTY NEW YORK

Drawing Title
REMEDIAL INVESTIGATION SOIL VAPOR ANALYTICAL RESULTS

| Project No. | Figure |
|---|---|
| 100652601 | 4 |
| Date: 3/21/2019 | |
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## Legend

- 2018 Remedial Investigation Sample Location
- Product Observed While Purging Prior to Groundwater Sampling
- LNAPL Observed Within Soil Boring
- LNAPL Observed During Well Gauging
- Potential DNAPL Observed Within Soil Boring
- Potential DNAPL Observed During Well Gauging
- Area of Concern (AOC)
- Site Boundary
- Former 275,000-gallon AST
- Former Building Footprint
- Existing Building Footprint

| AOCs |
|---|
| AOC-1: Former Gasoline Filling Area |
| AOC-2: Former Gasoline ASTs Area |
| AOC-3 Former Gasoline Truck Filling Area |
| AOC-4: Former Heavy Petroleum Distillate AST Area |
| AOC-5: Former Pump House Area |
| AOC-6: Former Garage Area |

Notes:
1. Basemap from "Draft Topographic, Boundary and Utility Survey" by Langan, dated 8/1/2018.
2. Areas of Concern (AOCs) digitized from figures provided in historical reports and the 1936 Sanborn Fire Insurance Map.
3. Existing buildings digitized from "Draft Topographic, Boundary and Utility Survey" by Langan, dated 8/1/2018.
4. Former buildings digitized from "Survey of Property" by Scalice Land Surveying, dated 12/10/2015.
5. 2018 Remedial Investigation sample locations are approximate and based on geolocation with a Trimble Geo 7x Handheld GNSS System.


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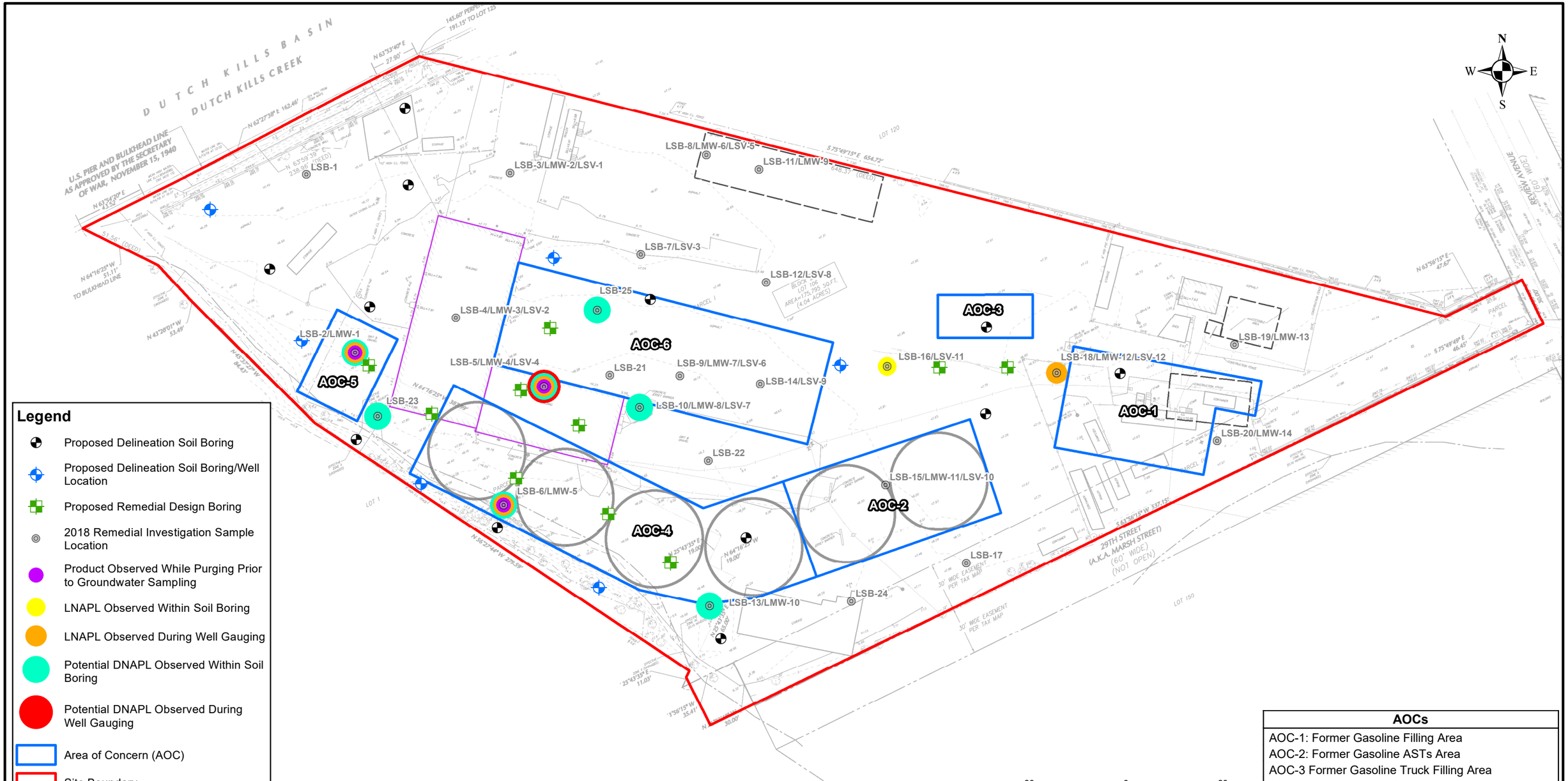
Drawing Title
REMEDIAL INVESTIGATION NAPL OBSERVATIONS

| | |
|---|---|
| Project No. | 100652601 |
| Date | 3/21/2019 |
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Figure 5

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## Legend

- Proposed Delineation Soil Boring
- Proposed Delineation Soil Boring/Well Location
- Proposed Remedial Design Boring
- 2018 Remedial Investigation Sample Location
- Product Observed While Purging Prior to Groundwater Sampling
- LNAPL Observed Within Soil Boring
- LNAPL Observed During Well Gauging
- Potential DNAPL Observed Within Soil Boring
- Potential DNAPL Observed During Well Gauging
- Area of Concern (AOC)
- Site Boundary
- Former 275,000-gallon
- Former Building Footprint
- Existing Building Footprint

| AOCs |
|---|
| AOC-1: Former Gasoline Filling Area |
| AOC-2: Former Gasoline ASTs Area |
| AOC-3 Former Gasoline Truck Filling Area |
| AOC-4: Former Heavy Petroleum Distillate AST Area |
| AOC-5: Former Pump House Area |
| AOC-6: Former Garage Area |

60 0 60
SCALE IN FEET

Notes:
1. Basemap from "Draft Topographic, Boundary and Utility Survey" by Langan, dated 8/1/2018.
2. Areas of Concern (AOCs) digitized from figures provided in historical reports and the 1936 Sanborn Fire Insurance Map.
3. Existing buildings digitized from "Draft Topographic, Boundary and Utility Survey" by Langan, dated 8/1/2018.
4. Former buildings digitized from "Survey of Property" by Scalice Land Surveying, dated 12/10/2015.
5. 2018 Remedial Investigation sample locations are approximate and based on geolocation with a Trimble Geo 7x Handheld GNSS System.
6. All proposed Remedial Design soil borings will be advanced within the footprint of the anticipated remediation extents and may be moved as needed based on field observations.
7. Up to four additional Delineation soil borings and/or monitoring wells will be advanced as offsets locations as needed for delineation purposes.


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Project
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Drawing Title
PROPOSED SUPPLEMENTAL INVESTIGATION LOCATIONS, NAPL OBSERVATIONS, AND AOCs

| | |
|---|---|
| Project No. | 100652601 |
| Date | 12/5/2018 |
| Scale | 1"=60' |
| Drawn By | JR |
| Last Revised | 3/25/2019 |
| Figure | 6 |

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# APPENDIX A

# HEALTH AND SAFETY PLAN

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# HEALTH AND SAFETY PLAN

# for

# SUPPLEMENTAL REMEDIAL INVESTIGATION

# 28-90 REVIEW AVENUE
# QUEENS, NEW YORK

***Prepared For:***

**28-90 Review Avenue Owner, LLC**
**c/o Innovo Property Group**
**1370 Avenue of the Americas, 19th Floor**
**New York, New York**

***Prepared By:***

**Langan Engineering, Environmental, Surveying,**
**Landscape Architecture and Geology D.P.C.**
**300 Kimball Drive**
**Parsippany, New Jersey 07054**

**April 2019**
**100652601**

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# ENVIRONMENTAL HEALTH AND SAFETY PLAN

| | |
|---|---|
| *Client:* | **28-90 Review Avenue Owner, LLC** |
| *Project:* | **Environmental Investigation** |
| *Location:* | **28-90 Review Avenue, Queens, New York** |
| Chemical Hazards: | **VOCs, Polycyclic aromatic hydrocarbons (PAHs), Metals (Historic Fill), petroleum hydrocarbons** |
| *Prepared By:* | **LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C.** |
| *Version:* | **1** |
| *Date:* | **April 2019** |

| | | |
|---|---|---|
| *Client Contact:* | **Stephen Kim** | **(212)-218-3158** |
| *Langan Project Manager (PM):* | **Amanda Forsburg** | **(973) 560-4900** |
| *Langan Health & Safety Manager (HSM):* | **Tony Moffa, CHMM** | **(215) 491-6545** |
| *Langan Health and Safety Officer (HSO):* | **Field Personnel** | |
| *Langan Incident/Injury Hotline:* | **1-800-952-6426 or (973) 560-4699** | |

LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C., (LANGAN), AND LANGAN SUBCONTRACTORS, DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS WHICH MAY BE ENCOUNTERED. STRICT ADHERENCE TO THE HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDELINES IN THIS PLAN WERE PREPARED SPECIFICALLY FOR THIS SITE AND SHOULD NOT BE USED ON ANY OTHER SITE WITHOUT PRIOR RESEARCH AND EVALUATION BY A TRAINED HEALTH AND SAFETY SPECIALIST. THIS HASP HAS BEEN PREPARED FOR LANGAN EMPLOYEES ONLY. ALL OTHER PARTIES WORKING ON THE SITE THAT HAVE THE POTENTIAL TO BE EXPOSED TO HAZARDOUS MATERIALS MUST DEVELOP AND IMPLEMENT THEIR OWN HASP FOR USE BY THEIR EMPLOYEES.

**APPROVALS**

By signature, the personnel identified below hereby acknowledge that they have reviewed this Health and Safely Plan (HASP) and agree to comply with the requirements contained therein as well as the applicable provisions of 29 CFR Parts 1910 and 1926. Furthermore, in reviewing and accepting this HASP, as currently written, the undersigned agree that to the best of their knowledge, this HASP adequately identifies the activities and hazards associated with work at this site and describes the appropriate and necessary precautions and protections for site workers required by the applicable OSHA statutes and regulations.



| | |
|---|---|
| LANGAN Project Manager - PM (Amanda Forsburg) | 24 April 2019<br>Date |
| LANGAN Health and Safety Manager (Tony Moffa, CHMM) | Date |
| LANGAN Health and Safety Officer – HSO | Date |

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### APPENDICES


| | |
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| **ATTACHMENT B** | **Field Procedures Change Authorization Form** |
| **ATTACHMENT C** | **Unsafe Conditions and Practices Form** |
| **ATTACHMENT D** | **Calibration Log** |
| **ATTACHMENT E** | **Emergency Notification Numbers** |
| **ATTACHMENT F** | **Accident / Incident Report Form** |
| **ATTACHMENT G** | **Jobsite Safety Inspection Checklist** |
| **ATTACHMENT H** | **Material Safety Data Sheets (MSDS)** |
| **ATTACHMENT I** | **Langan Guidelines** |

# 1.0 INTRODUCTION

## 1.1 Purpose and Policy

This Health and Safety Plan (HASP) has been developed to comply with the regulations under Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120(b)(4), Hazardous Waste Operations and Emergency Response. It addresses foreseeable activities associated with the site work to be conducted at 28-90 Review Avenue located in Queens, New York (see Figure 1). This HASP establishes personnel protection standards and mandatory safety practices and procedures. Additionally, it assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted at known or suspected hazardous waste sites.

Langan personnel involved with inspection of site work activities which involve the displacement of soil and/or material during the investigation activities during the proposed investigation shall comply with the requirements of this HASP. All Langan personnel engaged in onsite activities will read this document carefully and complete the Safety Briefing Form (Attachment A), a copy of which will be provided to Langan's Project files. Contractors and subcontractors conducting investigation-related activities which will disturb or displace soil or groundwater at the site are required to develop and follow their own HASP based on the identified hazards. All sampling data and environmental reports pertaining to the site that are available to Langan will be provided upon request to the Langan PM. Contractors and subcontractors are responsible for their own workers Health and Safety and providing a safe working environment in accordance with all applicable federal, state and local requirements. Each Subcontractor will have a designated Site Health and Safety Manager who will be responsible for ensuring that the designated procedures are implemented in the field. Personnel who have any questions or concerns regarding implementation of this plan are encouraged to request clarification from the Langan PM. Field personnel must follow the designated health and safety procedures, be alert to the hazards associated with working close to vehicles and equipment, and use common sense and exercise reasonable caution at all times.

This HASP covers investigation-related field activities which have the potential to disturb and/or displace potentially contaminated soil and groundwater. These activities include, but are not limited to: the completion of soil borings and

installation of permanent groundwater monitoring wells, and the collection of soil, groundwater, and light non-aqueous phase liquid (LNAPL) samples. Due to the petroleum impacts and historic fill present at the site, all soil drill cuttings and/or purged groundwater will be containerized in United States Department of Transportation (USDOT)-approved 55-gallon drums so as to prevent contact with such materials by any untrained workers or passersby.

This HASP was prepared in accordance with the following documents and/or guidelines:

- Occupational Safety and Health Administration (OSHA) regulations for hazardous site workers (29 CFR 1910.120 and 29 CFR 1926); and,
- NIOSH/OSHA/USCG/USEPA *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.*

Langan's Health and Safety Program and Safe Operating Procedures support this site-specific HASP.

The level of protection and the procedures specified in this HASP represent the minimum health and safety requirements to be observed by Langan site personnel engaged in the referenced investigation activities. Unknown conditions may exist, and known conditions may change. Should an employee find himself or herself in a potentially hazardous situation, the employee will immediately discontinue the hazardous procedure(s) and either personally effect appropriate preventative or corrective measures, or immediately notify the Health and Safety Officer or the Langan PM of the nature of the hazard. In the event of an immediately dangerous or life threatening situation, the employee always has "stop work" authority. Any necessary revision to the Health and Safety procedures will be recorded in the Field Procedure Change Authorization Form (Attachment B), and will require authorization from the Langan Health and Safety Manager and Langan PM.

The provisions of this HASP address worker health and safety within defined contaminant zones and assume that work will be completed within occupied and/or vacant buildings or in the surrounding parking lot. Additional provisions including modifications to drilling techniques to further limit potential exposure to sensitive populations will be required if work is to be conducted within occupied building areas or in occupied areas that may be impacted by the proposed work.

THE ULTIMATE RESPONSIBILITY FOR THE HEALTH AND SAFETY OF THE INDIVIDUAL EMPLOYEE RESTS WITH THE EMPLOYEE AND HIS OR HER COLLEAGUES. Each employee is responsible for exercising the utmost care and good judgment in protecting his or her own health and safety and that of fellow employees. Should any employee observe a potentially unsafe condition or situation, it is the responsibility of that employee to immediately bring the observed condition to the attention of the appropriate health and safety personnel as designated above and to follow-up the verbal notification by completing the Unsafe Conditions and Practices Form provided in Attachment C, a copy of which will be provided to the Langan Health and Safety Officer.

"Extenuating" circumstances such as budget or time constraints, equipment breakdown, changing or unexpected conditions, never justify unsafe work practices or procedures. In fact, the opposite is true. Under stressful circumstances all project personnel must be mindful of the potential to consciously or unconsciously compromise health and safety standards, and be especially safety conscious. **ALL SITE PERSONNEL ARE EXPECTED TO CONSIDER "SAFETY FIRST" AT ALL TIMES.**

## 1.2 Site Description

The subject property is designated as Block 294, Lot 106 by the New York City Department of Finance. The site consists of a one building used for automobile repair; the area surrounding the building consists of vacant and parking areas used for passenger car, commercial vehicle, and tractor trailer storage. The subject property is bound by a parking lot followed by Borden Avenue to the north, Review Avenue followed by a two-story industrial/manufacturing building and a vacant lot to the east, to the southeast by a closed portion of 29th Street followed by a manufacturing and industrial complex with six buildings, to the southwest by the New York City Transit Authority (NYCTA) Long Island Railroad (LIRR) track and right-of-way, and to the west by the Dutch Kill tributary of Newtown Creek.

The site was formerly utilized as a major oil storage facility occupied by The Texas Company from 1917 to 1971 and was equipped with multiple bulk storage tanks. The subject property was reportedly vacant and out-of-use from 1961 until 1971 when it was redeveloped into the recently demolished configuration. Since 1971, the subject property has operated as a truck and vehicle storage facility, with auto repair and refueling activities. Six spill cases were reported to the New York State Department of Environmental Conservation (NYSDEC) for the site between 1990 and 2008, all of which have been closed by the NYSDEC. The most recent spill

case, dated 2008, was addressed via a Monitored Natural Attenuation Plan, for which case closure was issued in 2010. Multiple above-ground storage tanks (ASTs) have been registered at the site.

### 1.3 Scope of Work

The site work activities which will require the oversight by a Langan Engineer include the following scope and will include the completion of:

- Task 1: Completion of geophysical utility clearance;
- Task 2: Completion of soil borings;
- Task 3: Collection of soil samples;
- Task 4: Installation of permanent groundwater monitoring wells; and
- Task 5: Collection of groundwater and LNAPL samples.

## 2.0 PROJECT TEAM ORGANIZATION AND RESPONSIBILITIES

This section specifies the Langan Project Organization.

### 2.1 Langan Project Manager

The Langan Project Manager (PM) is Amanda Forsburg. The PM responsibilities include:

- Prepares and organizes the background review of site conditions, the site HASP, and the field team;
- Obtains permission for site access and coordinates activities with appropriate officials;
- Briefs the field team on their specific assignments;
- Coordinates with the Health and Safety Officer (HSO) to ensure that health and safety requirements are met;
- Serves as the liaison with public officials;
- Ensuring that this HASP is developed and approved prior to on-site activities;
- Ensuring that all the tasks in the project are performed in a manner consistent with Langan's comprehensive Health and Safety Program for Hazardous Waste Operations and this HASP.

## 2.2 Health and Safety Manager (HSM)

The Langan Corporate Health and Safety Manager (HSM) is Tony Moffa. His responsibilities include:

- Serving as a resource in the development and implementation of HASPs;
- Assist in reviewing results of Jobsite Safety Inspections;
- Assisting site Health and Safety Officer (HSO) with development of the HASP, updating HASP as dictated by changing conditions, jobsite inspection results, etc.;
- Maintaining all records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

## 2.3 Langan Health and Safety Officer (HSO)

The Langan Health and Safety Officer (HSO) is to be identified prior to the start of field work. The HSO responsibilities include:

- Participating in the development and implementation of this HASP;
- Conducting Jobsite Safety Inspections (Attachment G) and correcting any shortcomings in a timely manner;
- Helping to select proper Personal Protective Equipment (PPE) and periodically inspecting it;
- Ensuring that PPE is properly stored and maintained;
- Controlling entry into and exit from the contaminated areas or zones of the site;
- Confirming each team member's suitability for work based on a current physician's recommendation;
- Monitoring the work parties for signs of stress, such as heat stress, fatigue, and cold exposure;
- Monitoring site hazards and conditions;
- Knowing (and ensuring that all site personnel also know) emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department;
- Resolves conflicting situations which may arise concerning safety requirements and working conditions.

- Conducting daily tailgate meetings to review applicable Hazard Analyses (Table 3) as well as check-in with site personnel.

## 3.0 HAZARDS ANALYSIS

This section presents an assessment of the general, chemical, physical, and biological hazards that may be encountered during the tasks specified under this HASP (Section 1.3). A detail on types of potential contaminants of concerns Langan anticipates to encounter at different locations during the intrusive investigation is listed in Tables 1 and 2 of this HASP.

### 3.1 General Hazard Assessment

A general hazard assessment was conducted for the required field work described in Section 1.3 and the following potential hazards have been identified:

- Inhalation of volatile organic compounds (VOCs) with high volatilization potential;
- Inhalation of polycyclic aromatic hydrocarbons (PAHs) with low volatilization potential;
- Skin and eye contact with contaminants;
- Ingestion of contaminants;
- Inhalation of dusts impacted with polycyclic aromatic hydrocarbons and metals;
- Physical hazards associated with the use of heavy equipment;
- Tripping hazards;
- Noise exposure;
- Heat stress (depending on weather conditions);
- Cold exposure (depending on weather conditions);
- Flammable hazards;
- Electrical hazards; and,
- Use of personal protective equipment.

These hazards are further described in the task-by-task hazard analysis in Table 3. Specific chemical, physical and biological hazards are discussed below.

Mitigation and controls will include as needed work procedures, work/rest regiment, dust control measures, personal protective equipment, and respiratory protection as appropriate.

## 3.2 Chemical Exposure Hazards

The following chemical hazard evaluation for the proposed site investigation activities is based on the historical use of the subject property and includes compounds commonly associated with historic urban fill and petroleum storage. The evaluation has been conducted to identify chemicals/materials that potentially may be present at the site, and to ensure that work activities, personnel protection, and emergency response are consistent with the specific contaminants that potentially could be encountered.

### 3.2.1 Specific Chemical Hazards Previously Detected at the Site

Potential contaminants that may be encountered while conducting site investigation activities include VOCs, SVOCs, and metals commonly associated with historic urban fill and petroleum impacted soils. Table 1 lists Contaminants of Concern and potentially affected media. Exposure limits for potential contaminants that might be encountered in the field are listed in Table 2.

### 3.2.2 Chemical Hazard Exposure Routes

Potential hazards and their exposure routes include:

- Inhalation of organic vapors due to the presence of volatile organic compounds in soil or groundwater and from diesel-powered equipment and minimal volatilization potential related to the presence of PAHs in soil.
- Inhalation of dust impacted with PAHs or metals associated with soil borings and soil sampling activity.
- Inadvertent ingestion of potentially toxic substances via hand to mouth contact or deliberate ingestion of materials inadvertently contaminated with potentially toxic materials.
- Dermal exposure and possible percutaneous (skin) absorption of certain lipophilic (readily absorbed through the skin) PAHs.

- Skin and eye contact with contaminants at the site and decontamination activities.

Exposure limits and health effects of selected chemicals are in Table 2. The probability of exposure for each task is outlined in Table 3.

### 3.2.3 Control of Exposure to Chemical Hazards

To protect potentially exposed personnel the following procedures and protocols will be adopted and used as needed: work procedures will be adhered to, work zones will be established, dust control will be utilized, respirators (if required) and personal protective equipment will be worn, Dust monitoring will be conducted during times of disturbance of the impacted soil to assess the potential inhalation pathway of exposure and strict personnel decontamination procedures will be followed.

## 3.3 Physical Hazards

### 3.3.1 Temperature Extremes

Hot Temperatures

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE, in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. If onsite workers exhibit the signs of heat exhaustion or heat stroke, they should seek immediate medical attention.

Cold Temperatures

Workers may be exposed to the hazard of working in a cold environment. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia, as well as slippery surfaces, brittle equipment, poor judgment, and unauthorized procedural changes. In order to prevent frostbite, hypothermia, trench foot and immersion foot, the workers are responsible for dressing warmly in layers with thick socks, gloves, and appropriate head and face gear. Upon the onset of discomfort due to the cold, onsite workers should take regular five to ten minute breaks to warm up inside nearby buildings and to drink warm fluids. Please note that the NYCDEP statute prohibits idling an engine for more than three minutes (one-minute if adjacent to a school). This statue includes

the use of a vehicle for the purpose of warming up employees. As such, all contractors and employees shall identify a place to warm up in advance. If discomfort continues and the onsite workers start to exhibit the signs of frostbite, hypothermia, trench foot or immersion foot, they should seek immediate medical attention.

### 3.3.2 Noise and Air Resources

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Hearing protection is required and shall be used in designated areas of the site as indicated by the posted signs.

### 3.3.3 Hand and Power Tools

In order to complete the various tasks for the project, personnel will utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Hand and power tools will be inspected prior to use. Proper personal protective equipment shall be worn while utilizing hand and power tools. Ground Fault Circuit Interrupters (GFCIs) are required for all portable electric tools.

### 3.3.4 Slips, Trips, and Falls

Working in and around the site will pose slip, trip and fall hazards due to equipment, piping, slippery surfaces that may be oil covered, or from surfaces that are wet from rain or ice. Potential adverse health effects include falling to the ground and becoming injured or twisting an ankle. Good housekeeping at the site must be maintained at all times.

### 3.3.5 Fire and Explosion

Prior to starting all excavation work, a review of appropriate New York City maps will be conducted to identify potential hazards. The possibility of encountering fire and explosion hazards exists from under- ground utilities and gases. Therefore, all excavation equipment must be grounded.

### 3.3.6 Material Handling

Manual lifting of heavy objects may be required. Failure to follow proper lifting techniques can result in back injuries and strains. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods.

Whenever possible, heavy objects must be lifted and moved by mechanical devices rather than by manual effort. The mechanical devices will be appropriate for the lifting or moving task and will be operated only by trained and authorized personnel. Objects that require special handling or rigging will only be moved under the guidance of a person who has been specifically trained to move such objects, such as a Master Rigger or equivalent. Lifting devices, including equipment, slings, ropes, chains, and straps, will be inspected, certified, and labeled to confirm their weight capacities. Defective equipment will be taken out of service immediately and repaired or destroyed.

The lift and swing path of a crane/equipment will be watched and maintained clear of obstructions. Personnel will not pass under a raised load, nor will a suspended load be left unattended. Personnel will not be carried on lifting equipment, unless it is specifically designed to carry passengers.

All reciprocating, rotating, or other moving parts will be guarded at all times. Accessible fire extinguishers will be made available in all mechanical lifting devices. All material must be stored in tiers, racked, blocked, or otherwise secure to prevent sliding, falling, or collapse. All loads/material will be verified to be secure before transportation.

### 3.3.7 Confined Space/Excavation Hazards

Personnel entry into trenches or unshored (*e.g.,* lagging) excavations within the designated areas of concern will not be permitted. No other confined spaces are known to exist on Site. If entry into trenches or excavations is required, all work will stop until the HASP has been revised to address the new hazards.

### 3.3.8 Working Near Equipment

Personnel working in the immediate vicinity of heavy equipment (*e.g.*, excavators, loaders, etc.) may encounter physical hazards resulting from contact with equipment. Field personnel should be aware of the presence of these hazards at all times and take appropriate action to avoid them. Due to the limited ability to communicate when wearing respiratory protection, the risk is increased. Workers must be careful to communicate with heavy equipment operators regarding their location, and should maintain a safe distance from operating equipment at all times. Prior to working around equipment, the site personnel will review appropriate hand signals with the operator.

Equipment will be equipped with back up alarms.

### 3.3.9 Drill Rig Operations

In order to complete soil borings a drilling rig will be used. Working with and near this equipment and associated power generators pose many potential hazards, including being struck by or against, or pinched/caught by moving parts. These hazards can result in serious physical harm. Other hazards include electrocution and explosion due to encountering overhead or underground utilities.

Drill rigs for hollow stem auger drilling and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and other field personnel must be aware of the location of this device. This device must be tested prior to job initiation and periodically thereafter. The driller and helper shall not simultaneously handle augers unless there is a standby person to activate the emergency switch. Only equipment that has been approved by the manufacturer may be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude excessively from augers shall not be allowed.

The driller must never leave the controls while the tools are rotating unless all personnel are kept clear of rotating equipment. A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Samplers must not reach into or

near the rotating equipment. Drillers, helpers, and other field personnel must secure all loose clothing when in the vicinity of drilling operations. No person shall climb the drill mast while tools are rotating or without the use of ANSI-approved fall protection (approved belts, lanyards and a fall protection slide rail) or portable ladder that meets the requirement of the OSHA standard.

### 3.3.10 Electrical Safety

The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Ground Fault Circuit Interrupters (GFCIs) are required for all portable electric tools.

### 3.3.11 Utilities

Prior to the start of any intrusive work, the location of above-ground and underground utilities and other structures will be completed by the contractor/subcontractor responsible for completing investigation activities.

### 3.3.12 Vehicular Traffic

Portions of site activities (mobilization/demobilization) will be conducted in the street so vehicular and pedestrian traffic will be present. Appropriate precautions to protect the on-site workers and civilians should be used including the use of cones and traffic vests as appropriate.

## 3.4 Biological Hazards

During the course of the project, there is a potential for workers to come into contact with biological hazards such as animals and insects. As the potential for exposure to blood borne pathogens during site investigation is anticipated to be low, a Blood Borne Pathogen Exposure Plan (BBPEP) is not required. A BBPEP will be prepared if site operation requires its implementation.

### 3.4.1 Animals

During site operations, animals such as dogs, cats, pigeons, mice, and rats may be encountered. Workers shall use discretion and avoid all contact

with animals. Bites and scratches from dogs and cats can be painful and if the animal is rabid, the potential for contracting rabies exists. Contact with rat and mice droppings may lead to contracting hantavirus. Inhalation of dried pigeon droppings may lead to psittacosis. Cryptococcosis and histoplasmosis are also diseases associated with exposure to dried bird droppings but these are less likely to occur in this occupational setting.

### 3.4.2 Insects

Insects, including bees, wasps, hornets, mosquitoes, spiders, and ticks may be present at the site. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition. In addition, mosquito bites may lead to St. Louis encephalitis or West Nile encephalitis.

### 3.4.3 Wound Care

A source of occupational exposure may occur when an employee gives First Aid and or CPR to an individual who had infectious blood. The occupational exposure occurs when there is the possibility for an employee's eyes, mucous membranes, non-intact skin (i.e., cut and abraded skin) to come into contact with potentially infectious materials from another employee. If an accident were to occur where First Aid would need to be administered, the person administering the First Aid will presume that any wounds and materials used are contaminated with BBP and should wear the appropriate PPE to prevent contact with these materials. Additionally, should the use of First Aid materials and or clothing that was potentially contaminated with BBP be encountered these materials should be property containerized and transported to the nearest hospital for proper disposal.

## 3.5 Task Hazard Analysis

The tasks to be completed during the proposed site work activities, as summarized in Section 1.3, are listed in Table 3 with a Hazard Analysis for each task.

### 3.5.1 Soil Boring Installation

Special attention shall be given to establishing the location of any underground utilities prior to boring or drilling. Prior to beginning the site investigation work, the N.Y. One Call Center will be contacted by the boring/drilling contractor for utility mark-outs. Additionally, a private geophysical contractor will be retained to identify potential underground utilities in the vicinity of each proposed soil boring location prior to drilling. Pressure safety valves and hose whip prevention devices will be installed and operational on any air compressors, hoses, and their tools to be used on site. Additionally, all appropriate and current FDNY Certificates of Fitness (C of F) cards must be on site for those workers using equipment where C of Fs are required.

Chemical exposure may also occur as soil cuttings and monitoring well purge water are handled, and soil, groundwater, and LNAPL samples are collected. Activities will be conducted in Level D, but personnel should be prepared to upgrade to Level C, as appropriate, based on field screening criteria.

If evidence of historic contamination is encountered during test borings other than what is part of the intended investigation, installation or drilling, work will be stopped and emergency contacts listed in Attachment E of this HASP will be immediately notified.

### 3.5.2 Soil Sample Collection

Chemical exposure may occur as soil samples are collected. Activities will be conducted in Level D, but personnel should be prepared to upgrade to Level C, as appropriate, based on field screening criteria.

If evidence of historic contamination is encountered during test borings other than what is part of the intended investigation, installation or drilling, work will be stopped and emergency contacts listed in Attachment D of this HASP will be immediately notified.

### 3.5.3 Permanent Monitoring Well Installation

Permanent monitoring wells will be installed for the collection of groundwater samples. Special attention shall be given to establishing the location of any underground utilities prior to boring or drilling. Prior to beginning the site investigation work, the N.J. One Call Center will be contacted by the boring/drilling contractor for utility mark-outs. Additionally, a private utility clearance subcontractor has been retained to complete a geophysical survey in the vicinity of each boring location to identify the potential presence of underground utility lines and to evaluate for the presence of USTS and nay other subsurface anomalies. Pressure safety valves and hose whip prevention devices will be installed and operational on any air compressors, hoses, and their tools to be used on site.

Chemical exposure may also occur as temporary monitoring wells are installed. Activities will be conducted in Level D, but personnel should be prepared to upgrade to Level C, as appropriate, based on field screening criteria.

If evidence of historic contamination is encountered during temporary monitoring well installation other than what is part of the intended investigation, installation or drilling, work will be stopped and emergency contacts listed in Attachment D of this HASP will be immediately notified.

### 3.5.4 Groundwater and LNAPL Sample Collection

Chemical exposure may occur as groundwater samples are collected. Activities will be conducted in Level D, but personnel should be prepared to upgrade to Level C, as appropriate, based on field screening criteria.

If evidence of historic contamination is encountered during test borings other than what is part of the intended investigation, installation or drilling, work will be stopped and emergency contacts listed in Attachment D of this HASP will be immediately notified.

## 4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

### 4.1 Levels of Protection

PPE must protect workers from the specific hazards they are likely to encounter on site. Selection of the appropriate PPE must take into consideration: (1) identification of the hazards or suspected hazards; (2) potential exposure routes; and, (3) the performance of the PPE construction (materials and seams) in providing a barrier to these hazards. Based on anticipated site conditions and the proposed work activities to be performed at the site, Level D Protection will be used for work completed within the defined exclusion zone. This will include any work within the defined investigation areas. Level D Protection will be required for all personnel working outside the investigation area but engaged with sampling or monitoring activities. The upgrading/downgrading of these levels of protection will be based on continuous air monitoring results as described in Section 5.0. The decision to modify standard PPE will be made by the HSO after conferring with the Project Manager. The levels of protection are described below.

- **Level D Protection**

  a. Safety glasses w/ sideshields or chemical splash goggles
  b. Safety boots/shoes (toe-protected)
  c. Hard hat
  d. Long sleeve work shirt and work pants
  e. Nitrile gloves
  f. Hearing protection (as needed)
  g. Reflective traffic vest

- **Level D Protection (Modified)**

  a. Safety glasses w/ sideshields or chemical splash goggles
  b. Safety boots/shoes (toe-protected)
  c. Disposable chemical-resistant boot covers
  d. Coveralls Tyvek or equivalent to be worn when contact with contaminated soil or groundwater, or non-aqueous phase liquids is anticipated)
  e. Hard hat
  f. Long sleeve work shirt and work pants
  g. Nitrile gloves
  h. Hearing protection (as needed)
  i. Reflective traffic vest

- **Level C Protection**

    a. Full face-piece, air-purifying, cartridge*-equipped, NIOSH-approved respirator [*combo cartridge P100/OV/CL/HC/SD/CD/HS (escape)]
    b. Inner (latex) and outer (nitrile) chemical-resistant glove
    c. Chemical-resistant safety boots/shoes (toe-protected)
    d. Disposable chemical-resistant boot covers
    e. Hard hat
    f. Long sleeve work shirt and work pants
    g. Coveralls (Tyvek or equivalent, poly-coated Tyvek will be worn when contact, or anticipated contact with wet contaminated soils, ground water, and/or non-aqueous phase liquids (NAPL) is anticipated)
    h. Hearing protection (as needed)
    i. Reflective traffic vest

The action levels used in determining the necessary levels of respiratory protection and upgrading to Level C are summarized in Table 4. The written Respiratory Protection Program is maintained by the HSM in Langan's Doylestown, Pennsylvania office. The monitoring procedures and equipment are outlined in Section 5.0.

## 4.2 Respirator Fit-Test

All Langan employees and subcontractors performing site work who could be exposed to hazardous substances at the work site are in possession of a full face-piece, air-purifying respirator and have been successfully quantitative fit-tested within the past year. Quantitative fit-test records are maintained by the HSM.

## 4.3 Respirator Cartridge Change-Out Schedule

Respiratory protection is required to be worn when certain action levels (Table 2) are reached. A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. The respirator cartridge change-out schedule for this project is as follows:

- Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first.

- If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short the time period was the previous day they were used.

## 5.0 AIR QUALITY MONITORING AND ACTIONS LEVELS

### 5.1 Monitoring During Site Operations

Atmospheric air monitoring results are used to provide data to determine when exclusion zones need to be established and when certain levels of personal protective equipment are required. For all instruments there are Site-specific action level criteria which are used in making field health and safety determinations. Other data, such as the visible presence of contamination or the steady state nature of air contaminant concentration, are also used in making field health and safety decisions. Therefore, the Langan Health and Safety Officer may expand the exclusion zone beyond the extents of the sampling area or require a person to wear a respirator even though atmospheric air contaminant concentrations are below established HASP action levels.

During site work involving disturbance of impacted soils, real time air monitoring will be conducted to assess the potential for exposure to airborne contaminants of concern including VOCs, PAHs, and metals. A photoionization detector (PID)will be used to monitor concentrations of VOCs at personnel breathing-zone height to assess the potential exposure to petroleum related VOCs related to use of machinery including backhoes, drill rigs, compressors etc. Dust monitoring will be completed with an aerosol monitor. Air monitoring will be the responsibility of the Langan Health and Safety Officer or designee. Air monitoring will be conducted during intrusive activities associated with the completion of soil borings and collection of soil, groundwater, and LNAPL samples. All manufacturers' instructions for instrumentation and calibration will be available onsite.

Subcontractors' air monitoring plans must be equal or more stringent as the Langan plan.

An air monitoring calibration log is provided in Attachment D of this HASP.

### 5.1.1 Volatile Organic Compounds

Monitoring with a PID, such as a MiniRAE 3000 (10.6v) or equivalent will occur during investigation activities. Colormetric Indicator Tubes for benzene may be used as backup for the PID, if measurements remain above background monitor every 2 hours. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (odors, visible gases, appearance of drill cuttings, etc.) since the last measurement. Instrument action levels for monitored gases are provided in Table 4.

### 5.1.2 Dust

As historic urban fill is present in the subsurface, the soil at the site is potentially impacted with common historic fill contaminants including PAHs, pesticides, polychlorinated biphenyls (PCBs), and metals including arsenic, lead, and mercury. During invasive procedures which have the potential for creating airborne dust, real time air monitoring with an aerosol monitor, such as a Thermo MEI person DataRAM-1000 (pDR-1000) will occur. If dust is generated during investigation activities, dust suppression methods will be employed to minimize potential for exposure. Action levels for dust monitoring are provided in Table 4.

### 5.1.3 Determination of Background Levels

Background (BKD) levels for VOCs and dust will be established prior to intrusive activities within the work zone. A notation of BKD levels will be referenced in the daily monitoring log. BKD levels are a function of prevailing conditions. BKD levels will be taken in an appropriate upwind location as determined by the Langan Health and Safety Officer.

## 5.2 Monitoring Equipment Calibration and Maintenance

Instrument calibration shall be documented and included in a dedicated safety and health logbook or on separate calibration pages of the field book. All instruments shall be calibrated before and after each shift. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

All instruments shall be operated in accordance with the manufacturers' specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on site by the HSO for reference.

### 5.3 Noise Monitoring

As a standard work practice, hearing protection will be worn within the area that exceeds 85 dBA created by any loud machinery as a precaution. Work areas or tasks which pose an exposure risk greater than 85 dBA will require hearing protection. Hearing protection is required and should be used in the exclusion zone while the drill rig is operating.

## 6.0 COMMUNITY HEALTH AND SAFETY CONSIDERATIONS

The potential impact of site work activities on the surrounding community (residential and business) is of concern. Precautions taken to reduce or prevent contamination from leaving the work areas include the following:

- All appropriate equipment will be decontaminated before leaving the Site;
- Work zone air monitoring will be conducted by Langan; and,
- Dust and vapor suppression techniques will be used as necessary.

## 7.0 WORK ZONES AND DECONTAMINATION

### 7.1 Site Control

Work zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas.

Any person working in an area where the potential for exposure to site contaminants exists will only be allowed access after providing the HSO with proper training and medical documentation.

***Exclusion Zone (EZ) -*** All activities which may involve exposure to site contaminants, hazardous materials and/or conditions should be considered an EZ. Decontamination of field equipment will also be conducted in the Contaminant Reduction Zone (CRZ) which will be located on the perimeter of the EZ. The EZ and the CRZ will be clearly delineated by cones, tapes or other means. The Langan

Health and Safety Officer may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the Langan Health and Safety Officer allowing adequate space for the activity to be completed, field members and emergency equipment. For purposes of this HASP the exclusion zones are defined by a 10-foot buffer around each soil boring and permanent monitoring well location but may be expanded based on the results of air monitoring or any other field conditions identified by the HSO. All personnel working in the EZ must have 40 hours HAZWOPER training and be enrolled in a medical monitoring program prior to conducting any site activities.

## 7.2 Contamination Control

### 7.2.1 Personnel Decontamination Station

Personal hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure.

### 7.2.2 Minimization of Contact with Contaminants

During completion of all site activities, personnel should attempt to minimize the chance of contact with contaminated materials. This involves a conscientious effort to keep "clean" during site activities. All personnel should minimize kneeling, splash generation, and other physical contact with contamination as PPE is intended to minimize accidental contact. This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

Field procedures will be developed to control over spray and runoff and to ensure that unprotected personnel working nearby are not affected.

### 7.2.3 Personnel Decontamination Sequence

Decontamination will be performed by removing all PPE used in EZ and placing it in drums/trash cans at the CRZ. Baby wipes shall be available for wiping hands and face. Drums/trash cans will be labeled by the field crews in accordance with all local, state, and federal requirements. Management plans for contaminated PPE, tools and investigative-derived waste (i.e., soil cutting) are provided below.

### 7.2.4 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination and wrap injured personnel with clean garments/blankets to avoid contaminating other personnel or transporting equipment.

If the injured person can be moved, he/she will be decontaminated by site personnel as described above before emergency responders handle the victim. If the person cannot be moved because of the extent of the injury (a back or neck injury), provisions shall be made to ensure that emergency response personnel will be able to respond to the victim without being exposed to potentially hazardous atmospheric conditions. If the potential for inhalation hazards exist, such as with open excavation, this area will be covered with polyethylene sheeting to eliminate any potential inhalation hazards. All emergency personnel are to be immediately informed of the injured person's condition, potential contaminants, and provided with all pertinent data.

### 7.2.5 Hand-Held Equipment Decontamination

Hand-held equipment includes all monitoring instruments as stated earlier, samples, hand tools, and notebooks. The hand-held equipment is dropped at the first decontamination station to be decontaminated by one of the decontamination team members. These items must be decontaminated or discarded as waste prior to removal from the CRZ.

To aid in decontamination, monitoring instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants. The instruments will be wiped clean using wipes or paper towels if contamination is visually evident. Sampling equipment, hand tools, etc. will be cleaned with non-phosphorous soap to remove any potentially contaminated soil, and rinsed with deionized water. All decontamination fluids will be containerized and stored on-site pending waste characterization sampling and appropriate off-site disposal.

### 7.2.6 Heavy Equipment Decontamination

All heavy equipment and vehicles arriving at the work site will be free from contamination from offsite sources. Any vehicles arriving to work that are suspected of being impacted will not be permitted on the work site. Potentially contaminated heavy equipment will not be permitted to leave the EZ unless it has been thoroughly decontaminated and visually inspected by the HSO or his designee.

## 7.3 Communications

The following communications equipment will be utilized as appropriate.

- Telephones - A cellular telephone will be located with the HSO for communication with the HSM and emergency support services/facilities.
- Hand Signals - Hand signals shall be used by field teams, along with the buddy system. The entire field team shall know them before operations commence and their use covered during site-specific training. Typical hand signals are the following:

| Signal | Meaning |
|---|---|
| Hand gripping throat | Out of air, can't breathe |
| Grip on partner's wrist or placement of both hands around partner's waist | Leave area immediately, no debate |
| Hands on top of head | Need assistance |
| Thumbs up | Okay, I'm all right, I understand |
| Thumbs down | No, negative |

# 8.0 MEDICAL SURVEILLANCE

All personnel who will be performing field work involving potential exposure to toxic and hazardous substances will be required to have passed an initial baseline medical examination, with annual follow-up medical exams thereafter, consistent with 29 CFR 1910.120(f). Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine. Results of medical evaluations are maintained by the HSM.

## 9.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures that are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures. In case of emergency, in addition to 911 the Langan Incident/Injury Hotline (1-800-952-6426 or 973-560-4699) should be called as soon as possible.

### 9.1 Responsibilities

#### 9.1.1 Langan Health and Safety Officer (HSO)

The HSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The HSO is responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The HSO is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the HSM can notify OSHA within the required time frame.

#### 9.1.2 Emergency Coordinator

For this project the Emergency Coordinator is the HSO.

The Emergency Coordinator shall locate emergency phone numbers and identify hospital routes prior *to beginning* work on the sites. The Emergency Coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator is responsible for implementing the Emergency Response/ Contingency Plan whenever conditions resulting from the Site Investigation warrant such action.

### 9.1.3 Site Personnel

Project site personnel are responsible for knowing the Emergency Response Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency. Project site personnel, including all subcontractors will be trained in the Emergency Response Plan.

## 9.2 Communications

Once an emergency situation has been stabilized or as soon as practically possible, the HSO will contact the Langan Incident/Injury Hotline (1-800-952-6426 or 973-560-4699) and Project Manager to identify any emergency situation.

## 9.3 Local Emergency Support Units

In order to be able to deal with any emergency that might occur during investigative activities at the site, Attachment E Emergency Notification Numbers, will be available in the field vehicles and provided to all personnel conducting work within the EZ.

Figure 2 is the hospital route map. Outside emergency number 911 and local ambulance should be relied on for response to medical emergencies and transport to emergency rooms. Due to traffic congestion that is prevalent in the New York metropolitan area, alternate hospital routes will need to be considered. The Emergency Coordinator will determine the appropriate route based on time of day and traffic patterns. Changes in the referenced primary facilities shall be documented with the HASP Field Change Authorization Request Form (Attachment B).

The Emergency Phone Numbers listed are preliminary. Upon mobilization, the HSO shall verify all numbers and document the changes in the Site Logbook. Any changes shall also be documented with the HASP Field Change Authorization Request Form.

Hospital route maps will be provided to all field personnel.

## 9.4 Pre-Emergency Planning

Langan will communicate directly with administrative personnel from the emergency room at the hospital in order to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from any of the contaminants expected to be found on the site. Instructions for finding the hospital will be posted conspicuously in the site office and in each site vehicle.

## 9.5 Emergency Medical Treatment

The procedures and rules in this HASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the HSO on site immediately. First-aid equipment will be available on site at the following locations:

| | |
|---|---|
| First Aid Kit: | Vehicles |
| Emergency Eye Wash: | Vehicles |

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that has been set up. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

Personnel with current first aid and CPR certification will be identified.

Only in non-emergency situations will an injured person be transported to the hospital by means other than an ambulance.

**Nearest hospital:** **New York City Health, Elmhurst Hospital**
**80-40 Baxter Avenue**
**Queens, NY 11373**
**(718) 334-4000**
*(directions from site to hospital found on Figure 2)*

## 9.6 Emergency Site Evacuation Routes and Procedures

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs as a result of the site investigation activities, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, the Langan Project Manager will be verbally notified immediately. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the nearest intersection to be accounted for and to receive further instructions.

## 9.7 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site and notification of the Langan Project Manager of the investigation activities. Portable fire extinguishers will be provided at the work zone. The extinguishers located in the various locations should also be identified prior to the start of work. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

### 9.7.1 Fire Prevention

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases away from oxidizers.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.
- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities.

The person responsible for the control of fuel source hazards and the maintenance of fire prevention and/or control equipment is the HSO.

## 9.8 Significant Vapor Release

Based on the proposed tasks, the potential for a significant vapor event is low. However, if a release occurs, the following steps will be taken:

- Move all personnel to an upwind location. All non-essential personnel shall evacuate.
- Upgrade to Level C Respiratory Protection.
- Downwind perimeter locations shall be monitored for volatile organics..
- If the release poses a potential threat to human health or the environment in the community, the Emergency Coordinator shall notify the Langan Project Manager.
- Local emergency response coordinators will be notified.

## 9.9 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet (MSDS) will be followed, when necessary.

SKIN AND EYE: Use copious amounts of soap and water from eye-wash kits and portable hand wash stations.

CONTACT: Wash/rinse affected areas thoroughly, then provide appropriate medical attention. Skin shall also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs. Affected items of clothing shall also be removed from contact with skin.

Providing wash water and soap will be the responsibility of each individual contractor or subcontractor on-site.

## 9.10 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or omitted. The HSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination when necessary. The outer garments can be

removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

## 9.11 Incident Reporting

Once first aid and/or emergency response needs have been met, the following parties are to be contacted:

- Langan Incident/Injury Report Hotline 1-800-952-6426 or (973-560-4699)
- Langan Project Manager, Amanda Forsburg (973-560-4900) or Steve Ciambruschini (973-560-4900)
- Langan Health and Safety Manager, Tony Moffa (215-491-6500)
- The employer of any injured worker who is not a Langan employee

For emergencies involving personal injury and/or exposure including near-misses, the HSO or designee will complete and submit an Accident/Incident Report Form (Attachment F) within 24 hours. If the employee involved is not a Langan employee, his employer shall receive a copy of the report.

## 9.12 Adverse Weather Conditions

In the event of adverse weather conditions, the HSO will determine if work will continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.

- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds).
- Limited visibility (fog).
- Potential for electrical storms.
- Earthquakes.
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The HSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

## 9.13 Spill Control and Response

All small spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining proper waste characterization and the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size of the spill.

All contractor vehicles shall have spill kits on them with enough material to contain and absorb the worst-case spill from that vehicle. All vehicles and equipment shall be inspected prior to be admitted on site. Any vehicle or piece of equipment that develops a leak will be taken out of service and removed from the job site.

The following seven steps shall be taken by the Emergency Coordinator:

1. Determine the nature, identity and amounts of major spills.
2. Make sure all unnecessary persons are removed from the spill area.
3. Notify the HSO immediately.
4. Use proper PPE in consultation with the HSO.

5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosion-proof equipment to contain or clean up the spill (diesel-only vehicles, air-operated pumps, etc.)
6. If possible, try to stop the leak with appropriate material.
7. Remove all surrounding materials that can react or compound with the spill.

In addition to the spill control and response procedures described in this HASP, Langan personnel will coordinate with the designated project manager relative to spill response and control actions. Notification to the Project Manager must be immediate and, to the extent possible, include the following information:

- Time and location of the spill.
- Type and nature of the material spilled.
- Amount spilled.
- Whether the spill has affected or has a potential to affect a waterway or sewer.
- A brief description of affected areas/equipment.
- Whether the spill has been contained.
- Expected time of cleanup completion. If spill cleanup cannot be handled by Langan's on-site personnel alone, such fact must be conveyed to the Project Manager immediately.

Langan shall not make any notification of spills to outside agencies. The client will notify regulatory agencies as per their reporting procedures.

## 9.14 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on site:

- Industrial first aid kit.
- Fire extinguishers (one per site).
- Absorbent material.

### 9.15 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers.
- Refilling medical supplies.
- Recharging eyewashes and/or showers.
- Replenishing spill control supplies.

## 10.0 TRAINING

### 10.1 General Health and Safety Training

Completion of an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training program (or its equivalent) as detailed in OSHA's 29 CFR 1910.120(e) is required for all employees who will perform work in areas where the potential for a toxic exposure exists. Annual 8-hour refresher training is also required to maintain competencies to ensure a safe work environment.

### 10.2 Site Specific Training

Prior to commencement of site activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include a documented verbal review of the entire HASP and all the provisions within the HASP document. Should any new employees arrive on-site, they will also be given a documented full HASP review – or one that address the appropriate tasks that remain at the time of the new employee's arrival.

### 10.3 Onsite Safety Briefings

Project personnel and visitors will participate in documented daily on-site health and safety briefings ("Tailgate Talks") led by the HSO to assist site personnel in safely conducting their work activities. The briefings will include information on operations to be conducted that shift, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously

discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity for the work crews to be updated on monitoring results. Prior to starting any new activity, a training session will be held for crew members involved in the activity. The Health and Safety Briefing Statement (Attachment A) can be used to facilitate this effort.

### 10.4 Hazard Communication

All material brought on-site will be in the appropriate containers and will be properly labeled. The SDS for contaminants typically associated with petroleum-impacted soil and historic fill are attached. Langan's written Hazard Communication program, in compliance with 29 CFR 1910.1200, is maintained by the HSM.

## 11.0 RECORDKEEPING

The following is a summary of required health and safety logs, reports and recordkeeping.

### 11.1 Field Change Authorization Request

A Field Procedures Change Authorization Request Form is to be completed for requesting a change to this HASP (Attachment B). Any changes to the work to be performed that is not included in the HASP will require an Addendum that is approved by the Langan Project Manager and Langan HSM to be prepared. Approved changes will be reviewed with all field personnel at a safety briefing.

### 11.2 Medical and Training Records

Copies or verification of training (40-hour, 8-hour, supervisor, site-specific training, documentation of three-day OJT, and respirator fit-test records) and medical clearance for Site work and respirator use will be maintained in the office and available upon request. Records for all subcontractor employees must also be available upon request. All employee medical records will be maintained by the HSM.

### 11.3 Onsite Log

A log of personnel on site each day will be kept by the Site Supervisor or designee.

### 11.4 Daily Safety Meetings ("Tailgate Talks")

Completed Safety Briefing forms will be maintained by the HSO.

### 11.5 Exposure Records

All personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be maintained by the HSO during site work. At the end of the project they will be maintained according to 29 CFR 1910.1020.

### 11.6 Hazard Communication Program/MSDS

Material Safety Data Sheets (MSDS) have been obtained for applicable substances and are included in this HASP (Attachment H). Langan's written Hazard Communication program, in compliance with 29 CFR 1910.1200, is maintained by the HSM in Parsippany, New Jersey.

### 11.7 Documentation

Immediately following an incident or near miss, unless emergency medical treatment is required, either the employee or a coworker must contact the Langan Incident/Injury Hotline at 1-800-952-6426 ext. 4699 or (973)560-4699 and the client representative to report the incident or near miss. A written report must be completed and submitted to the client representative within 24 hours of the incident. For emergencies involving personnel injury and/or exposure, employee will complete and submit the Langan Incident/Injury Report to the Langan Corporate Health and Safety Manager as soon as possible following the incident. Accidents will be investigated in-depth to identify all causes and to recommend hazard control measures.

## 12.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have been verbally given a full HASP review by Langan personnel, and understand the provisions of this EHS Plan. It is maintained on site by the HSO as a project record.

Each field team member shall sign this section after Site-specific training is completed and before being permitted to work onsite.

| ***Name (Print and Sign)*** | ***Company*** | ***Date*** |
|---|---|---|
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# TABLES

**TABLE 1**
**SUSPECTED CONTAMINANTS OF CONCERN**
**28-90 REVIEW AVENUE**
**QUEENS, NEW YORK**

| Contaminant Of Concern | Affected Media |
|---|---|
| **VOLATILES** | |
| | |
| Benzene | Soil / Groundwater / Soil Vapor |
| Toluene | Soil / Groundwater / Soil Vapor |
| Ethylethylene | Soil / Groundwater / Soil Vapor |
| Xylenes (m,p-Xylene, and o-Xylene) | Soil / Groundwater / Soil Vapor |
| Total Volatiles | Soil / Groundwater / Soil Vapor |
| | |
| **Common Historic Fill Contaminants:** | |
| Benzo(a)anthracene | Soil / Groundwater |
| Benzo(b)flouranthene | Soil / Groundwater |
| Benzo(k)flouranthene | Soil / Groundwater |
| Benzo(a)pyrene | Soil / Groundwater |
| Chrysene | Soil / Groundwater |
| Dibenzo(a,h)anthracene | Soil / Groundwater |
| Indeno (1,2,3-cd) pyrene | Soil / Groundwater |
| Flouranthene | Soil / Groundwater |
| Pyrene | Soil / Groundwater |
| Diesel Fuel / Fuel Oils | Soil / Groundwater |
| Hydraulic Oil | Soil / Groundwater |
| Miscellaneous TBD | Soil / Groundwater |
| | |
| **METALS** | |
| | |
| Lead | Soil / Groundwater |
| Arsenic | Soil / Groundwater |
| Chromium | Soil / Groundwater |
| Mercury | Soil / Groundwater |
| Copper | Soil / Groundwater |
| Nickel | Soil / Groundwater |
| | |

**TABLE 2**
**SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS**
**28-90 REVIEW AVENUE**
**QUEENS, NEW YORK**

| Chemical | Permissible Exposure Limit | IDLH Limit | Exposure Routes | Exposure Symptoms |
|---|---|---|---|---|
| Benzene | 1 ppm | 50 ppm | Inhalation, Skin Absorption, Ingestion, skin and/or eye contact | Irritate eyes, skin, nose; respiratory system; giddiness; head, nausea, staggered gait; fatigue, anorexia, lassitude; dermatitis; bone marrow depression; [carcinogenic] |
| Toluene | 200 ppm | 500 ppm | Inhalation, Skin Absorption, Ingestion, skin and/or eye contact | Irritate eyes, nose; fatigue, weakness, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation; nervousness, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage; mucous membrane; narcosis, coma |
| Ethylbenzene | 100 ppm | 800 ppm (10% LEL) | Inhalation, Ingestion, skin and/or eye contact | Irritate eyes, skin, mucous membrane; headache, dermatitis; narcosis, coma |
| Xylenes | 100 ppm | 900 ppm | Inhalation, Skin Absorption, Ingestion, skin and/or eye contact | Irritate eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corn vacuolization; anorexia, nausea, vomit, abdominal pain; dermatitis |
| Tetrachloroethene | 15 ppm | 150 ppm | Inhalation, Skin Absorption, Ingestion, skin and/or eye contact | Nausea, vomiting, abdominal pain, tremor fingers, jaundice, hepatitis, liver tenderness, dermatitis, monocytosis, kidney damage [potential occupational carcinogen] |
| Trichloroethene | 100 ppm | 1,000 ppm | Inhalation, Skin Absorption, Ingestion, skin and/or eye contact | Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen] |

**TABLE 2**
**SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS**
**28-90 REVIEW AVENUE**
**QUEENS, NEW YORK**

| Chemical | Permissible Exposure Limit | IDLH Limit | Exposure Routes | Exposure Symptoms |
|---|---|---|---|---|
| Total Volatile Organics | 15 ppm | 150 ppm | Inhalation, Skin Absorption, Ingestion | Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen] |
| Benzo(a)anthracene | 0.2 mg/m3 | 80 mg/m3 | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Benzo(b)fluoranthene | 0.2 mg/m3 | 80 mg/m3 | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Benzo(k)fluoranthene | 0.2 mg/m3 | 80 mg/m3 | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Benzo(a)pyrene | 0.2 mg/m3 | 80 mg/m3 | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Chrysene | 0.2 mg/m3 | 80 mg/m3 | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Dibenzo(a,h)anthracene | 0.2 mg/m3 | 80 mg/m3 | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Flouranthene | 0.2 mg/m3 | 80 mg/m3 | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Indeno (1,2,3-cd) pyrene | 0.2 mg/m3 | 80 mg/m3 | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Pyrene | 0.2 mg/m3 | 80 mg/m3 | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Pesticides | 1 mg/m3 | 500 mg/m3 | Inhalation, Skin Absorption, Ingestion, skin and/or eye contact | Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen] |

**TABLE 2**
**SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS**
**28-90 REVIEW AVENUE**
**QUEENS, NEW YORK**

| Chemical | Permissible Exposure Limit | IDLH Limit | Exposure Routes | Exposure Symptoms |
|---|---|---|---|---|
| Lead | 0.05 mg/mg3 | 100 mg/mg3 | Inhalation, Ingestion, Skin and/or Eye Contact | Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension |
| Arsenic | 0.010 mg/m3 | 5 mg/m3 | Inhalation, Ingestion, Skin Absorption, Skin and/or Eye Contact | Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen] |
| Hexavalent Chromium | 5 mg/m3 | 250 mg/m3 | Inhalation, Ingestion, Skin and/or Eye Contact | Irritation eyes, skin; lung fibrosis (histologic) |
| Total Chromium | 5 mg/m3 | 250 mg/m3 | Inhalation, Ingestion, Skin and/or Eye Contact | Irritation eyes, skin; lung fibrosis (histologic) |
| Mercury | 0.1 mg/m3 | 10 mg/m3 | Inhalation, Ingestion, Skin Absorption, Skin and/or Eye Contact | Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria |
| Copper | 1 mg/m3 | 100 mg/m3 | Inhalation, Ingestion, skin and/or eye contact | Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing; [potential occupational carcinogen] |

**TABLE 2**
**SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS**
**28-90 REVIEW AVENUE**
**QUEENS, NEW YORK**

| Chemical | Permissible Exposure Limit | IDLH Limit | Exposure Routes | Exposure Symptoms |
|---|---|---|---|---|
| Nickel | 1 mg/m3 | 10 mg/m3 | Inhalation, Skin Absorption, Ingestion, skin and/or eye contact | Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria |

--- No exposure limits listed in the NIOSH Pocket Guide to Chemical Hazards dated November 2010.

# TABLE 3
# HAZARD ANALYSIS
# 28-90 REVIEW AVENUE
# QUEENS, NEW YORK

| Task | Potential Risk | Description | Control Measure |
|---|---|---|---|
| 1, 2, 3, 4, 5 | Lifting equipment | Improper lifting/carrying of equipment and materials | Follow safe lifting and general material handling |
| 2, 3, 4 | Noise | Loud sounds caused by the machines during drilling, or excavation | Wear proper PPE (hearing protection) |
| 1, 2, 3, 4, 5 | Working near heavy machinery | Close proximity to drill rig and/or construction equipment | Be aware of surroundings, wear safety vest and hard hat |
| 1, 2, 3, 4, 5 | Slips, trips, and falls | Any number of injuries from slips, trips, and falls in carrying out these tasks | Good housekeeping at site, constant awareness and focus on the task |
| 2, 3, 4 | Inhalation of Dust | Breathing in visible dust from earthwork using drills or excavators | Wear proper PPE, monitor air for dust concentrations, use dust suppression techniques |
| 2, 3, 4, 5 | Inhalation of Volatiles | Breathing in volatiles from earthwork using drills or excavators causing dust | Wear proper PPE, monitor air for volatile concentrations, use dust suppression techniques |
| 1, 2, 4 | Utilities | Hitting utility lines during drilling and or excavating | Use proper mark out of underground utilities before beginning earthwork |
| 2, 3, 4, 5 | Skin contact with contaminated material | Material falls on skin; gets in eye | Wear proper PPE; follow safe work practices |
| 2, 3, 4, 5 | Ingestion of contaminated material | Material falls on skin; gets into mouth | Wear proper PPE; follow safe work practices |
| 2, 3, 4, 5 | Skin and eye contact with contaminated material | Material falls on skin; gets in eye | Wear proper PPE; follow safe work practices |
| 1, 2, 3, 4, 5 | Heat Stress | Stress or exhaustion related to high temperatures | Hydrate and rest as needed |
| 1, 2, 3, 4, 5 | Cold Stress | Stress or exhaustion related to low temperatures; hypothermia | Wear proper PPE; follow safe work practices |
| 1, 2, 3, 4, 5 | Bites and stings | Bee stings, ticks, snake bites | Wear proper PPE, be watchful, follow safe work practices |
| 1, 2, 3, 4, 5 | Lacerations and abrasions | Many opportunities working with hand tools | Inspect equipment being used for sharp edges, wear proper PPE; follow safe work practices |

# TABLE 4
# INSTRUMENTATION ACTION LEVELS
# 28-90 REVIEW AVENUE
# QUEENS, NEW YORK

| Instrument | Action Level | Level of Protection / Action Required |
|---|---|---|
| PID | Background to 5 ppm | Level D/No respirator; no further action required |
| | > 5 ppm for > 5 minutes | 1. Temporarily discontinue all activities and evaluate potential causes of the excessive readings. If these levels persist and cannot be mitigated (i.e., by slowing drilling or excavation activities), contact HSO to review conditions and determine source and appropriate response action.<br>2. If PID readings remain above 5 ppm, temporarily discontinue work and upgrade to Level C protection.<br>3. If sustained PID readings fall below 1 ppm, downgrading to Level D protection may be permitted |
| | > 5 ppm but < 150 ppm for > 5 minutes | Level C/<br>1. Discontinue all work; all workers shall move to an area upwind of the jobsite.<br>2. Evaluate potential causes of the excessive readings and allow work area to vent until VOC concentrations fall below 5 ppm.<br>3. Level C protection will continue to be used until PID readings fall below 1 ppm. |
| | > 30 ppm (steady state condition) within AOC zone | Stop Work / Suppress Emissions / Evacuate and re-evaluate. |
| | > 150 ppm | Evacuate the work area |

| | | |
|---|---|---|
| Total Dust Aerosol Monitor | > 0.100 mg/m$^3$ above BKD (steady state condition) at perimeter of AOC zone for 15-minutes or visible dust. | Stop Work / Implement dust control / Continue dust monitoring if dust levels are less than 150 mg/m3 |
| | < 0.150 mg/m3 above BKD (following dust suppression measures) | Stop Work / implement dust control, continue work once levels are <150 mg/m3 |
| | >5 mg/m$^3$ | Level C |

Notes:

1. 1 ppm level based on OSHA Permissible Exposure Limit (PEL) for benzene.
2. 5 ppm level based on OSHA Short Term Exposure Limit (STEL) maximum exposure for vinyl chloride for any 15 minute period.
3. 150 ppm level based on NIOSH Immediately Dangerous to Life and Health (IDLH) for tetrachloroethylene

# TABLE 5
# PERSONAL PROTECTIVE EQUIPMENT
# 28-90 REVIEW AVENUE
# QUEENS, NEW YORK

**Respiratory Protection*:***

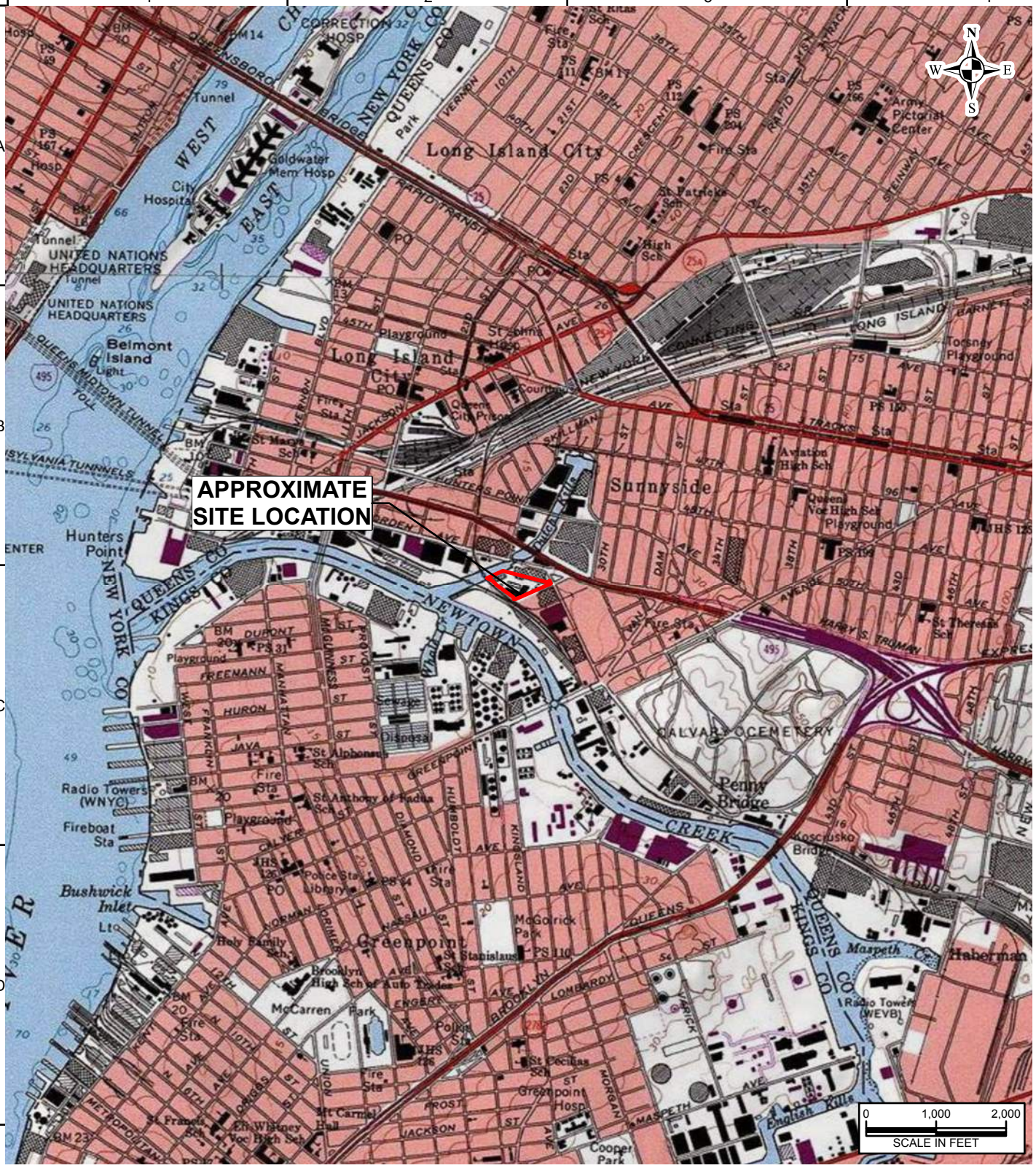
| | |
|---|---|
| Level D: | No respirator required. |
| Level C: | Half-face, Air Purifying Respirator (APR) with combination HEPA (dusts, fumes, aerosols) and organic vapor cartridges. The respirator will be NIOSH-approved. |
| Level C - supplemental by task | Fullface, Air Purifying Respirator (APR) with combination HEPA (dusts, fumes, aerosols), acid gas, organic vapor cartridges. The respirator will be NIOSH-approved. |

**Personal Protective Clothing*:***

| | |
|---|---|
| Level D: | Hard-hat, traffic vest (if working on or adjacent to the roadway), long sleeve work shirt & work pants of natural fibers, safety glasses or goggles, steel-toed boots, hearing protection (if needed), nitril inner gloves and leather outer gloves. |
| Level D - supplemental PPE by task | Tyvek disposal suit |
| Level C: | Chemically resistant outer boots and Chemical resistant Tyvek disposal suite. |

\\LANGAN.COM\DATA\PAR\DATA6\100652601\ENGINEERING DATA\ENVIRONMENTAL\REPORTS\2019-04 - BCP SRIWP\APPENDIX A - HASP\TABLES\HASP TABLE 5 - PPE.DOC

# FIGURES




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Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

**28-90 REVIEW AVENUE**

LONG ISLAND CITY

QUEENS COUNTY NEW YORK

**SITE LOCATION**

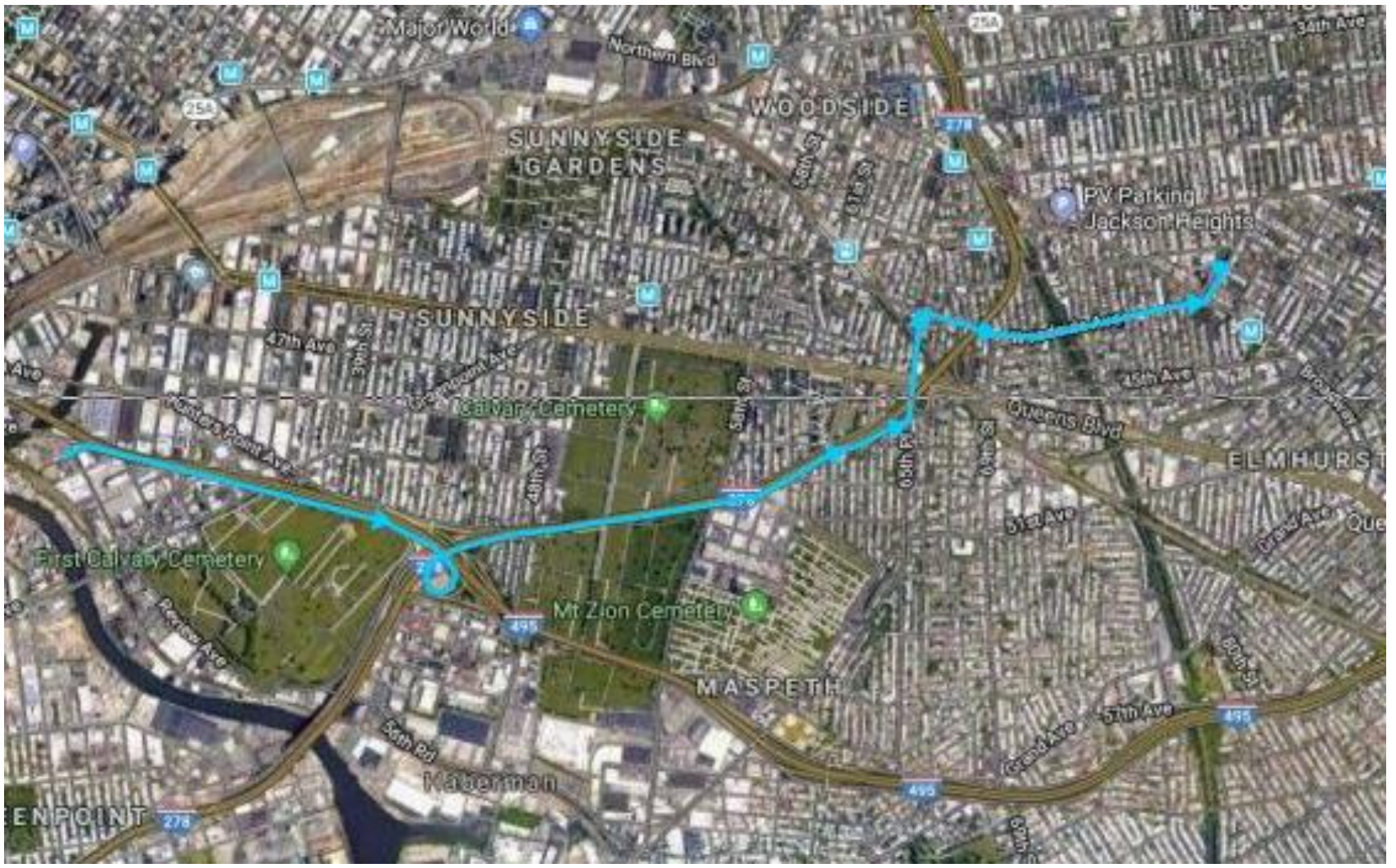
Spatial Reference: NAD 1983 StatePlane Connecticut FIPS 0600 Feet

| | |
|---|---|
| Project No. | 100652601 |
| Date | 6/18/2018 |
| Scale | 1:2,000 |
| Drawn By | Site Analyzer |
| Submission Date | 06/18/2018 |

Figure 1

Sheet 1 of 1

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**Emergency Route to New York City Health, Elmhurst Hospital (Phone # (718) 334-4000) :**

1 Start traveling Northeast on 29th Street towards Borden Avenue
2 Turn Right onto Borden Avenue
3 Use the two middle lanes to merge onto Interstate 278 East
4 Take exit 39 towards 65th Place
5 Turn Left onto 65th Place
6 Turn Right onto Woodside Avenue
7 Slight Left to stay on Woodside Avenue
8 Continue onto Baxter Avenue
9 Elmhurst Hospital Emergency Room is on the left.

**MAP REFERENCE: Google Maps**

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**Project**

**28-90 REVIEW AVENUE**
**EMERGENGY HOSPITAL ROUTE MAP**

**Queens** **New York**

| Project | DATE | SCALE | FIGURE NO. |
|---|---|---|---|
| **100652601** | **4/24/2019** | **NTS** | **2** |

# ATTACHMENT A

# Health and Safety Briefing Statement

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## ATTACHMENT A

## HEALTH AND SAFETY BRIEFING STATEMENT

The following personnel were present at a pre-job safety briefing conducted at _____(time) on _____ (date) at _____(location), and have read this Health and Safety Plan for the above Site and are familiar with its provisions:

| Name | Signature |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

Fully charged ABC class fire extinguisher available on Site? _____
Fully stocked First Aid Kit available on Site? _____
All project personnel advised of location of nearest phone? _____
All project personnel advised of location of designated medical facility? _____

_____
Name of Field Team Leader or Site Safety Officer

_____
Signature Date

# ATTACHMENT B

# Field Procedures Change Authorization Form

## ATTACHMENT B

## FIELD PROCEDURES CHANGE AUTHORIZATION FORM

Section to be changed:_____

Duration of Authorization Requested Date:_____

_____ Today only

_____ Duration of Task

_____ Other_____

_____

_____

Description of Procedures Modification:

_____

_____

_____

Justification:

_____ _____

Person Requesting Change Verbal Authorization Received From:

_____ _____

Name Name Time

_____ _____

Title Title

_____

Signature

Approvals:

_____

_____

_____

# ATTACHMENT C

# Unsafe Conditions and Practices Form

LANGAN

**ATTACHMENT C**

**UNSAFE CONDITIONS AND PRACTICES FORM**

DESCRIPTION OF CIRCUMSTANCES REGARDING UNSAFE CONDITION OR PRACTICE:

_____

_____

_____

_____

_____

_____

_____

IS THIS CONDITION EXISTING OR POTENTIAL?_____

REPORTED TO: _____

REPORTED BY:_____

DATE REPORTED:_____

COMMENTS:_____

_____

_____

# ATTACHMENT D

# Calibration Log

# ATTACHMENT D

**PROJECT:_____**

**DATE:_____**

## CALIBRATION LOG

| Time | Inst Type | Inst # | Media | Initial Reading | Span # | Calib Reading | Performed By: |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
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# ATTACHMENT E

# Emergency Notification Numbers

# ATTACHMENT E

## EMERGENCY NOTIFICATION NUMBERS

The following list provides names and telephone numbers for emergency contact personnel.

| ORGANIZATION | CONTACT | | TELEPHONE |
|---|---|---|---|
| New York City Police | | | 911 |
| New York City Fire | | | 911 |
| NYC Health, Elmhurst Hospital | | | 718-334-4000 |
| Langan Incident/Injury Hotline | | | 1-800-952-6426 or (973)560-4699 |
| Langan Project Manager | Amanda Forsburg | | 973-560-4900 |
| National Response Center | | | 800-424-8802 |
| Center for Disease Control | | | 404-488-4100 |
| CHEMTREC | | | 800-424-9300 |
| TSCA HOTLINE | | | 202-554-1404 |
| RCRA HOTLINE | | | 800-424-9346 |
| CDC | | (DAY)<br>(NIGHT) | 404-452-4100<br>404-329-2888 |
| BUREAU OF ALCOHOL, TOBACCO & FIREARMS | | | 800-424-9555<br>202-566-7777 |
| NATIONAL RESPONSE CENTER | | | 800-424-8802 |
| PESTICIDE INFORMATION SERVICE | | | 800-424-9346 |
| BUREAU OF EXPLOSIVES, A.A. RAILWAYS | | | 202-835-9500 |
| FEDERAL EXPRESS - HAZARDOUS MATERIAL INFO | | | 901-922-1666 |

# ATTACHMENT F

# Accident / Incident Report Form

## ATTACHMENT F

## INCIDENT REPORT

### LANGAN EMPLOYEE EXPOSURE/INJURY INCIDENT REPORT
### (Submit a Separate Report for Each Employee and/or Incident)

Date: _____

Employee's Name:_____ Employee No:_____

Sex: M _____ F _____ Age: _____

Region: _____ Location:_____

Project: _____ Project No: _____

Incident:_____

Type: Possible Exposure _____ Exposure _____ Physical Injury _____

Location: _____

Date of Incident: _____ Time of Incident: _____

Date of Report Incident: _____

Person(s) to Whom Incident was Reported: _____

Weather Conditions During Incident: Temperature _____ Humidity _____

Wind Speed and Direction: _____ Cloud Cover: _____

Clear: _____ Precipitation: _____

Materials Potentially Encountered: _____

Chemical (give name of description - liquid, solid, gas, vapor, fume, mist):

_____

_____

Radiological:_____

Other: _____

Nature of the Exposure/Injury: (State the nature of the exposure/injury in detail and list the parts of the body affected. Attach extra sheets if necessary).

_____

_____

_____

_____

_____

Did you receive medical care? Yes _____ No _____ If so, when _____

Where? On-Site _____ Off-Site _____

By Whom: Name of Paramedic: _____

Name of Physician: _____

Other: _____

If Off-Site, name facility (hospital, clinic, etc):_____

_____

Length of stay at the facility?_____

Was the Site Safety Officer contacted? Yes _____ No _____ When?_____

Was the Corporate Health and Safety Officer contacted? Yes _____ No _____

If so, who was the contact?_____

Did the exposure/injury result in permanent disability? Yes _____ No _____

If so, explain:_____

_____

_____

_____

Has the employee returned to work? Yes _____ No _____

List the names of other persons affected during this incident:

_____

_____

_____

_____

_____

_____

_____

List the names of persons who witnessed the exposure/injury incident:

_____

_____

_____

_____

_____

_____

_____

Possible cause of the exposure/injury incident: _____

_____

_____

_____

_____

_____

What was the name and title of the field team leader or immediate supervisor at the site of the incident?

_____

Was the operation being conducted under an established Health and Safety Plan?

Yes _____ No _____ If yes, attach a copy. If no, explain

_____

_____

_____

_____

_____

_____

Describe protective equipment and clothing used by the employee:

_____

_____

_____

_____

_____

_____

Did any limitations in safety equipment or protective clothing contribute to or affect exposure? If so, explain:

_____

_____

_____

What was the employee doing when the exposure/injury occurred? (Describe briefly as Site Reconnaissance, Site Characterization, or Sampling, etc.):

_____

_____

_____

_____

Where exactly on site or off site did the exposure/injury occur?

_____

_____

_____

_____

_____

How did the exposure/injury occur? (Describe fully what factors led up to and/or contributed to the incident):

_____

_____

_____

_____

_____

Name of person(s) initiating report, job title, phone number:

_____

_____

_____

_____ _____

Employee Signature Date

_____ _____

Site Safety Officer Signature or Field Team Leader Signature Date

# ATTACHMENT G

# Jobsite Safety Inspection Checklist

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**JOBSITE SAFETY INSPECTION CHECKLIST**

Client: _____ Inspection Date: _____

Site: _____ Inspector: _____

Employees: _____

**Notes:**_____

_____

_____

Check one of the following: **A:** Acceptable **NA**: Not Applicable **D**: Deficiency

| | A | NA | D | Remarks |
|---|---|---|---|---|
| **GENERAL** | | | | |
| Appropriate PPE being worn by Langan employees and subcontractors? | | | | |
| Air monitoring instruments calibrated daily and results recorded on the Daily Instrument Calibration check sheet? | | | | |
| Air monitoring readings recorded on the air monitoring data sheet/field log book? | | | | |
| Incident reporting procedures known? | | | | |
| Site security an issue? | | | | |
| Vehicle /pedestrian traffic issue? | | | | |
| Adequate size/type fire extinguisher supplied? | | | | |
| Evidence that drilling operator is responsible for the safety of his rig. | | | | |
| First Aid kit available? | | | | |
| **PERSONAL PROTECTIVE EQUIPMENT** | | | | |
| Eye Protection? | | | | |
| Head protection? | | | | |
| Safety Shoes? | | | | |
| Safety vests? | | | | |
| Hand protection? | | | | |
| Other? | | | | |
| Deficiencies?? | | | | |
| **HOUSEKEEPING** | | | | |
| Work area kept clean/tidy to minimize potential hazards? | | | | |
| Waste being disposed of quickly and properly | | | | |
| Adequate lighting for job? | | | | |
| Portable water available? | | | | |
| **HAND TOOLS** | | | | |
| Are tools in good condition and properly used? (INSPECT) | | | | |
| Are proper tools being used? | | | | |
| Are tools safety stored when not in use? | | | | |
| Have tools been inspected prior to use? | | | | |
| Are employees familiar with using tools? | | | | |
| Is additional PPE required for tools? Available? | | | | |
| **POWER TOOLS** | | | | |
| Are tools in good condition and properly used? (INSPECT) | | | | |
| Are tools properly grounded? | | | | |
| Safety guards in place and used correctly? | | | | |
| Competent instruction / supervision? | | | | |
| Cords include in inspection? | | | | |

| | | | | |
|---|---|---|---|---|
| **HAZWOPER** | | | | |
| Employees have current 40-hr./8-hr./Supervisor HAZWOPER training? | | | | |
| Project staff medically cleared to work in hazardous waste sites and fit-tested to wear respirators, if needed? | | | | |
| Respiratory protection readily available? | | | | |
| Subcontract workers have current 40-hr./8-hr./Spvsr. HAZWOPER training, as appropriate? | | | | |
| Subcontract workers medically cleared to work on site, and fit-tested for respirator wear? | | | | |
| Subcontract workers have respirators readily available? | | | | |
| **HEALTH & SAFETY PLAN** | | | | |
| HASP available on site for inspection? | | | | |
| Health & Safety Compliance agreement (in HASP) appropriately signed by Langan employees and subcontractors? | | | | |
| Hospital route map with directions posted on site? | | | | |
| Emergency Notification List posted on site? | | | | |
| Personnel trained in CPR/First Aid on site? | | | | |
| MSDSs readily available, and all workers knowledgeable about the specific chemicals and compounds to which they may be exposed? | | | | |
| Project site safe practices ("Standing Orders") posted? | | | | |
| Health & Safety Incident Report forms available? | | | | |
| Decontamination procedures being followed as outlined in HASP? | | | | |
| **UNDERGROUND UTILITY** | | | | |
| Mark outs of underground utilities done prior to initiating any subsurface activities? | | | | |
| Underground utilities located and authorities contacted before digging? | | | | |
| Visually observed mark-outs? | | | | |
| Is subsurface work within three feet of underground utilities? | | | | |
| - Is so, is or was soft dig techniques used? | | | | |
| Drilling performed in areas free from underground utilities? | | | | |
| **EXCAVATION / TRENCH** | | | | |
| Are excavations/trenches over 5 feet deep sloped, shored or a trench box used? | | | | |
| Operations supervised by a Competent Person? | | | | |
| Is Competent Person preforming daily inspections of excavation/trench? | | | | |
| Adequate barricades in place? | | | | |
| Have underground utilities been identified? | | | | |
| Ladders / means of egress in trench with 25-foot of every worker? | | | | |
| Has PE designed or approved protective system? | | | | |
| Excavated material and other objects placed more than 2 feet away from excavation edge? | | | | |
| Public protected from exposure to open excavation? | | | | |
| **CONFINED / PERMIT-ENTRY CONFINED SPACE** | | | | |
| People entering the excavation regarding it as a permit-required confined space and following appropriate procedures? | | | | |
| Confined space entry permit is completed and posted? | | | | |
| All persons knowledgeable about the conditions and characteristics of the confined space? | | | | |
| All persons engaged in confined space operations have been trained in safe entry and rescue (non-entry)? | | | | |
| Full body harnesses, lifelines, and hoisting apparatus available for rescue needs? | | | | |
| Attendant and/or supervisor certified in basic first aid and CPR? | | | | |
| Confined space atmosphere checked before entry and continuously while the work is going on? | | | | |
| Results of confined space atmosphere testing recorded? | | | | |
| Evidence of coordination with off-site rescue services to perform entry rescue, if needed? | | | | |
| **ELECTRICAL SAFETY** | | | | |
| Equipment at least 10 feet from overhead power lines? | | | | |
| Is equipment grounded? | | | | |
| GFCI used and tested where required? | | | | |
| Are extension cords rated for this work being used and are they properly maintained? | | | | |
| Electrical dangers posted at site? | | | | |

| | | | | |
|---|---|---|---|---|
| **FLAMMABLE LIQUIDS** | | | | |
| Are flammable liquids used at site? | | | | |
| Are flammable liquids stored in appropriate containers? | | | | |
| Are flammable liquids kept away from combustion sources? | | | | |
| Do flammable liquid containers have warning labels? | | | | |
| **LADDERS** | | | | |
| Are ladders used at site? | | | | |
| Were ladders inspected prior to use? | | | | |
| Are ladders in good working condition? | | | | |
| Are ladders secured to prevent slipping, sliding or falling? | | | | |
| Do side rails extend three feet above top of landing area? | | | | |
| Are top two steps of stepladders being used? | | | | |
| Is extension on ladder facing out? | | | | |
| Are ladders sufficient for task? | | | | |
| Are ladders sufficient for task? | | | | |

**Unsafe acts observed?** _____

_____

_____

_____

_____

_____

**Additional remarks** _____

_____

_____

_____

_____

_____

_____

**Notes:**_____

_____

_____

_____

_____

_____

**Distribution:** Project Manager - Name: _____

Health & Safety Officer - Name: _____

Health & Safety Manager- Name: Anthony Moffa, CHMM

Q:\Other\HealthandSafety\GenericAppendixAJobsiteSafetyInspectionChecklist

# ATTACHMENT H

# Material Safety Data Sheets (MSDS)

Safety Data Sheet

# 1,1-Dichloro-2,2-bis(4-chlorophenyl-$d_4$)ethylene

## Section 1. Chemical product and company identifications

**Product code:** D-3005
**Chemical formula:** $C_{14}D_8Cl_4$
**CAS:** 93952-19-3
**CAS (unlabelled):** 72-55-9
**Synonyms:** 4,4'-DDE, 2,2-Bis(4-chlorophenyl)-1,1-dichloroethylene

**Supplier / Manufacturer:**

**C/D/N Isotopes Inc.**
88 Leacock Street
Pointe-Claire (Québec) H9R 1H1
Phone: 514-697-6254
Toll-Free (Canada & USA): 1-800-565-4696
Fax: 514-697-6148
Website: www.cdnisotopes.com

**In case of emergency:**

**TOXYSCAN HOTLINE: 1-855-780-0599**

## Section 2. Hazards identifications

**Physical state:** Solid
**Warning:** Harmful if swallowed. Suspected of causing cancer.
**Routes of entry:** Inhalation, skin and eyes

**GHS (Globally Harmonized System of Classification and Labelling of Chemicals):**

**GHS Classification:**
- Acute toxicity, Oral (Category 4)
- Carcinogenicity (Category 2)

**GHS Label elements:**
- Pictograms: 
- Signal word: Warning

**Hazards statement:**
- H302 Harmful if swallowed.
- H351 Suspected of causing cancer.

**Precautionary statement:** - P281 Use personal protective equipment as required.

## Section 3. Composition and information on ingredients

| Name | CAS | Concentration % |
|---|---|---|
| 1,1-Dichloro-2,2-bis(4-chlorophenyl-$d_4$)ethylene | 93952-19-3 | > 98 |

## Section 4. First aid measures

**Eye contact:** Flush eyes with water as a precaution.
**Skin contact:** Wash off with soap and plenty of water. Consult a physician.
**Inhalation:** If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.
**Ingestion:** Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.
**General advice:** Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

©2015 All rights reserved C/D/N Isotopes, Inc. / Toxyscan, Inc.

## Section 5. Firefighting measures

**Flammability of the product:** Not flammable or combustible.
**Lower explosion limit:** No data available.
**Upper explosion limit:** No data available.
**Auto-ignition temperature:** No data available.
**Flash point:** No data available.
**Products of combustion:** Hazardous decomposition products formed under fire conditions: Carbon oxides, hydrogen chloride gas.
**Firefighting media and instructions:** Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
**Special protective equipment for firefighters:** Wear self-contained breathing apparatus for firefighting if necessary.

## Section 6. Accidental release measures

**Personal precautions:** Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
**Environmental precautions:** Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
**Methods for cleaning up:** Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

## Section 7. Handling and storage

**Handling:** Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.
**Storage:** Store at room temperature. Adequate ventilation. Protect from light.

## Section 8. Exposure Controls, Personal Protections

**Engineering controls:** Use mechanical exhaust or laboratory fumehood to avoid exposure.
**Eyes:** Safety glasses with side-shields conforming to NIOSH (US).
**Respiratory:** 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).
**Hands:** Handle with gloves. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
**Skin/body:** Impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

## Section 9. Physical and chemical properties (unlabelled)

**Molecular weight:** 318.03 g/mol
**Physical status:** Solid
**Color:** White-pale yellow
**Odour:** No data available
**Density:** No data available
**Melting point:** 88 - 90 °C (190 - 194 °F)
**Boiling point:** 336 °C (637 °F)
**Vapour pressure:** < 0.00001 hPa (< 0.00001 mmHg)
**Vapour density:** No data available
**Partition coefficient (octanol/water):** log Pow: 6.51
**Water solubility:** 0.04 mg/L

## Section 10. Stability and reactivity

**Stability and reactivity:** Stable under recommended storage conditions.
**Incompatibility:** Strong oxidizing agents, strong bases.
**Products of combustion:** Hazardous decomposition products formed under fire conditions: Carbon oxides, hydrogen chloride gas.
**Reactivity conditions:** No data available.

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## Section 11. Toxicological information (unlabelled)

**Toxicological data:** 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene

**Information on ingredients:**

| Name | CAS | $LD_{50}$ | $LC_{50}$ |
|---|---|---|---|
| 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene | 72-55-9 | Oral - rat - 880 mg/kg | No data available |

**Potential acute effects**

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

**Potential chronic effects**

- **Carcinogenic effects:** This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification. Limited evidence of carcinogenicity in animal studies. IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
- **Mutagenic effects:** No data available.
- **Teratogenic effects:** No data available.
- **Medical conditions aggravated by overexposure:** No data available.

## Section 12. Ecological information

**Ecological data:**

| Name | Results | Species | Period |
|---|---|---|---|
| 1,1-Dichloro-2,2-bis | 0.2 - 0.3 mg/l LC50 | Lepomis macrochirus | 96 h |
| (4-chlorophenyl)ethylene | 0.03 - 0.04 mg/l LC50 | Oncorhynchus mykiss | 96 h |
| | 0.05 - 0.18 mg/l LC50 | Salmo salar | 96 h |

**Effects on environment:** An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
**Mobility:** No data available.
**Environmental precautions:** No data available.
**Persistence and degradability:** No data available.
**Bioaccumulative potential:** Gambusia affinis (Mosquito fish) - 33 d. Bioconcentration factor (BCF): 12,037.

## Section 13. Disposal considerations

**Waste disposal:** 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.

## Section 14. Transportation information

**Classification DOT/IMDG/IATA label:**

**Shipping name:** Not dangerous goods
**UN number:** None
**Class:** None
**Packaging group:** None

**Additional information:** None

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## Section 15. Regulatory information

**UNITED STATES:**
**NFPA classification**



Health: 1
Flammable: 0
Reactivity: 0
Specials conditions: None

**Legend: 4: Severe, 3: High, 2: Moderate, 1: Slightly, 0: Not hazardous**

**U.S. Federal regulations:**

**TSCA 8(b) inventory:** 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene
**SARA 302/304/311/312 extremely hazardous substances:** Not Listed
**SARA 302/304 emergency planning and notification:** Not Listed
**SARA 302/304/311/312 hazardous chemicals:** Not Listed
**SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard:** Not Listed
**CWA (Clean Water Act) 307:** Not Listed
**CWA (Clean Water Act) 311:** Not Listed
**CAA (Clean Air Act) 112 accidental release prevention:** Not Listed
**CAA (Clean Air Act) 112 regulated flammable substances:** Not Listed
**CAA (Clean Air Act) 112 regulated toxic substances:** Not Listed

**State regulations:**

**DEA List I Chemicals (Precursor Chemicals):** Not Listed
**DEA List II Chemicals (Essential Chemicals):** Not Listed
**Substances in Massachusetts:** Not Listed
**Dangerous substances in New Jersey:** Not Listed
**New York – Dangerous substances with acute effects:** Not Listed
**Dangerous substances in Pennsylvania – right to know:** Not Listed

**WHMIS (Canada):**



Not WHMIS controlled.

## Section 16. Additional information

**References:**

- ANSI Z400.1, MSDS Standard, 2001.
- Manufacturer's Material Safety Data Sheet.
- 29CFR Part1910.1200 OSHA MSDS Requirements.
- 49CFR Table List of Hazardous Materials, UN#, Proper Shipping Names, PG. -Canada
- Gazette Part II, Vol. 122, No. 2 Registration SOR/88-64 31 December, 1987 Hazardous Products Act "Ingredient Disclosure List".
- Federal act on the controlled products
- Canadian Transport of Dangerous Goods, Regulations and Schedules, Clear Language version 2002.
- Toxicological repertory, HSC.
- Material safety data sheet from the components.

**Date of issue:** **February 20th, 2017**
**Version:** 1
**Elaborated by:** **Toxyscan Inc., 1-866-780-0599**
**Notice to reader:** To the best of our knowledge, the information contained herein is accurate. However, C/D/N Isotopes Inc., Toxyscan Inc., or 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.

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# Safety Data Sheet

**Revision Date: 12/23/16**

www.restek.com

## 1. IDENTIFICATION

| | |
|---|---|
| **Catalog Number / Product Name:** | **32203 / 4,4'-DDT Standard** |
| **Company:** | Restek Corporation |
| **Address:** | 110 Benner Circle<br>Bellefonte, Pa. 16823 |
| **Phone#:** | 814-353-1300 |
| **Fax#:** | 814-353-1309 |
| **Emergency#:** | 800-424-9300 (CHEMTREC)<br>703-527-3887 (Outside the US) |
| **Email:** | www.restek.com |
| **Revision Number:** | 8 |
| **Intended use:** | For Laboratory use only |

## 2. HAZARD(S)IDENTIFICATION

**Emergency Overview:**

**GHS Hazard Symbols:**



**GHS Classification:**
Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 1
Flammable Liquid Category 2
Acute Toxicity - Inhalation Dust / Mist Category 3
Acute Toxicity - Dermal Category 3
Acute Toxicity - Oral Category 3

**GHS Signal Word:**
Danger

**GHS Hazard:**
Highly flammable liquid and vapour.
Toxic if swallowed, in contact with skin or if inhaled.
Causes damage to organs.

**GHS Precautions:**

**Safety Precautions:**
Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilation and lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe dust/fume/gas/mist/vapours/spray.
Wash hands and skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/protective clothing/eye protection/face protection.

**First Aid Measures:**
IF SWALLOWED: Immediately call a POISON CENTER/doctor/....
IF ON SKIN: Wash with plenty of soap and water.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF exposed: Call a POISON CENTER or doctor/physician.
Call a POISON CENTER or doctor/physician.
Call a POISON CENTER or doctor/physician if you feel unwell.
Specific treatment see section 4.
Rinse mouth.
Take off immediately all contaminated clothing and wash it before reuse.
In case of fire: Use extinguishing media in section 5 for extinction.

**Storage:** Store in a well-ventilated place. Keep container tightly closed.
Store in a well-ventilated place. Keep cool.
Store locked up.

**Disposal:** Dispose of contents/container according to section 13 of the SDS.

**Single Exposure Target Organs:** No data available.

**Repeated Exposure Target Organs:** No data available.

## 3. COMPOSITION / INFORMATION ON INGREDIENT

| Chemical Name | CAS # | EINEC # | % Composition |
|---|---|---|---|
| methanol | 67-56-1 | 200-659-6 | 99.900000 |
| 4,4'-DDT | 50-29-3 | 200-024-3 | 0.100000 |

## 4. FIRST-AID MEASURES

**Inhalation:** Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

**Eyes:** Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

**Skin Contact:** Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

**Ingestion:** Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

## 5. FIRE- FIGHTING MEASURES

**Extinguishing Media:** Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water may be ineffective but water spray can be used extinguish a fire if swept across the base of the flames. Water can absorb heat and keep exposed material from being damaged by fire.

**Fire and/or Explosion Hazards:** Vapors may be ignited by sparks, flames or other sources of ignition if material is above the flash point giving rise to a fire (Class B). Vapors are heavier than air and may travel to a source of ignition and flash back.

**Fire Fighting Methods and Protection:** Do not enter fire area without proper protection including self-contained breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

**Hazardous Combustion Products:** Carbon dioxide, Carbon monoxide

## 6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions and Equipment:** Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.

**Methods for Clean-up:** Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

## 7. HANDLING AND STORAGE

**Handling Technical Measures and Precautions:** Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

**Storage Technical Measures and Conditions:** Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**United States:**

| Chemical Name | CAS No. | IDLH | ACGIH STEL | ACGIH TLV-TWA | OSHA Exposure Limit |
|---|---|---|---|---|---|
| methanol | 67-56-1 | 6000 ppm IDLH | 250 ppm STEL | 200 ppm TWA | 200 ppm TWA; 260 mg/m3 TWA |
| 4,4'-DDT | 50-29-3 | 500 mg/m3 IDLH | | 1 mg/m3 TWA | 1 mg/m3 TWA (listed under Dichlorodiphenyltrichloroethane) |

**Personal Protection:**

**Engineering Measures:** Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.

**Respiratory Protection:** Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.If an exposure limit is exceeded or if an operator is experiencing symptoms of inhalation overexposure as explained in Section 3, provide respiratory protection.

**Eye Protection:** Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

**Skin Protection:** Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| **Appearance, color:** | No data available. |
| **Odor:** | Mild |
| **Physical State:** | No data available. |
| **pH:** | No data available. |
| **Vapor Pressure:** | No data available. |
| **Vapor Density:** | 1.1 (air = 1) |
| **Boiling Point:** | No data available. |
| **Melting Point:** | -98 °C |
| **Flash Point:** | 52 |
| **Flammability:** | Highly Flammable |
| **Upper Flammable/Explosive Limit, % in air:** | 36 |
| **Lower Flammable/Explosive Limit, % in air:** | 6 |
| **Autoignition Temperature:** | 464 deg C |
| **Decomposition Temperature:** | No data available. |
| **Specific Gravity:** | 0.791 - 0.792 g/cm3 at 20 °C |
| **Evaporation Rate:** | No data available. |
| **Odor Threshold:** | No data available. |
| **Solubility:** | Moderate; 50-99% |
| **Partition Coefficient: n-octanol in water:** | No data available. |
| **VOC % by weight:** | 99.9 |
| **Molecular Weight:** | 32.04 |

## 10. STABILITY AND REACTIVITY

| | |
|---|---|
| **Stability:** | Stable under normal conditions. |
| **Conditions to Avoid:** | No data available. |
| **Materials to Avoid / Chemical Incompatiability:** | Strong oxidizing agents |
| **Hazardous Decomposition Products:** | Carbon dioxide Carbon monoxide |

## 11. TOXICOLOGICAL INFORMATION

| | |
|---|---|
| **Routes of Entry:** | Inhalation, Skin Contact, Eye Contact, Ingestion |
| **Target Organs Potentially Affected By Exposure:** | Eyes, Central nervous system stimulation, Skin, GI Tract, Respiratory Tract |
| **Chemical Interactions That Change Toxicity:** | None Known |

**Immediate (Acute) Health Effects by Route of Exposure:**

| | |
|---|---|
| **Inhalation Irritation:** | Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache. |
| **Inhalation Toxicity:** | Harmful! Can cause systemic damage (see "Target Organs)Methanol can cause central nervous system depression and overexposure can cause damage to the optic nerve resulting in visual impairment or blindness. |
| **Skin Contact:** | Can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage. |
| **Eye Contact:** | Can cause moderate irritation, tearing and reddening, but not likely to permanently injure eye tissue. |
| **Ingestion Irritation:** | Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.Highly toxic and may be fatal if swallowed. |
| **Ingestion Toxicity:** | Toxic if swallowed. May cause target organ failure and/or death.May be fatal if swallowed. |

**Long-Term (Chronic) Health Effects:**

| | |
|---|---|
| **Carcinogenicity:** | Contains a probable or known human carcinogen. |
| **Reproductive and Developmental Toxicity:** | Contains a known human reproductive and/or developmental hazard. |
| **Inhalation:** | Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs) |
| **Skin Contact:** | Upon prolonged or repeated contact, can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage. |
| **Ingestion:** | Toxic if swallowed. May cause target organ failure and/or death. |

**Component Toxicological Data:**

**NIOSH:**

| Chemical Name | CAS No. | LD50/LC50 |
|---|---|---|
| Methanol | 67-56-1 | Inhalation LC50 Rat 22500 ppm 8 h |
| DDT | 50-29-3 | Dermal LD50 Rabbit 300 - 2820 mg/kg |

**Component Carcinogenic Data:**

**OSHA:**

| Chemical Name | CAS No. | |
|---|---|---|
| DDT | 50-29-3 | Present |

**ACGIH:**

| Chemical Name | CAS No. | |
|---|---|---|
| DDT | 50-29-3 | A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans |

**NIOSH:**

| Chemical Name | CAS No. | |
|---|---|---|
| DDT | 50-29-3 | potential occupational carcinogen |

**NTP:**

| Chemical Name | CAS No. |
|---|---|
| No data available. | |

**IARC:**

| Chemical Name | CAS No. | Group No. |
|---|---|---|
| No data. | | Group 1 |
| DDT | 50-29-3 | Group 2A |
| No data. | | Group 2B |

## 12. ECOLOGICAL INFORMATION

| | |
|---|---|
| **Overview:** | Moderate ecological hazard. This product may be dangerous |

to plants and/or wildlife.

**Mobility:** No data
**Persistence:** No data
**Bioaccumulation:** No data
**Degradability:** Biodegrades slowly.
**Ecological Toxicity Data:** No data available.

## 13. DISPOSAL CONSIDERATIONS

**Waste Description of Spent Product:** Spent or discarded material is a hazardous waste.
**Disposal Methods:** Dispose of by incineration following Federal, State, Local, or Provincial regulations.
**Waste Disposal of Packaging:** Comply with all Local, State, Federal, and Provincial Environmental Regulations.

## 14. TRANSPORTATION INFORMATION

**United States:**
**DOT Proper Shipping Name:** Methanol
**UN Number:** UN1230
**Hazard Class:** 3
**Packing Group:** II

**International:**
**IATA Proper Shipping Name:** Methanol
**UN Number:** UN1230
**Hazard Class:** 3(6.1)
**Packing Group:** II

**Marine Pollutant:** No

| Chemical Name | CAS# | Marine Pollutant | Severe Marine Pollutant |
|---|---|---|---|
| No data available. | | | |

## 15. REGULATORY INFORMATION

**United States:**

| Chemical Name | CAS# | CERCLA | SARA 313 | SARA EHS 313 | TSCA |
|---|---|---|---|---|---|
| methanol | 67-56-1 | X | X | - | X |
| 4,4'-DDT | 50-29-3 | X | - | - | X |

**The following chemicals are listed on CA Prop 65:**

| Chemical Name | CAS # | Regulation |
|---|---|---|
| DDT | 50-29-3 | Prop 65 Cancer |
| Methanol | 67-56-1 | Prop 65 Devolop Tox |
| p,p''-DDT | 50-29-3 | Prop 65 Devolop Tox |
| p,p''-DDT | 50-29-3 | Prop 65 Rep Female |
| p,p''-DDT | 50-29-3 | Prop 65 Rep Male |

**State Right To Know Listing:**

| Chemical Name | CAS# | New Jersey | Massachusetts | Pennsylvania | California |
|---|---|---|---|---|---|
| methanol | 67-56-1 | X | X | X | X |
| 4,4'-DDT | 50-29-3 | X | X | X | X |

## 16. OTHER INFORMATION

**Prior Version Date:** 09/30/14
**Other Information:** Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
**References:** No data available.
**Disclaimer:** Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose

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# SAFETY DATA SHEET

Version 4.7
Revision Date 05/23/2016
Print Date 06/23/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Arsenic

Product Number : 202657
Brand : Aldrich
Index-No. : 033-001-00-X

CAS-No. : 7440-38-2

### 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 # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 3), H331
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)
H302 Harmful if swallowed.
H331 Toxic if inhaled.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin 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.

| | |
|---|---|
| P301 + P312 + P330 | IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth. |
| P304 + P340 + P311 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor. |
| 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 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 | : | As |
| Molecular weight | : | 74.92 g/mol |
| CAS-No. | : | 7440-38-2 |
| EC-No. | : | 231-148-6 |
| Index-No. | : | 033-001-00-X |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Arsenic** | | |
| | Acute Tox. 4; Acute Tox. 3; Aquatic Acute 1; Aquatic Chronic 1; H302, H331, 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**
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
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.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. 1 and 2 / very toxic 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 |
|---|---|---|---|---|
| Arsenic | 7440-38-2 | TWA | 0.01 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Lung cancer<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Confirmed human carcinogen | | |
| | | C | 0.0020 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A<br>15 minute ceiling value | | |

**Biological occupational exposure limits**

| Component | CAS-No. | Parameters | Value | Biological specimen | Basis |
|---|---|---|---|---|---|
| Arsenic | 7440-38-2 | inorganic arsenic plus methylated metabolites | 35µg As/l | In urine | ACGIH - Biological Exposure Indices (BEI) |
| | Remarks | End of the workweek (After four or five consecutive working days | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | with exposure) | | | |
| | | inorganic arsenic plus methylated metabolites | 35µg As/l | Urine | ACGIH - Biological Exposure Indices (BEI) |
| | | End of the workweek (After four or five consecutive working days with exposure) | | | |

### 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 N99 (US) or type P2 (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: Pieces<br>Colour: grey |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |

| | | |
|---|---|---|
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 817 °C (1,503 °F) - lit. |
| f) | Initial boiling point and boiling range | 613 °C (1,135 °F) - lit. |
| g) | Flash point | Not applicable |
| 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 | 5.727 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**
Heat Exposure to air may affect product quality.

**10.5 Incompatible materials**
Oxidizing agents, Halogens, Palladium undergoes a violent reaction with arsenic, Zinc, Platinum oxide, Nitrogen trichloride, Bromine azide

**10.6 Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Arsenic 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 - 763 mg/kg
Remarks: Behavioral:Ataxia. Diarrhoea

LD50 Oral - Mouse - 145 mg/kg
Remarks: Behavioral:Ataxia. Diarrhoea

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

| | |
|---|---|
| IARC: | 1 - Group 1: Carcinogenic to humans (Arsenic) |
| NTP: | Known to be human carcinogen (Arsenic) |
| | Known to be human carcinogen (Arsenic) |
| OSHA: | OSHA specifically regulated carcinogen (Arsenic) |

**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: CG0525000

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.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | LC50 - Pimephales promelas (fathead minnow) - 9.9 mg/l - 96.0 h |
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 3.8 mg/l - 48 h |

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

## 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: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic
Reportable Quantity (RQ): 1 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 1558 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: ARSENIC
Marine pollutant:yes

**IATA**
UN number: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic

## 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 |
|---|---|---|
| Arsenic | 7440-38-2 | 2007-07-01 |

**SARA 311/312 Hazards**
Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Arsenic | 7440-38-2 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Arsenic | 7440-38-2 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Arsenic | 7440-38-2 | 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 |
|---|---|---|
| Arsenic | 7440-38-2 | 2008-10-10 |

## 16. OTHER INFORMATION

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

| | |
|---|---|
| Acute Tox. | Acute toxicity |
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| H302 | Harmful if swallowed. |
| H331 | Toxic if inhaled. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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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 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: 4.7 Revision Date: 05/23/2016 Print Date: 06/23/2016

# SAFETY DATA SHEET

Version 5.6
Revision Date 06/02/2016
Print Date 07/20/2017

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

| | | |
|---|---|---|
| Product name | : | Benz[*a*]anthracene |
| Product Number | : | 48563 |
| Brand | : | Supelco |
| 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<br>3050 Spruce Street<br>SAINT LOUIS MO 63103<br>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 | 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-Benzanthracene<br>Tetraphene |
| Formula | : | $C_{18}H_{12}$ |
| 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 |
|---|---|---|
| **Benz[a]anthracene** | | |
| | 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: 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
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 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. (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**
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 |
|---|---|---|
| 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. Benz[a]anthracene | CAS-No. 56-55-3 | Revision Date 2007-09-28 |
| WARNING! This product contains a chemical known to the State of California to cause cancer. Benz[a]anthracene | CAS-No. 56-55-3 | Revision Date 2007-09-28 |

## 16. OTHER INFORMATION

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

| | |
|---|---|
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| Carc. | Carcinogenicity |
| H350 | May cause cancer. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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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 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: 06/02/2016 Print Date: 07/20/2017

# SAFETY DATA SHEET

**Revision Date** 22-May-2017 **Revision Number** 2

## 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** Not for food, drug, pesticide or biocidal product use

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

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

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**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
WARNING! This product contains a chemical known in the State of California to cause cancer.

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Benzo[a]pyrene | 50-32-8 | > 96 |

## 4. First-aid measures

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

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes.

**Inhalation** Move to fresh air.

**Ingestion** Do not induce vomiting.

**Most important symptoms/effects** 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

**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Unsuitable Extinguishing Media** No information available

**Flash Point**
**Method -** No information available

**Autoignition Temperature** No information available

**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** 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**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 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.

## 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 | Mexico OEL (TWA) |
|---|---|---|---|---|
| Benzo[a]pyrene | | TWA: 0.2 mg/m³ | | |

*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

| | |
|---|---|
| **Physical State** | Powder Solid |
| **Appearance** | Dark yellow |
| **Odor** | aromatic |
| **Odor Threshold** | No information available |
| **pH** | |
| **Melting Point/Range** | 175 179 °C |
| **Boiling Point/Range** | °C @ 760 mmHg |

| | |
|---|---|
| **Flash Point** | |
| **Evaporation Rate** | No information available |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | No information available |
| **Vapor Density** | No information available |
| **Specific Gravity** | No information available |
| **Solubility** | Insoluble in water |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | No information available |
| **Decomposition Temperature** | No information available |
| **Viscosity** | No information available |
| **Molecular Formula** | C20H12 |
| **Molecular Weight** | 252.31 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products.

**Incompatible Materials** Strong oxidizing agents

**Hazardous Decomposition Products** None under normal use conditions

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** 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

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** None known

**STOT - repeated exposure** None known

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** 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

**Endocrine Disruptor Information** No information available

| Component | EU - Endocrine Disrupters 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 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 |
|---|---|---|---|---|
| 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 |

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

| 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

## 16. Other information

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

**Revision Date** 22-May-2017
**Print Date** 22-May-2017
**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**

# SAFETY DATA SHEET

**Revision Date** 10-Feb-2015 **Revision Number** 1

## 1. Identification

**Product Name** **Barium**

**Cat No. :** **AC317860000; AC317860250; AC317861000; AC317865000**

**Synonyms** None Known.

**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

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**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)

| | |
|---|---|
| Flammable solids | Category 2 |
| Acute oral toxicity | Category 3 |
| Skin Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Flammable solid
Toxic if swallowed
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation



**Precautionary Statements**
**Prevention**
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
**Response**
Call a POISON CENTER or doctor/physician if you feel unwell
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
**Skin**
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
**Eyes**
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 advice/attention
**Ingestion**
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
**Fire**
Explosion risk in case of fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
**Storage**
Store locked up
Store in a closed container
Store in a well-ventilated place. Keep cool
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
None identified

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Barium | 7440-39-3 | 99.9 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

**Ingestion** Do not induce vomiting. Call a physician or Poison Control Center immediately.

**Most important symptoms/effects** No information available.
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Dry chemical.

**Unsuitable Extinguishing Media** No information available

**Flash Point** No information available
**Method -** No information available

**Autoignition Temperature** No information available
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Contact with water liberates toxic gas. Water reactive. Combustible material. Produce flammable gases on contact with water.

**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**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 3 | 3 | 0 | W |

## 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment.
**Environmental Precautions** See Section 12 for additional ecological information.

**Methods for Containment and Clean Up** Sweep up or vacuum up spillage and collect in suitable container for disposal.

## 7. Handling and storage

**Handling** Avoid contact with skin and eyes. Do not breathe dust. Do not breathe vapors or spray mist. Handle under inert gas, protect from moisture. Wear personal protective equipment.

**Storage** Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Protect from moisture. Never allow product to get in contact with water during storage. Store under an inert atmosphere.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| Barium | TWA: 0.5 mg/m$^3$ | (Vacated) TWA: 0.5 mg/m$^3$ | |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Barium | | | TWA: 0.5 mg/m³ |

*Legend*

*ACGIH - American Conference of Governmental Industrial Hygienists*
*OSHA - Occupational Safety and Health Administration*

**Engineering Measures** Use explosion-proof electrical/ventilating/lighting/equipment. 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** 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

| | |
|---|---|
| **Physical State** | Solid |
| **Appearance** | Grey |
| **Odor** | Odorless |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | 725 °C / 1337 °F |
| **Boiling Point/Range** | 1640 °C / 2984 °F |
| **Flash Point** | No information available |
| **Evaporation Rate** | No information available |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | 10 mmHg @ 1094 °C |
| **Vapor Density** | No information available |
| **Relative Density** | 3.51 @ 20 °C |
| **Solubility** | No information available |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | No information available |
| **Decomposition Temperature** | No information available |
| **Viscosity** | No information available |
| **Molecular Formula** | Ba |
| **Molecular Weight** | 137.34 |

## 10. Stability and reactivity

**Reactive Hazard** Yes

**Stability** Moisture sensitive. Air sensitive.

**Conditions to Avoid** Exposure to air. Incompatible products. Exposure to moisture.

**Incompatible Materials** Acids, Water, Alcohols, Halogens

**Hazardous Decomposition Products** None under normal use conditions

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**
**Oral LD50** Category 3. ATE = 50 - 300 mg/kg.
**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Barium | 132 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**

**Irritation** Irritating to eyes, respiratory system and skin

**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 |
|---|---|---|---|---|---|---|
| Barium | 7440-39-3 | Not listed | Not listed | Not listed | Not listed | Not listed |

**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** 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**
Do not empty into drains.

**Persistence and Degradability** No information available
**Bioaccumulation/ Accumulation** No information available.

**Mobility** No information available.

## 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** | UN1400 |
| **Proper Shipping Name** | BARIUM |
| **Hazard Class** | 4.3 |
| **Packing Group** | II |

**TDG**

| | |
|---|---|
| **UN-No** | UN1400 |
| **Proper Shipping Name** | BARIUM |
| **Hazard Class** | 4.3 |
| **Packing Group** | II |

**IATA**

| | |
|---|---|
| **UN-No** | UN1400 |
| **Proper Shipping Name** | Barium |
| **Hazard Class** | 4.3 |
| **Packing Group** | II |

**IMDG/IMO**

| | |
|---|---|
| **UN-No** | UN1400 |
| **Proper Shipping Name** | Barium |
| **Hazard Class** | 4.3 |
| **Packing Group** | II |

## 15. Regulatory information

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Barium | X | X | - | 231-149-1 | - | | 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 % |
|---|---|---|---|
| Barium | 7440-39-3 | 99.9 | 1.0 |

**SARA 311/312 Hazardous Categorization**

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

**Clean Water Act** Not applicable

**Clean Air Act** Not applicable

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

**CERCLA**
Not applicable

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Barium | 1000 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 |
|---|---|---|---|---|---|
| Barium | 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**
B4 Flammable solid
B6 Reactive flammable material
D2B Toxic materials
D1A 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

**Revision Date: 12/08/16**
www.restek.com

## 1. IDENTIFICATION

| | |
|---|---|
| **Catalog Number / Product Name:** | **31272 / Benzo(b)fluoranthene Standard** |
| **Company:** | Restek Corporation |
| **Address:** | 110 Benner Circle<br>Bellefonte, Pa. 16823 |
| **Phone#:** | 814-353-1300 |
| **Fax#:** | 814-353-1309 |
| **Emergency#:** | 800-424-9300 (CHEMTREC)<br>703-527-3887 (Outside the US) |
| **Email:** | www.restek.com |
| **Revision Number:** | 9 |
| **Intended use:** | For Laboratory use only |

## 2. HAZARD(S)IDENTIFICATION

**Emergency Overview:**

**GHS Hazard Symbols:**





| | |
|---|---|
| **GHS Classification:** | Flammable Liquid Category 2<br>Serious Eye Damage/Eye Irritation Category 2<br>Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3 |
| **GHS Signal Word:** | Danger |
| **GHS Hazard:** | Highly flammable liquid and vapour.<br>Causes serious eye irritation.<br>May cause drowsiness or dizziness. |
| **GHS Precautions:** | |
| **Safety Precautions:** | Keep away from heat/sparks/open flames/hot surfaces. – No smoking.<br>Ground/bond container and receiving equipment.<br>Use explosion-proof electrical/ventilation and lighting equipment.<br>Use only non-sparking tools.<br>Take precautionary measures against static discharge.<br>Avoid breathing dust/fume/gas/mist/vapours/spray.<br>Wash hands and skin thoroughly after handling.<br>Use only outdoors or in a well-ventilated area.<br>Wear protective gloves/protective clothing/eye protection/face protection. |
| **First Aid Measures:** | IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.<br>IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.<br>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.<br>Call a POISON CENTER or doctor/physician if you feel unwell.<br>If eye irritation persists: Get medical advice/attention.<br>In case of fire: Use extinguishing media in section 5 for extinction. |
| **Storage:** | Store in a well-ventilated place. Keep container tightly closed.<br>Store in a well-ventilated place. Keep cool.<br>Store locked up. |
| **Disposal:** | Dispose of contents/container according to section 13 of the SDS. |

**Single Exposure Target Organs:** No data available.

**Repeated Exposure Target Organs:** No data available.

## 3. COMPOSITION / INFORMATION ON INGREDIENT

| Chemical Name | CAS # | EINEC # | % Composition |
|---|---|---|---|
| Acetone | 67-64-1 | 200-662-2 | 99.900000 |
| benzo (b) fluoranthene | 205-99-2 | 205-911-9 | 0.100000 |

## 4. FIRST-AID MEASURES

**Inhalation:** Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

**Eyes:** Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

**Skin Contact:** Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

**Ingestion:** Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

## 5. FIRE- FIGHTING MEASURES

**Extinguishing Media:** Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water spray or fog may also be effective for extinguishing if swept across the base of the fire. Water can also be used to absorb heat and keep exposed material from being damaged by fire. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

**Fire and/or Explosion Hazards:** Vapors may be ignited by heat, sparks, flames or other sources of ignition at or above the low flash point giving rise to a Class B fire. Vapors are heavier than air and may travel to a source of ignition and flash back

**Fire Fighting Methods and Protection:** Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling.

**Hazardous Combustion Products:** Carbon dioxide, Carbon monoxide

## 6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions and Equipment:** Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

**Methods for Clean-up:** Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

## 7. HANDLING AND STORAGE

**Handling Technical Measures and Precautions:** Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

**Storage Technical Measures and Conditions:** Store in a cool dry ventilated location. Isolate from

incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**United States:**

| Chemical Name | CAS No. | IDLH | ACGIH STEL | ACGIH TLV-TWA | OSHA Exposure Limit |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | 2500 ppm IDLH (10% LEL) | 500 ppm STEL 750 ppm STEL; 1782 mg/m3 STEL | 250 ppm TWA 500 ppm TWA; 1188 mg/m3 TWA | 1000 ppm TWA; 2400 mg/m3 TWA |
| benzo (b) fluoranthene | 205-99-2 | ND | | No TLV | No data available. |

**Personal Protection:**

**Engineering Measures:** Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.

**Respiratory Protection:** No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.

**Eye Protection:** Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

**Skin Protection:** Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

**Medical Conditions Aggravated By Exposure:** Respiratory disease including asthma and bronchitis

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance, color:** Depends upon product selection
**Odor:** Strong
**Physical State:** No data available.
**pH:** No data available.
**Vapor Pressure:** No data available.
**Vapor Density:** 2.0 (air = 1)
**Boiling Point:** No data available.
**Melting Point:** -95.4 °C Melting Point
**Flash Point:** 39
**Flammability:** Highly Flammable
**Upper Flammable/Explosive Limit, % in air:** No data available.
**Lower Flammable/Explosive Limit, % in air:** No data available.
**Autoignition Temperature:** 465 deg C
**Decomposition Temperature:** No data available.
**Specific Gravity:** 0.7845 g/cm3 at 25 °C
**Evaporation Rate:** No data available.
**Odor Threshold:** ND
**Solubility:** Complete; 100%
**Partition Coefficient: n-octanol in water:** No data available.
**VOC % by weight:** 0
**Molecular Weight:** 58.08

## 10. STABILITY AND REACTIVITY

**Stability:** Stable under normal conditions.
**Conditions to Avoid:** No data available.
**Materials to Avoid / Chemical Incompatiability:** Strong oxidizing agents Strong acids
**Hazardous Decomposition Products:** Carbon dioxide Carbon monoxide

## 11. TOXICOLOGICAL INFORMATION

**Routes of Entry:** Inhalation, Skin Contact, Eye Contact, Ingestion
**Target Organs Potentially Affected By Exposure:** Eyes, Central nervous system stimulation, Respiratory Tract, Skin
**Chemical Interactions That Change Toxicity:** None Known

**Immediate (Acute) Health Effects by Route of Exposure:**

| | |
|---|---|
| **Inhalation Irritation:** | Can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache. |
| **Skin Contact:** | Can cause minor skin irritation, defatting, and dermatitis. |
| **Eye Contact:** | Can cause minor irritation, tearing and reddening. |
| **Ingestion Irritation:** | May be harmful if swallowed. |
| **Ingestion Toxicity:** | Harmful if swallowed. May cause systemic poisoning. |

**Long-Term (Chronic) Health Effects:**

| | |
|---|---|
| **Carcinogenicity:** | Contains a probable or known human carcinogen. |
| **Reproductive and Developmental Toxicity:** | No data available to indicate product or any components present at greater than 0.1% may cause birth defects. |
| **Inhalation:** | Upon prolonged and/or repeated exposure, can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache. |
| **Skin Contact:** | Upon prolonged or repeated contact, can cause minor skin irritation, defatting, and dermatitis. |

**Component Toxicological Data:**
**NIOSH:**

| **Chemical Name** | **CAS No.** | **LD50/LC50** |
|---|---|---|
| Acetone | 67-64-1 | Dermal LD50 Rabbit >15700 mg/kg; Oral LD50 Rat 5800 mg/kg; Inhalation LC50 Rat 50100 mg/m3 8 h |

**Component Carcinogenic Data:**
**OSHA:**

| **Chemical Name** | **CAS No.** | |
|---|---|---|
| Benzo(b)fluoranthene | 205-99-2 | Present |

**ACGIH:**

| **Chemical Name** | **CAS No.** | |
|---|---|---|
| Acetone | 67-64-1 | A4 - Not Classifiable as a Human Carcinogen |
| Benzo[b]fluoranthene | 205-99-2 | A2 - Suspected Human Carcinogen |

**NIOSH:**

| **Chemical Name** | **CAS No.** |
|---|---|
| No data available. | |

**NTP:**

| **Chemical Name** | **CAS No.** |
|---|---|
| No data available. | |

**IARC:**

| **Chemical Name** | **CAS No.** | **Group No.** |
|---|---|---|
| No data. | | Group 1 |
| No data. | | Group 2A |
| Benzo(b)fluoranthene | 205-99-2 | Group 2B |

## 12. ECOLOGICAL INFORMATION

| | |
|---|---|
| **Overview:** | This material is not expected to be harmful to the ecology. |
| **Mobility:** | No data |
| **Persistence:** | No data |
| **Bioaccumulation:** | No data |
| **Degradability:** | No data |
| **Ecological Toxicity Data:** | No data available. |

## 13. DISPOSAL CONSIDERATIONS

| | |
|---|---|
| **Waste Description of Spent Product:** | Spent or discarded material is a hazardous waste. |
| **Disposal Methods:** | Dispose of by incineration following Federal, State, Local, or Provincial regulations. |
| **Waste Disposal of Packaging:** | Comply with all Local, State, Federal, and Provincial Environmental Regulations. |

## 14. TRANSPORTATION INFORMATION

**United States:**
**DOT Proper Shipping Name:** Acetone

**UN Number:** UN1090
**Hazard Class:** 3
**Packing Group:** II

**International:**
**IATA Proper Shipping Name:** Acetone
**UN Number:** UN1090
**Hazard Class:** 3
**Packing Group:** II

**Marine Pollutant:** No

| Chemical Name | CAS# | Marine Pollutant | Severe Marine Pollutant |
|---|---|---|---|
| No data available. | | | |

## 15. REGULATORY INFORMATION

**United States:**

| Chemical Name | CAS# | CERCLA | SARA 313 | SARA EHS 313 | TSCA |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | X | - | - | X |
| benzo (b) fluoranthene | 205-99-2 | X | X | - | - |

**The following chemicals are listed on CA Prop 65:**

| Chemical Name | CAS # | Regulation |
|---|---|---|
| Benzo[b]fluoranthene | 205-99-2 | Prop 65 Cancer |

**State Right To Know Listing:**

| Chemical Name | CAS# | New Jersey | Massachusetts | Pennsylvania | California |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | X | X | X | X |
| benzo (b) fluoranthene | 205-99-2 | X | X | X | X |

## 16. OTHER INFORMATION

**Prior Version Date:** 03/23/15
**Other Information:** Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
**References:** No data available.
**Disclaimer:** Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding prodcuts described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

## 1 Identification

**Product identifier**

**Product name: Benzene**

**Stock number:** L14012
**CAS Number:**
71-43-2
**EC number:**
200-753-7
**Index number:**
601-020-00-8
**Relevant identified uses of the substance or mixture and uses advised against.**
**Identified use:** SU24 Scientific research and development

**Details of the supplier of the safety data sheet**
**Manufacturer/Supplier:**
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
**Information Department:** Health, Safety and Environmental Department
**Emergency telephone number:**
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

## 2 Hazard(s) identification

**Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)**



GHS02 Flame

Flam. Liq. 2 H225 Highly flammable liquid and vapor.



GHS08 Health hazard

Muta. 1B H340 May cause genetic defects.
Carc. 1A H350 May cause cancer.
STOT RE 1 H372 Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
Asp. Tox. 1 H304 May be fatal if swallowed and enters airways.



GHS07

Skin Irrit. 2 H315 Causes skin irritation.
Eye Irrit. 2 H319 Causes serious eye irritation.
**Hazards not otherwise classified** No information known.

**Label elements**
**GHS label elements** The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
**Hazard pictograms**



GHS02 GHS07 GHS08

**Signal word** Danger
**Hazard statements**
H225 Highly flammable liquid and vapor.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H372 Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
H304 May be fatal if swallowed and enters airways.
**Precautionary statements**
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/…
P303+P361+P353 If on skin (or hair): 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.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
**WHMIS classification**
B2 - Flammable liquid
D2A - Very toxic material causing other toxic effects



**Classification system**
**HMIS ratings (scale 0-4)**
**(Hazardous Materials Identification System)**




Health (acute effects) = 2
Flammability = 3
Physical Hazard = 1

(Contd. on page 2)

**Product name: Benzene**

(Contd. of page 1)

**Other hazards**
**Results of PBT and vPvB assessment**
**PBT:** Not applicable.
**vPvB:** Not applicable.

## 3 Composition/information on ingredients

**Chemical characterization: Substances**
**CAS# Description:**
71-43-2 Benzene
**Identification number(s):**
**EC number:** 200-753-7
**Index number:** 601-020-00-8

## 4 First-aid measures

**Description of first aid measures**
**After inhalation**
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
**After skin contact**
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
**After eye contact** Rinse opened eye for several minutes under running water. Then consult a doctor.
**After swallowing** Seek medical treatment.
**Information for doctor**
**Most important symptoms and effects, both acute and delayed** No further relevant information available.
**Indication of any immediate medical attention and special treatment needed** No further relevant information available.

## 5 Fire-fighting measures

**Extinguishing media**
**Suitable extinguishing agents** Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
**Special hazards arising from the substance or mixture**
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
**Advice for firefighters**
**Protective equipment:**
Wear self-contained respirator.
Wear fully protective impervious suit.

## 6 Accidental release measures

**Personal precautions, protective equipment and emergency procedures**
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Keep away from ignition sources
**Environmental precautions:** Do not allow product to reach sewage system or any water course.
**Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose of contaminated material as waste according to section 13.
Ensure adequate ventilation.
**Prevention of secondary hazards:** Keep away from ignition sources.
**Reference to other sections**
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

## 7 Handling and storage

**Handling**
**Precautions for safe handling**
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Open and handle container with care.
**Information about protection against explosions and fires:**
Protect against electrostatic charges.
Fumes can combine with air to form an explosive mixture.
Keep ignition sources away.

**Conditions for safe storage, including any incompatibilities**
**Storage**
**Requirements to be met by storerooms and receptacles:** Store in a cool location.
**Information about storage in one common storage facility:**
Do not store together with acids.
Store away from strong bases.
Store away from oxidizing agents.
Store away from halogens.
**Further information about storage conditions:**
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
**Specific end use(s)** No further relevant information available.

## 8 Exposure controls/personal protection

**Additional information about design of technical systems:**
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

(Contd. on page 3)

**Product name: Benzene**

(Contd. of page 2)

**Control parameters**

**Components with limit values that require monitoring at the workplace:**

**71-43-2 Benzene (100.0%)**

| | |
|---|---|
| PEL (USA) | Short-term value: 15* mg/m³, 5* ppm<br>Long-term value: 3* mg/m³, 1* ppm<br>*table Z-2 for exclusions in 29CFR1910.1028(d) |
| REL (USA) | Short-term value: 1 ppm<br>Long-term value: 0.1 ppm<br>See Pocket Guide App. A |
| TLV (USA) | Short-term value: 8 mg/m³, 2.5 ppm<br>Long-term value: 1.6 mg/m³, 0.5 ppm<br>Skin; BEI |
| EL (Canada) | Short-term value: 2.5 ppm<br>Long-term value: 0.5 ppm<br>Skin; ACGIH A1; IARC 1 |
| EV (Canada) | Short-term value: 2.5 ppm<br>Long-term value: 0.5 ppm<br>Skin |

**Ingredients with biological limit values:**

**71-43-2 Benzene (100.0%)**

| | |
|---|---|
| BEI (USA) | 25 µg/g creatinine<br>Medium: urine<br>Time: end of shift Parameter<br>Parameter: S-Phenylmercapturic acid (background<br><br>500 µg/g creatinine<br>Medium: urine<br>Time: end of shift<br>Parameter: t,t-Muconic acid (background) |

**Additional information:** No data

**Exposure controls**
**Personal protective equipment**
**General protective and hygienic measures**
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
Avoid contact with the eyes and skin.
Maintain an ergonomically appropriate working environment.
**Breathing equipment:** Use suitable respirator when high concentrations are present.
**Recommended filter device for short term use:**
Use a respirator with organic vapor/acid gas cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards such as NIOSH (USA) or CEN (EU).
**Protection of hands:**
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
**Material of gloves** Fluorocarbon rubber (Viton)
**Penetration time of glove material (in minutes)** Not determined
**Eye protection:** Safety glasses
**Body protection:** Protective work clothing.

## 9 Physical and chemical properties

**Information on basic physical and chemical properties**
**General Information**
**Appearance:**

| | |
|---|---|
| **Form:** | Liquid |
| **Color:** | Colorless |
| **Odor:** | Aromatic |
| **Odor threshold:** | Not determined. |
| **pH-value:** | Not determined. |
| **Change in condition** | |
| **Melting point/Melting range:** | 5 °C (41 °F) |
| **Boiling point/Boiling range:** | 80 °C (176 °F) |
| **Sublimation temperature / start:** | Not determined |
| **Flash point:** | -11 °C (12 °F) |
| **Flammability (solid, gaseous)** | Not determined. |
| **Ignition temperature:** | 555 °C (1031 °F) |
| **Decomposition temperature:** | Not determined |
| **Auto igniting:** | Not determined. |
| **Danger of explosion:** | Product is not explosive. However, formation of explosive air/vapor mixtures is possible. |
| **Explosion limits:** | |
| **Lower:** | 1.2 Vol % |
| **Upper:** | 8 Vol % |
| **Vapor pressure at 20 °C (68 °F):** | 101 hPa (76 mm Hg) |
| **Density at 20 °C (68 °F):** | 0.874 g/cm³ (7.294 lbs/gal) |
| **Relative density** | Not determined. |
| **Vapor density** | Not determined. |
| **Evaporation rate** | Not determined. |
| **Solubility in / Miscibility with** | |
| **Water at 25 °C (77 °F):** | 1.8 g/l |
| **Partition coefficient (n-octanol/water):** | Not determined. |
| **Viscosity:** | |
| **dynamic at 20 °C (68 °F):** | 0.66 mPas |
| **kinematic:** | Not determined. |

(Contd. on page 4)

**Product name: Benzene**

(Contd. of page 3)

**Other information** No further relevant information available.

## 10 Stability and reactivity

**Reactivity** No information known.
**Chemical stability** Stable under recommended storage conditions.
**Thermal decomposition / conditions to be avoided:** Decomposition will not occur if used and stored according to specifications.
**Possibility of hazardous reactions** Reacts with strong oxidizing agents
**Conditions to avoid** No further relevant information available.
**Incompatible materials:**
Acids
Oxidizing agents
Bases
Halogens
**Hazardous decomposition products:** Carbon monoxide and carbon dioxide

## 11 Toxicological information

**Information on toxicological effects**
**Acute toxicity:** The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.

**LD/LC50 values that are relevant for classification:**

| | | |
|---|---|---|
| Oral | LD50 | 930 mg/kg (rat) |
| Dermal | LD50 | >9400 µL/kg (rabbit) |
| Inhalative | LC50/7H | 10000 ppm/7H (rat) |

**Skin irritation or corrosion:** Causes skin irritation.
**Eye irritation or corrosion:** Causes serious eye irritation.
**Sensitization:** No sensitizing effects known.
**Germ cell mutagenicity:**
May cause genetic defects.
The Registry of Toxic Effects of Chemical Substances (RTECS) contains mutation data for this substance.
**Carcinogenicity:**
May cause cancer.
EPA-A: human carcinogen: sufficient evidence from epidemiologic studies to support a causal association between exposure and cancer.
IARC-1: Carcinogenic to humans: sufficient evidence of carcinogenicity.
ACGIH A1: Confirmed human carcinogen: Agent is carcinogenic to humans based on epidemiologic studies of, or convincing clinical evidence in, exposed humans.
EPA-K: Known human carcinogens.
Carcinogen as defined by OSHA.
NTP-K: Known to be carcinogenic: sufficient evidence from human studies.
The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.
**Reproductive toxicity:** The Registry of Toxic Effects of Chemical Substances (RTECS) contains reproductive data for this substance.
**Specific target organ system toxicity - repeated exposure:**
Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
**Specific target organ system toxicity - single exposure:** No effects known.
**Aspiration hazard:** May be fatal if swallowed and enters airways.
**Subacute to chronic toxicity:** The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
**Additional toxicological information:** To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

## 12 Ecological information

**Toxicity**
**Aquatic toxicity:** No further relevant information available.
**Persistence and degradability** No further relevant information available.
**Bioaccumulative potential** No further relevant information available.
**Mobility in soil** No further relevant information available.
**Additional ecological information:**
**General notes:**
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
Avoid transfer into the environment.
**Results of PBT and vPvB assessment**
**PBT:** Not applicable.
**vPvB:** Not applicable.
**Other adverse effects** No further relevant information available.

## 13 Disposal considerations

**Waste treatment methods**
**Recommendation** Consult state, local or national regulations to ensure proper disposal.
**Uncleaned packagings:**
**Recommendation:** Disposal must be made according to official regulations.

## 14 Transport information

| | |
|---|---|
| **UN-Number** | |
| **DOT, IMDG, IATA** | UN1114 |
| **UN proper shipping name** | |
| **DOT** | RQ Benzene |
| **IMDG, IATA** | BENZENE |
| **Transport hazard class(es)** | |
| **DOT** | |



| | |
|---|---|
| **Class** | 3 Flammable liquids. |
| **Label** | 3 |
| **Class** | 3 (F1) Flammable liquids |

(Contd. on page 5)

**Product name: Benzene**

(Contd. of page 4)

| | |
|---|---|
| **Label**<br>**IMDG, IATA** | 3 |
|  | |
| **Class**<br>**Label** | 3 Flammable liquids.<br>3 |
| **Packing group**<br>**DOT, IMDG, IATA** | II |
| **Environmental hazards:** | Not applicable. |
| **Special precautions for user**<br>**EMS Number:** | Warning: Flammable liquids<br>F-E,S-D |
| **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code** | Not applicable. |
| **Transport/Additional information:** | |
| **DOT**<br>**Hazardous substance:**<br>**Marine Pollutant (DOT):** | <br>10 lbs, 4.54 kg<br>No |
| **UN "Model Regulation":** | UN1114, Benzene, 3, II |

## 15 Regulatory information

**Safety, health and environmental regulations/legislation specific for the substance or mixture**
**GHS label elements** The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
**Hazard pictograms**



GHS02 GHS07 GHS08

**Signal word** Danger
**Hazard statements**
H225 Highly flammable liquid and vapor.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H372 Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
H304 May be fatal if swallowed and enters airways.
**Precautionary statements**
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/…
P303+P361+P353 If on skin (or hair): 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.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
**National regulations**
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).

**SARA Section 313 (specific toxic chemical listings)**

| | |
|---|---|
| 71-43-2 | Benzene |

**California Proposition 65**

**Prop 65 - Chemicals known to cause cancer**

| | |
|---|---|
| 71-43-2 | Benzene |

**Prop 65 - Developmental toxicity**

| | |
|---|---|
| 71-43-2 | Benzene |

**Prop 65 - Developmental toxicity, female** Substance is not listed.

**Prop 65 - Developmental toxicity, male**

| | |
|---|---|
| 71-43-2 | Benzene |

**Information about limitation of use:**
Workers are not allowed to be exposed to this hazardous material. Exceptions can be made by the authorities in certain cases.
For use only by technically qualified individuals.
**Other regulations, limitations and prohibitive regulations**
**Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006.** Substance is not listed.
**The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.**
Substance is not listed.
**Annex XIV of the REACH Regulations (requiring Authorisation for use)** Substance is not listed.
**Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

## 16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

**Department issuing SDS:** Global Marketing Department
**Date of preparation / last revision** 11/23/2015 / -
**Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative

(Contd. on page 6)

**Product name: Benzene**

(Contd. of page 5)

ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

# SAFETY DATA SHEET

Version 4.6
Revision Date 12/29/2015
Print Date 05/01/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Beryllium

Product Number : 378135
Brand : Aldrich

CAS-No. : 7440-41-7

### 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 # : (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 3), H301
Acute toxicity, Inhalation (Category 2), H330
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Specific target organ toxicity - repeated exposure (Category 1), H372

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)
H301 Toxic if swallowed.
H315 Causes skin irritation.
H317 May cause an allergic skin reaction.
H319 Causes serious eye irritation.
H330 Fatal if inhaled.
H335 May cause respiratory irritation.
H350 May cause cancer.

| | |
|---|---|
| H372 | Causes damage to organs through prolonged or repeated exposure. |

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/ fume/ gas/ mist/ vapours/ spray. |
| P264 | Wash skin thoroughly after handling. |
| P270 | Do not eat, drink or smoke when using this product. |
| P271 | Use only outdoors or in a well-ventilated area. |
| P272 | Contaminated work clothing should not be allowed out of the workplace. |
| P280 | Wear protective gloves/ protective clothing/ eye protection/ face protection. |
| P284 | Wear respiratory protection. |
| P301 + P310 + P330 | IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician. Rinse mouth. |
| P302 + P352 | IF ON SKIN: Wash with plenty of soap and water. |
| P304 + P340 + P310 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician. |
| 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. |
| P333 + P313 | If skin irritation or rash 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**

| | | |
|---|---|---|
| Formula | : | Be |
| Molecular weight | : | 9.01 g/mol |
| CAS-No. | : | 7440-41-7 |
| EC-No. | : | 231-150-7 |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Berylium foil** | | |
| | Acute Tox. 3; Acute Tox. 2; Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 1B; STOT SE 3; STOT RE 1; H301, H315, H317, H319, H330, H335, H350, H372 | <= 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**
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**
Beryllium 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**
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.

**6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

**6.4 Reference to other sections**
For disposal see section 13.

## 7. HANDLING AND STORAGE

**7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

**7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat. 1 and 2 / very toxic 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 |
|---|---|---|---|---|
| Berylium foil | 7440-41-7 | TWA | 2.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | CEIL | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Peak | 25.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | TWA | 2.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | Remarks | Z27.29-1970 | | |
| | | CEIL | 5.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | Peak | 25.000000micro gram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | TWA | 0.000050 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Beryllium sensitization<br>Chronic beryllium disease (berylliosis)<br>Confirmed human carcinogen<br>Danger of cutaneous absorption<br>Sensitizer | | |
| | | C | 0.000500 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |
| | | See Table Z-2 | | |
| | | TWA | 2.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | TWA | 2.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | CEIL | 5.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | CEIL | 5.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | Peak | 25.000000micro gram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | Peak | 25.000000micro gram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | TWA | 0.000050 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Beryllium sensitization | | |

| | | | | |
|---|---|---|---|---|
| | | Chronic beryllium disease (berylliosis)<br>Adopted values or notations enclosed are those for which changes are proposed in the NIC<br>See Notice of Intended Changes (NIC)<br>Confirmed human carcinogen<br>Danger of cutaneous absorption<br>Sensitizer | | |
| | | C | 0.000500 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |
| | | See Table Z-2 | | |
| | | TWA | 2microgram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | CEIL | 5microgram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | Peak | 25microgram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | C | 0.0005 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |

## 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.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: powder<br>Colour: grey |
| b) | Odour | odourless |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 1,278 °C (2,332 °F) - lit. |
| f) | Initial boiling point and boiling range | 2,970 °C (5,378 °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 | 1.85 g/cm3 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**
Alkali metals

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

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

**Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - 0.496 mg/kg
Remarks: Liver:Hepatitis (hepatocellular necrosis), zonal.

**Skin corrosion/irritation**
No data available

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

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
Hamster
Lungs
Result: negative

**Carcinogenicity**

Carcinogenicity - Rat - Intratracheal
Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma.

Carcinogenicity - Rabbit - Intravenous
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal:Tumors.

Possible human carcinogen

| | |
|---|---|
| IARC: | 1 - Group 1: Carcinogenic to humans (Berylium foil) |
| NTP: | Known to be human carcinogen (Berylium foil) |
| | Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Berylium foil) |
| 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: DS1750000

## 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)**
UN number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium, powder
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 1567 Class: 6.1 (4.1) Packing group: II EMS-No: F-G, S-G
Proper shipping name: BERYLLIUM POWDER

**IATA**
UN number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium powder

## 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 |
|---|---|---|
| Berylium foil | 7440-41-7 | 1993-04-24 |

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Berylium foil | 7440-41-7 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Berylium foil | 7440-41-7 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Berylium foil | 7440-41-7 | 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 |
|---|---|---|
| Berylium foil | 7440-41-7 | 2008-10-10 |

## 16. OTHER INFORMATION

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

| | |
|---|---|
| Acute Tox. | Acute toxicity |
| Carc. | Carcinogenicity |
| Eye Irrit. | Eye irritation |
| H301 | Toxic if swallowed. |
| H315 | Causes skin irritation. |
| H317 | May cause an allergic skin reaction. |
| H319 | Causes serious eye irritation. |
| H330 | Fatal if inhaled. |
| H335 | May cause respiratory irritation. |
| H350 | May cause cancer. |
| H372 | Causes damage to organs through prolonged or repeated exposure. |
| Skin Irrit. | Skin irritation |
| Skin Sens. | Skin sensitisation |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 4 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 4 |
| Fire Hazard: | 3 |
| Reactivity Hazard: | 3 |

**Further information**

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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 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

# Safety Data Sheet

**Revision Date: 12/30/16**
www.restek.com

## 1. IDENTIFICATION

| | |
|---|---|
| **Catalog Number / Product Name:** | **31274 / Benzo(k)fluoranthene Standard** |
| **Company:** | Restek Corporation |
| **Address:** | 110 Benner Circle<br>Bellefonte, Pa. 16823 |
| **Phone#:** | 814-353-1300 |
| **Fax#:** | 814-353-1309 |
| **Emergency#:** | 800-424-9300 (CHEMTREC)<br>703-527-3887 (Outside the US) |
| **Email:** | www.restek.com |
| **Revision Number:** | 10 |
| **Intended use:** | For Laboratory use only |

## 2. HAZARD(S)IDENTIFICATION

**Emergency Overview:**

**GHS Hazard Symbols:**





| | |
|---|---|
| **GHS Classification:** | Flammable Liquid Category 2<br>Serious Eye Damage/Eye Irritation Category 2<br>Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3 |
| **GHS Signal Word:** | Danger |
| **GHS Hazard:** | Highly flammable liquid and vapour.<br>Causes serious eye irritation.<br>May cause drowsiness or dizziness. |
| **GHS Precautions:** | |
| **Safety Precautions:** | Keep away from heat/sparks/open flames/hot surfaces. – No smoking.<br>Ground/bond container and receiving equipment.<br>Use explosion-proof electrical/ventilation and lighting equipment.<br>Use only non-sparking tools.<br>Take precautionary measures against static discharge.<br>Avoid breathing dust/fume/gas/mist/vapours/spray.<br>Wash hands and skin thoroughly after handling.<br>Use only outdoors or in a well-ventilated area.<br>Wear protective gloves/protective clothing/eye protection/face protection. |
| **First Aid Measures:** | IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.<br>IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.<br>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.<br>Call a POISON CENTER or doctor/physician if you feel unwell.<br>If eye irritation persists: Get medical advice/attention.<br>In case of fire: Use extinguishing media in section 5 for extinction. |
| **Storage:** | Store in a well-ventilated place. Keep container tightly closed.<br>Store in a well-ventilated place. Keep cool.<br>Store locked up. |
| **Disposal:** | Dispose of contents/container according to section 13 of the SDS. |

**Single Exposure Target Organs:** No data available.

**Repeated Exposure Target Organs:** No data available.

## 3. COMPOSITION / INFORMATION ON INGREDIENT

| Chemical Name | CAS # | EINEC # | % Composition |
|---|---|---|---|
| Acetone | 67-64-1 | 200-662-2 | 99.900000 |
| benzo (k) fluoranthene | 207-08-9 | 205-916-6 | 0.100000 |

## 4. FIRST-AID MEASURES

**Inhalation:** Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

**Eyes:** Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

**Skin Contact:** Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

**Ingestion:** Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

## 5. FIRE- FIGHTING MEASURES

**Extinguishing Media:** Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water spray or fog may also be effective for extinguishing if swept across the base of the fire. Water can also be used to absorb heat and keep exposed material from being damaged by fire. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

**Fire and/or Explosion Hazards:** Vapors may be ignited by heat, sparks, flames or other sources of ignition at or above the low flash point giving rise to a Class B fire. Vapors are heavier than air and may travel to a source of ignition and flash back

**Fire Fighting Methods and Protection:** Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling.

**Hazardous Combustion Products:** Carbon dioxide, Carbon monoxide

## 6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions and Equipment:** Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

**Methods for Clean-up:** Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

## 7. HANDLING AND STORAGE

**Handling Technical Measures and Precautions:** Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

**Storage Technical Measures and Conditions:** Store in a cool dry ventilated location. Isolate from

incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**United States:**

| Chemical Name | CAS No. | IDLH | ACGIH STEL | ACGIH TLV-TWA | OSHA Exposure Limit |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | 2500 ppm IDLH (10% LEL) | 500 ppm STEL 750 ppm STEL; 1782 mg/m3 STEL | 250 ppm TWA 500 ppm TWA; 1188 mg/m3 TWA | 1000 ppm TWA; 2400 mg/m3 TWA |
| benzo (k) fluoranthene | 207-08-9 | ND | | No TLV | No data available. |

**Personal Protection:**

**Engineering Measures:** Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.

**Respiratory Protection:** No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.

**Eye Protection:** Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

**Skin Protection:** Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

**Medical Conditions Aggravated By Exposure:** Respiratory disease including asthma and bronchitis

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance, color:** Depends upon product selection
**Odor:** Strong
**Physical State:** No data available.
**pH:** No data available.
**Vapor Pressure:** No data available.
**Vapor Density:** 2.0 (air = 1)
**Boiling Point:** No data available.
**Melting Point:** -95.4 °C Melting Point
**Flash Point:** 39
**Flammability:** Highly Flammable
**Upper Flammable/Explosive Limit, % in air:** No data available.
**Lower Flammable/Explosive Limit, % in air:** No data available.
**Autoignition Temperature:** 465 deg C
**Decomposition Temperature:** No data available.
**Specific Gravity:** 0.7845 g/cm3 at 25 °C
**Evaporation Rate:** No data available.
**Odor Threshold:** ND
**Solubility:** Complete; 100%
**Partition Coefficient: n-octanol in water:** No data available.
**VOC % by weight:** 0
**Molecular Weight:** 58.08

## 10. STABILITY AND REACTIVITY

**Stability:** Stable under normal conditions.
**Conditions to Avoid:** No data available.
**Materials to Avoid / Chemical Incompatiability:** Strong oxidizing agents Strong acids
**Hazardous Decomposition Products:** Carbon dioxide Carbon monoxide

## 11. TOXICOLOGICAL INFORMATION

**Routes of Entry:** Inhalation, Skin Contact, Eye Contact, Ingestion
**Target Organs Potentially Affected By Exposure:** Eyes, Central nervous system stimulation, Respiratory Tract, Skin
**Chemical Interactions That Change Toxicity:** None Known

**Immediate (Acute) Health Effects by Route of Exposure:**

| | |
|---|---|
| **Inhalation Irritation:** | Can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache. |
| **Skin Contact:** | Can cause minor skin irritation, defatting, and dermatitis. |
| **Eye Contact:** | Can cause minor irritation, tearing and reddening. |
| **Ingestion Irritation:** | May be harmful if swallowed. |
| **Ingestion Toxicity:** | Harmful if swallowed. May cause systemic poisoning. |

**Long-Term (Chronic) Health Effects:**

| | |
|---|---|
| **Carcinogenicity:** | Contains a probable or known human carcinogen. |
| **Reproductive and Developmental Toxicity:** | No data available to indicate product or any components present at greater than 0.1% may cause birth defects. |
| **Inhalation:** | Upon prolonged and/or repeated exposure, can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache. |
| **Skin Contact:** | Upon prolonged or repeated contact, can cause minor skin irritation, defatting, and dermatitis. |

**Component Toxicological Data:**
**NIOSH:**

| **Chemical Name** | **CAS No.** | **LD50/LC50** |
|---|---|---|
| Acetone | 67-64-1 | Dermal LD50 Rabbit >15700 mg/kg; Oral LD50 Rat 5800 mg/kg; Inhalation LC50 Rat 50100 mg/m3 8 h |

**Component Carcinogenic Data:**
**OSHA:**

| **Chemical Name** | **CAS No.** | |
|---|---|---|
| Benzo(k)fluoranthene | 207-08-9 | Present |

**ACGIH:**

| **Chemical Name** | **CAS No.** | |
|---|---|---|
| Acetone | 67-64-1 | A4 - Not Classifiable as a Human Carcinogen |

**NIOSH:**

| **Chemical Name** | **CAS No.** |
|---|---|
| No data available. | |

**NTP:**

| **Chemical Name** | **CAS No.** |
|---|---|
| No data available. | |

**IARC:**

| **Chemical Name** | **CAS No.** | **Group No.** |
|---|---|---|
| No data. | | Group 1 |
| No data. | | Group 2A |
| Benzo(k)fluoranthene | 207-08-9 | Group 2B |

## 12. ECOLOGICAL INFORMATION

| | |
|---|---|
| **Overview:** | This material is not expected to be harmful to the ecology. |
| **Mobility:** | No data |
| **Persistence:** | No data |
| **Bioaccumulation:** | No data |
| **Degradability:** | No data |
| **Ecological Toxicity Data:** | No data available. |

## 13. DISPOSAL CONSIDERATIONS

| | |
|---|---|
| **Waste Description of Spent Product:** | Spent or discarded material is a hazardous waste. |
| **Disposal Methods:** | Dispose of by incineration following Federal, State, Local, or Provincial regulations. |
| **Waste Disposal of Packaging:** | Comply with all Local, State, Federal, and Provincial Environmental Regulations. |

## 14. TRANSPORTATION INFORMATION

| | |
|---|---|
| **United States:** | |
| **DOT Proper Shipping Name:** | Acetone |
| **UN Number:** | UN1090 |

**Hazard Class:** 3
**Packing Group:** II

**International:**
**IATA Proper Shipping Name:** Acetone
**UN Number:** UN1090
**Hazard Class:** 3
**Packing Group:** II

**Marine Pollutant:** No

| Chemical Name | CAS# | Marine Pollutant | Severe Marine Pollutant |
|---|---|---|---|
| No data available. | | | |

## 15. REGULATORY INFORMATION

**United States:**

| Chemical Name | CAS# | CERCLA | SARA 313 | SARA EHS 313 | TSCA |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | X | - | - | X |
| benzo (k) fluoranthene | 207-08-9 | X | X | - | - |

**The following chemicals are listed on CA Prop 65:**

| Chemical Name | CAS # | Regulation |
|---|---|---|
| Benzo[k]fluoranthene | 207-08-9 | Prop 65 Cancer |

**State Right To Know Listing:**

| Chemical Name | CAS# | New Jersey | Massachusetts | Pennsylvania | California |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | X | X | X | X |
| benzo (k) fluoranthene | 207-08-9 | X | X | X | X |

## 16. OTHER INFORMATION

**Prior Version Date:** 05/15/15
**Other Information:** Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
**References:** No data available.
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# SAFETY DATA SHEET

**Creation Date** 14-May-2010 **Revision Date** 23-Dec-2014 **Revision Number** 1

## 1. Identification

**Product Name** **Carbazole**

**Cat No. :** **AC108260000; AC108260010; AC108260050; AC108260250; AC108262500; AC108265000**

**Synonyms** 9-Azafluorene; Dibenzopyrrole; Diphenylenimine

**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

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**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 Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Carcinogenicity | Category 1B |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Causes skin irritation
Causes serious eye irritation
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
Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
**Response**
IF exposed or concerned: Get medical attention/advice
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
**Skin**
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
**Eyes**
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 advice/attention
**Storage**
Store locked up
Store in a well-ventilated place. Keep container tightly closed
**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 % |
|---|---|---|
| 9H-Carbazole | 86-74-8 | >95 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Obtain medical attention.

**Inhalation** Remove from exposure, lie down. Move to fresh air. Obtain medical attention.

**Ingestion** Clean mouth with water. Get medical attention.

**Most important symptoms/effects** No information available.
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Water spray. Carbon dioxide ($CO_2$). Dry chemical. chemical foam.

**Unsuitable Extinguishing Media** No information available

**Flash Point** 220 °C / 428 °F
**Method -** No information available

**Autoignition Temperature** 540 °C / 1004 °F
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Do not allow run-off from fire fighting to enter drains or water courses.

**Hazardous Combustion Products**
Nitrogen oxides (NOx) Carbon monoxide (CO) Carbon dioxide ($CO_2$)
**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**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 1 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment.
**Environmental Precautions** 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.

**Methods for Containment and Clean Up** Sweep up or vacuum up spillage and collect in suitable container for disposal. Do not let this chemical enter the environment.

## 7. Handling and storage

**Handling** Avoid contact with skin and eyes. Do not breathe dust. Do not ingest. Use only in area provided with appropriate exhaust ventilation.

**Storage** Keep in a dry, cool and well-ventilated place. Keep container tightly closed.

## 8. Exposure controls / personal protection

**Exposure Guidelines** This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

**Engineering Measures** Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

**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

| | |
|---|---|
| **Physical State** | Solid |
| **Appearance** | Beige |
| **Odor** | pungent |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | 240 - 246 °C / 464 - 474.8 °F |
| **Boiling Point/Range** | 355 °C / 671 °F @ 760 mmHg |
| **Flash Point** | 220 °C / 428 °F |
| **Evaporation Rate** | Not applicable |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | 400 mmHg @ 323 °C |
| **Vapor Density** | Not applicable |
| **Relative Density** | 1.1 |
| **Solubility** | insoluble |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | 540 °C / 1004 °F |
| **Decomposition Temperature** | No information available |
| **Viscosity** | Not applicable |
| **Molecular Formula** | C12 H9 N |
| **Molecular Weight** | 167.21 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products.

**Incompatible Materials** Strong oxidizing agents, Strong bases

**Hazardous Decomposition Products** Nitrogen oxides (NOx), Carbon monoxide (CO), Carbon dioxide ($CO_2$)

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| 9H-Carbazole | >5000 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**

**Irritation** No information available

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen. Limited evidence of a carcinogenic effect.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| 9H-Carbazole | 86-74-8 | Group 2B | Not listed | Not listed | X | Not listed |

**Mutagenic Effects** Not mutagenic in AMES Test

**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** 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**
Very toxic 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 |
|---|---|---|---|---|
| 9H-Carbazole | 6.7 mg/L EC50 = 60 h | 1 mg/L LC50 48 h | EC50 = 10.6 mg/L 15 min<br>EC50 = 11.6 mg/L 30 min<br>EC50 = 13.6 mg/L 5 min | Not listed |

**Persistence and Degradability** Insoluble in water Persistence is unlikely
**Bioaccumulation/ Accumulation** No information available.

**Mobility** . Is not likely mobile in the environment due its low water solubility.

| Component | log Pow |
|---|---|
| 9H-Carbazole | 3.84 |

## 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 substance, solid, n.o.s.
**Proper technical name** 9H-Carbazole
**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9H-Carbazole | X | X | - | 201-696-0 | - | | 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** Not applicable

**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** Not applicable

**Clean Air Act** Not applicable

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

**CERCLA**
Not applicable

**California Proposition 65** This product contains the following Proposition 65 chemicals:

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 9H-Carbazole | 86-74-8 | Carcinogen | 4.1 µg/day | Carcinogen |

**State Right-to-Know** Not applicable

**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

**Creation Date** 14-May-2010
**Revision Date** 23-Dec-2014
**Print Date** 23-Dec-2014
**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 5.4
Revision Date 04/21/2015
Print Date 05/13/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Chlordane - Sandy Loam 2

Product Number : CRM825
Brand : Sigma-Aldrich

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

Identified uses : Laboratory chemicals, Manufacture of substances

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

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

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

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Carcinogenicity (Category 1A), H350
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), H373
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)

| | |
|---|---|
| H350 | May cause cancer. |
| H373 | May cause damage to organs through prolonged or repeated exposure if inhaled. |
| 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. |
| P260 | Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. |
| P273 | Avoid release to the environment. |
| P281 | Use personal protective equipment as required. |
| P308 + P313 | IF exposed or concerned: Get medical advice/ attention. |

| | |
|---|---|
| P405 | Store locked up. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

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

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**3.2 Mixtures**

**Hazardous components**

| Component | | Classification | Concentration |
|---|---|---|---|
| **Quartz** | | | |
| CAS-No.<br>EC-No. | 14808-60-7<br>238-878-4 | Carc. 2; STOT RE 2; H351, H373 | >= 90 - <= 100 % |
| **Chlordane** | | | |
| CAS-No.<br>EC-No.<br>Index-No. | 57-74-9<br>200-349-0<br>602-047-00-8 | Acute Tox. 3; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301 + H311, H351, H410 | < 0.1 % |

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**
silicon oxides

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**
No data available

## 6. ACCIDENTAL RELEASE MEASURES

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

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

### 6.2 Environmental precautions

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

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

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

### 6.4 Reference to other sections

For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.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 at Room Temperature.
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 |
|---|---|---|---|---|
| Quartz | 14808-60-7 | TWA | 0.025 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Suspected human carcinogen | | |
| | | TWA | 0.025 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Lung cancer<br>Pulmonary fibrosis<br>Suspected human 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**

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**
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: solid |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | 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 | No data available |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

### 9.2 Other safety information
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

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

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents

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

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects**

**Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

No data available

**Skin corrosion/irritation**
No data available

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

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

| | |
|---|---|
| IARC: | 1 - Group 1: Carcinogenic to humans (Quartz) |
| 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: | Known to be human carcinogen (Quartz) |
| 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.

Liver - Irregularities - Based on Human Evidence
Liver - Irregularities - Based on Human Evidence
Nerves. - (Chlordane)

## 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.
Harmful 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**
Not dangerous goods

**IATA**
Not dangerous goods

## 15. REGULATORY INFORMATION

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

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

**SARA 311/312 Hazards**
Chronic Health Hazard

**Massachusetts Right To Know Components**

CAS-No. Revision Date

| | | |
|---|---|---|
| Quartz | 14808-60-7 | 1994-04-01 |
| Chlordane | 57-74-9 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Quartz | 14808-60-7 | 1994-04-01 |
| Chlordane | 57-74-9 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Quartz | 14808-60-7 | 1994-04-01 |

**California Prop. 65 Components**

| WARNING! This product contains a chemical known to the State of California to cause cancer. | CAS-No. | Revision Date |
|---|---|---|
| Chlordane | 57-74-9 | 2007-09-28 |
| Quartz | 14808-60-7 | 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 |
| H301 + H311 | Toxic if swallowed or in contact with skin |
| H350 | May cause cancer. |
| H351 | Suspected of causing cancer. |
| H373 | May cause damage to organs through prolonged or repeated exposure if inhaled. |
| H402 | Harmful to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |
| H412 | Harmful to aquatic life with long lasting effects. |
| STOT RE | Specific target organ toxicity - repeated 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**

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**Preparation Information**

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

Version: 5.4 Revision Date: 04/21/2015 Print Date: 05/13/2016

# SAFETY DATA SHEET

Methyl Chloride (R40)

## Section 1. Identification

**GHS product identifier** : Methyl Chloride (R40)

**Chemical name** : chloromethane

**Other means of identification** : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)

**Product use** : Synthetic/Analytical chemistry.

**Synonym** : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)

**SDS #** : 001036

**Supplier's details** : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

**Emergency telephone number (with hours of operation)** : 1-866-734-3438

## Section 2. Hazards identification

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture** : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas
ACUTE TOXICITY (inhalation) - Category 4
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (central nervous system (CNS)) - Category 2

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Danger

**Hazard statements** : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.
Harmful if inhaled.
Suspected of causing cancer.
May cause damage to organs through prolonged or repeated exposure. (central nervous system (CNS))

**Precautionary statements**



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## Section 2. Hazards identification

**General** : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

**Prevention** : Never Put cylinders into unventilated areas of passenger vehicles. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use only outdoors or in a well-ventilated area. Do not breathe gas. Use and store only outdoors or in a well ventilated place.

**Response** : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. 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. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

**Storage** : Store locked up. Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

**Disposal** : Dispose of contents and container in accordance with all local, regional, national and international regulations.

**Hazards not otherwise classified** : Liquid can cause burns similar to frostbite.

## Section 3. Composition/information on ingredients

**Substance/mixture** : Substance

**Chemical name** : chloromethane

**Other means of identification** : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)

**CAS number/other identifiers**

**CAS number** : 74-87-3

**Product code** : 001036

| Ingredient name | % | CAS number |
|---|---|---|
| chloromethane | 100 | 74-87-3 |

**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**

**Eye contact** : 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.



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# Section 4. First aid measures

**Inhalation** : 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 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. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

**Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. Get medical attention. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Wash clothing before reuse. Clean shoes thoroughly before reuse.

**Ingestion** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. 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. As this product rapidly becomes a gas when released, refer to the inhalation section.

## Most important symptoms/effects, acute and delayed

### Potential acute health effects

**Eye contact** : Liquid can cause burns similar to frostbite.

**Inhalation** : Harmful if inhaled. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

**Skin contact** : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

**Frostbite** : Try to warm up the frozen tissues and seek medical attention.

**Ingestion** : Ingestion of liquid can cause burns similar to frostbite.

### Over-exposure signs/symptoms

**Eye contact** : Adverse symptoms may include the following:
frostbite

**Inhalation** : No specific data.

**Skin contact** : Adverse symptoms may include the following:
frostbite

**Ingestion** : Adverse symptoms may include the following:
frostbite

## Indication of immediate medical attention and special treatment needed, if necessary

**Notes to physician** : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

**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.

**See toxicological information (Section 11)**



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# Section 5. Fire-fighting measures

## Extinguishing media

**Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.

**Unsuitable extinguishing media** : None known.

**Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. 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. Gas may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back, causing fire or explosion.

**Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides

**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. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

**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. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.

# Section 6. Accidental release measures

## Personal precautions, protective equipment and emergency procedures

**For non-emergency personnel** : Accidental releases pose a serious fire or explosion hazard. 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 gas. 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** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. 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** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

**Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.



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# Section 7. Handling and storage

## Precautions for safe handling

**Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. 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. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

**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 away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

# Section 8. Exposure controls/personal protection

## Control parameters

### Occupational exposure limits

| Ingredient name | Exposure limits |
|---|---|
| chloromethane | **ACGIH TLV (United States, 3/2012).**<br>**Absorbed through skin.**<br>TWA: 50 ppm 8 hours.<br>TWA: 103 mg/m³ 8 hours.<br>STEL: 100 ppm 15 minutes.<br>STEL: 207 mg/m³ 15 minutes.<br>**OSHA PEL 1989 (United States, 3/1989).**<br>TWA: 50 ppm 8 hours.<br>TWA: 105 mg/m³ 8 hours.<br>STEL: 100 ppm 15 minutes.<br>STEL: 210 mg/m³ 15 minutes.<br>**OSHA PEL Z2 (United States, 11/2006).**<br>TWA: 100 ppm 8 hours.<br>CEIL: 200 ppm<br>AMP: 300 ppm 5 minutes. |

**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.



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## Section 8. Exposure controls/personal protection

**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.

**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: safety glasses with side-shields.

**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. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. 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** : Gas. [Liquefied compressed gas.]

**Color** : Colorless.

**Molecular weight** : 50.49 g/mole

**Molecular formula** : C-H3-Cl

**Boiling/condensation point** : -23.7°C (-10.7°F)

**Melting/freezing point** : -97°C (-142.6°F)

**Critical temperature** : 143.65°C (290.6°F)

**Odor** : Mild. Sweetish.

**Odor threshold** : Not available.

**pH** : Not available.

**Flash point** : Closed cup: 10°C (50°F)



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## Section 9. Physical and chemical properties

**Burning time** : Not applicable.

**Burning rate** : Not applicable.

**Evaporation rate** : Not available.

**Flammability (solid, gas)** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

**Lower and upper explosive (flammable) limits** : Lower: 8.1%
Upper: 17.4%

**Vapor pressure** : 58.7 (psig)

**Vapor density** : 1.8 (Air = 1)

**Specific Volume ($ft^3/lb$)** : 1.0977

**Gas Density ($lb/ft^3$)** : 0.911 (25°C / 77 to °F)

**Relative density** : Not applicable.

**Solubility** : Not available.

**Solubility in water** : 5.32 g/l

**Partition coefficient: n-octanol/water** : 0.91

**Auto-ignition temperature** : 632°C (1169.6°F)

**Decomposition temperature** : Not available.

**SADT** : Not available.

**Viscosity** : Not applicable.

## 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 gas to accumulate in low or confined areas.

**Incompatibility with various substances** : Extremely reactive or incompatible with the following materials: oxidizing materials.

**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.



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# Section 11. Toxicological information

## Information on toxicological effects

### Acute toxicity

| Product/ingredient name | Result | Species | Dose | Exposure |
|---|---|---|---|---|
| chloromethane | LC50 Inhalation Gas. | Rat | 8300 ppm | 4 hours |

### Irritation/Corrosion

Not available.

### Sensitization

Not available.

### Mutagenicity

Not available.

### Carcinogenicity

Not available.

### Classification

| Product/ingredient name | OSHA | IARC | NTP |
|---|---|---|---|
| chloromethane | - | 3 | - |

### Reproductive toxicity

Not available.

### Teratogenicity

Not available.

### Specific target organ toxicity (single exposure)

Not available.

### Specific target organ toxicity (repeated exposure)

| Name | Category | Route of exposure | Target organs |
|---|---|---|---|
| chloromethane | Category 2 | Not determined | central nervous system (CNS) |

### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.

### Potential acute health effects

**Eye contact** : Liquid can cause burns similar to frostbite.

**Inhalation** : Harmful if inhaled. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

**Skin contact** : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

**Ingestion** : Ingestion of liquid can cause burns similar to frostbite.

### Symptoms related to the physical, chemical and toxicological characteristics

**Eye contact** : Adverse symptoms may include the following:
frostbite



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# Section 11. Toxicological information

**Inhalation** : No specific data.

**Skin contact** : Adverse symptoms may include the following:
frostbite

**Ingestion** : Adverse symptoms may include the following:
frostbite

## 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

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

### Potential chronic health effects

Not available.

**General** : May cause damage to organs through prolonged or repeated exposure.

**Carcinogenicity** : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

**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

| Product/ingredient name | Result | Species | Exposure |
|---|---|---|---|
| chloromethane | Acute LC50 270000 µg/l Marine water | Fish - Menidia beryllina | 96 hours |

## Persistence and degradability

Not available.

## Bioaccumulative potential

| Product/ingredient name | $LogP_{ow}$ | BCF | Potential |
|---|---|---|---|
| chloromethane | 0.91 | - | low |

## Mobility in soil



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# Section 12. Ecological information

**Soil/water partition coefficient ($K_{OC}$)** : 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. Empty Airgas-owned pressure vessels should be returned to Airgas. 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. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

**United States - RCRA Toxic hazardous waste "U" List**

| Ingredient | CAS # | Status | Reference number |
|---|---|---|---|
| Methyl chloride (I,T); Methane, chloro- (I, T) | 74-87-3 | Listed | U045 |

# Section 14. Transport information

| | DOT | TDG | Mexico | IMDG | IATA |
|---|---|---|---|---|---|
| **UN number** | UN1063 | UN1063 | UN1063 | UN1063 | UN1063 |
| **UN proper shipping name** | METHYL CHLORIDE, OR REFRIGERANT GAS R 40 | METHYL CHLORIDE; OR REFRIGERANT GAS R 40 | METHYL CHLORIDE, OR REFRIGERANT GAS R 40 | METHYL CHLORIDE (REFRIGERANT GAS R 40) | METHYL CHLORIDE |
| **Transport hazard class(es)** | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   |
| **Packing group** | - | - | - | - | - |
| **Environment** | No. | No. | No. | No. | No. |
| **Additional information** | **Reportable quantity** 100 lbs / 45.4 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.<br><br>**Limited quantity** Yes.<br><br>**Packaging instruction** **Passenger aircraft** Quantity limitation: 5 kg<br><br>**Cargo aircraft** Quantity limitation: 100 kg | **Explosive Limit and Limited Quantity Index** 0.125<br><br>**ERAP Index** 3000<br><br>**Passenger Carrying Ship Index** Forbidden<br><br>**Passenger Carrying Road or Rail Index** Forbidden | - | - | **Passenger and Cargo Aircraft** Quantity limitation: 0 Forbidden<br>**Cargo Aircraft Only** Quantity limitation: 100 kg |



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# Section 14. Transport information

| | | | | | |
|---|---|---|---|---|---|
| | **Special provisions**<br>T50 | | | | |

**"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) 307**: chloromethane

**Clean Air Act (CAA) 112 regulated toxic substances**: chloromethane

**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
Sudden release of pressure
Immediate (acute) health hazard
Delayed (chronic) health hazard

**Composition/information on ingredients**

| Name | % | Fire hazard | Sudden release of pressure | Reactive | Immediate (acute) health hazard | Delayed (chronic) health hazard |
|---|---|---|---|---|---|---|
| chloromethane | 100 | Yes. | Yes. | No. | Yes. | Yes. |

**SARA 313**



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# Section 15. Regulatory information

| | Product name | CAS number | % |
|---|---|---|---|
| **Form R - Reporting requirements** | chloromethane | 74-87-3 | 100 |
| **Supplier notification** | chloromethane | 74-87-3 | 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.

## California Prop. 65

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

| Ingredient name | Cancer | Reproductive | No significant risk level | Maximum acceptable dosage level |
|---|---|---|---|---|
| chloromethane | No. | Yes. | No. | No. |

**Canada inventory** : This material is listed or exempted.

## International regulations

**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)**: Not determined.
**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 A: Compressed gas.
Class B-1: Flammable gas.
Class B-6: Reactive flammable material
Class D-2A: Material causing other toxic effects (Very 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.



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# Section 16. Other information

**Canada Label requirements** : Class A: Compressed gas.
Class B-1: Flammable gas.
Class B-6: Reactive flammable material
Class D-2A: Material causing other toxic effects (Very toxic).

**Hazardous Material Information System (U.S.A.)**

| | | |
|---|---|---|
| Health | * | 2 |
| Flammability | | 4 |
| Physical hazards | | 2 |

**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.)**




**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** : 5/20/2015.

**Date of issue/Date of revision** : 5/20/2015.

**Date of previous issue** : 10/15/2014.

**Version** : 0.03

**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 NationsACGIH – 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



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# Section 16. Other information

(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

**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.**



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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)<br>Target Organs - Respiratory system. | Category 3 |

**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

**General Advice** If symptoms persist, call a physician.

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

**Ingestion** Do not induce vomiting. Obtain medical attention.

**Most important symptoms/effects** None reasonably foreseeable.
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Unsuitable Extinguishing Media** Carbon dioxide (CO2)

**Flash Point** Not applicable
**Method -** No information available

**Autoignition Temperature** Not applicable
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** 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**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 1 | 1 | N/A |

## 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation.

**Environmental Precautions** 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.

**Methods for Containment and Clean Up** 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

**Handling** Avoid dust formation. Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.

**Storage** 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/m³ | (Vacated) TWA: 1 mg/m³<br>TWA: 1 mg/m³ | IDLH: 250 mg/m³<br>TWA: 0.5 mg/m³ |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Chromium | TWA: 0.5 mg/m³ | TWA: 0.5 mg/m³ | TWA: 0.5 mg/m³ |

*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** Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

**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

| | |
|---|---|
| **Physical State** | Powder |
| **Appearance** | Silver |
| **Odor** | Odorless |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | 1857.2 °C / 3375 °F |

| | |
|---|---|
| **Boiling Point/Range** | 2640 °C / 4784 °F |
| **Flash Point** | Not applicable |
| **Evaporation Rate** | Not applicable |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | No information available |
| **Vapor Density** | Not applicable |
| **Relative Density** | 7.2 |
| **Solubility** | Insoluble in water |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | Not applicable |
| **Decomposition Temperature** | No information available |
| **Viscosity** | Not applicable |
| **Molecular Formula** | Cr |
| **Molecular Weight** | 51.996 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Sensitive to air.

**Conditions to Avoid** Incompatible products. Excess heat. Avoid dust formation.

**Incompatible Materials** Strong oxidizing agents, Strong acids

**Hazardous Decomposition Products** Chromium oxide

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** 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** May cause irritation of respiratory tract

**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 |
|---|---|---|---|---|---|---|
| Chromium | 7440-47-3 | Not listed | Not listed | Not listed | Not listed | Not listed |

**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** 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** Not regulated

- **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**

# SAFETY DATA SHEET

Version 5.3
Revision Date 03/04/2015
Print Date 05/13/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Chrysene

Product Number : 35754
Brand : Sigma-Aldrich
Index-No. : 601-048-00-0

CAS-No. : 218-01-9

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

Identified uses : Laboratory chemicals, Manufacture of substances

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

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

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

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H341 Suspected of causing genetic defects.
H350 May cause cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.

| | |
|---|---|
| P391 | Collect spillage. |
| P405 | Store locked up. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

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

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**3.1 Substances**

| | | |
|---|---|---|
| Formula | : | $C_{18}H_{12}$ |
| Molecular weight | : | 228.29 g/mol |
| CAS-No. | : | 218-01-9 |
| EC-No. | : | 205-923-4 |
| Index-No. | : | 601-048-00-0 |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Chrysene** | | |
| | Muta. 2; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H341, H350, H410 | <= 100 % |

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

## 4. FIRST AID MEASURES

**4.1 Description of first aid measures**

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

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

**In case of skin contact**
Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**
Flush eyes with water as a precaution.

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

**4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**
No data available

## 5. FIREFIGHTING MEASURES

**5.1 Extinguishing media**

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

**5.2 Special hazards arising from the substance or mixture**
Carbon oxides

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**
No data available

## 6. ACCIDENTAL RELEASE MEASURES

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

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

### 6.2 Environmental precautions

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

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

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

### 6.4 Reference to other sections

For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

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

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

### 7.3 Specific end use(s)

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

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| | Remarks | Cancer<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs)<br>Exposure by all routes should be carefully controlled to levels as low as possible.<br>Confirmed animal carcinogen with unknown relevance to humans | | |
| Chrysene | 218-01-9 | TWA | 0.200000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 0.200000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | 1910.1002<br>As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard<br>OSHA specifically regulated carcinogen | | |
| | | TWA | 0.100000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar | | |

| | | |
|---|---|---|
| | | products.<br>cyclohexane-extractable fraction<br>See Appendix C<br>See Appendix A |

**Biological occupational exposure limits**

| Component | CAS-No. | Parameters | Value | Biological specimen | Basis |
|---|---|---|---|---|---|
| Chrysene | 218-01-9 | 1-Hydroxypyrene (1-HP) | | Urine | ACGIH - Biological Exposure Indices (BEI) |
| | Remarks | End of shift at end of workweek | | | |

## 8.2 Exposure controls

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

**Personal protective equipment**

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

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

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: solid |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 252 - 254 °C (486 - 489 °F) - lit. |
| f) | Initial boiling point and boiling range | 448 °C (838 °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 | insoluble |
| o) | Partition coefficient: n-octanol/water | log Pow: 5.73 |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

### 9.2 Other safety information

No data available

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

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

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

**Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - > 320 mg/kg

**Skin corrosion/irritation**
No data available

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

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
Laboratory experiments have shown mutagenic effects.
In vitro tests showed mutagenic effects

**Carcinogenicity**

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

Possible human carcinogen

| | |
|---|---|
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Chrysene) |
| NTP: | No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP. |
| OSHA: | OSHA specifically regulated carcinogen (Chrysene) |

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: GC0700000

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

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 1.90 mg/l - 2 h |

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

No data available

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

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

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Chrysene)
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chrysene)
Marine pollutant:yes

**IATA**
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Chrysene)

**Further information**
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

## 15. REGULATORY INFORMATION

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

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

| | CAS-No. | Revision Date |
|---|---|---|
| Chrysene | 218-01-9 | 1994-04-01 |

**SARA 311/312 Hazards**
Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|

| | | |
|---|---|---|
| Chrysene | 218-01-9 | 1994-04-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Chrysene | 218-01-9 | 1994-04-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Chrysene | 218-01-9 | 1994-04-01 |

**California Prop. 65 Components**

| WARNING! This product contains a chemical known to the State of California to cause cancer. | CAS-No. | Revision Date |
|---|---|---|
| Chrysene | 218-01-9 | 2007-09-28 |

## 16. OTHER INFORMATION

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

| | |
|---|---|
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| Carc. | Carcinogenicity |
| H341 | Suspected of causing genetic defects. |
| H350 | May cause cancer. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |

**HMIS Rating**

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

**NFPA Rating**

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

**Further information**

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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 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: 5.3 Revision Date: 03/04/2015 Print Date: 05/13/2016

# SAFETY DATA SHEET

**Creation Date** 22-Sep-2009 **Revision Date** 10-Feb-2015 **Revision Number** 1

## 1. Identification

**Product Name** **cis-1,2-Dichloroethylene**

**Cat No. :** **AC113380000; AC113380025; AC113380100; AC113380500**

**Synonyms** cis-Acetylene dichloride.

**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

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**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)

| | |
|---|---|
| Flammable liquids | Category 2 |
| Acute oral toxicity | Category 4 |
| Acute Inhalation Toxicity - Vapors | Category 4 |
| Skin Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Highly flammable liquid and vapor
Harmful if swallowed
Harmful if inhaled
Causes serious eye irritation
Causes skin irritation
May cause respiratory irritation



**Precautionary Statements**
**Prevention**
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Avoid breathing dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Take precautionary measures against static discharge
Do not eat, drink or smoke when using this product
**Response**
Call a POISON CENTER or doctor/physician if you feel unwell
**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
**Skin**
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation occurs: Get medical advice/attention
**Eyes**
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 advice/attention
**Ingestion**
Rinse mouth
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
**Fire**
Explosion risk in case of fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
**Storage**
Store in a well-ventilated place. Keep cool
Store in a closed container
Store locked up
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
None identified

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| cis-1,2-Dichloroethylene | 156-59-2 | 97 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

**Ingestion** Do not induce vomiting. Obtain medical attention.

**Most important symptoms/effects** Breathing difficulties. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Water spray. Carbon dioxide ($CO_2$). Dry chemical. Use water spray to cool unopened containers. chemical foam.

**Unsuitable Extinguishing Media** No information available

**Flash Point** 6 °C / 42.8 °F
**Method -** No information available

**Autoignition Temperature** 440 °C / 824 °F

**Explosion Limits**
**Upper** 12.80%
**Lower** 9.70%
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Flammable. Vapors may travel to source of ignition and flash back.

**Hazardous Combustion Products**
Hydrogen chloride gas Carbon monoxide (CO) Carbon dioxide ($CO_2$)
**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**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 3 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes and clothing.

**Environmental Precautions** See Section 12 for additional ecological information.

**Methods for Containment and Clean Up** Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

## 7. Handling and storage

**Handling** Ensure adequate ventilation. Wear personal protective equipment. Use explosion-proof equipment. Use only non-sparking tools. Avoid contact with skin, eyes and clothing. Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges.

**Storage** Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat and sources of ignition. Flammables area.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| cis-1,2-Dichloroethylene | TWA: 200 ppm | | |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| cis-1,2-Dichloroethylene | | | TWA: 200 ppm |

*Legend*

*ACGIH - American Conference of Governmental Industrial Hygienists*

**Engineering Measures** Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

**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

| | |
|---|---|
| **Physical State** | Liquid |
| **Appearance** | Colorless |
| **Odor** | aromatic |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | -80 °C / -112 °F |
| **Boiling Point/Range** | 60 °C / 140 °F @ 760 mmHg |
| **Flash Point** | 6 °C / 42.8 °F |
| **Evaporation Rate** | No information available |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | 12.80% |
| **Lower** | 9.70% |
| **Vapor Pressure** | 201 mmHg @ 25 °C |
| **Vapor Density** | 3.34 (Air = 1.0) |
| **Relative Density** | 1.280 |
| **Solubility** | No information available |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | 440 °C / 824 °F |
| **Decomposition Temperature** | No information available |
| **Viscosity** | No information available |
| **Molecular Formula** | C2 H2 Cl2 |
| **Molecular Weight** | 96.94 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Keep away from open flames, hot surfaces and sources of ignition. Exposure to air. Exposure to light. Incompatible products. Exposure to moist air or water.

**Incompatible Materials** Bases

**Hazardous Decomposition Products** Hydrogen chloride gas, Carbon monoxide (CO), Carbon dioxide ($CO_2$)

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information** No acute toxicity information is available for this product

**Component Information**

**Toxicologically Synergistic Products** No information available

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

**Irritation** Irritating to eyes, respiratory system and skin

**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 |
|---|---|---|---|---|---|---|
| cis-1,2-Dichloroethylene | 156-59-2 | Not listed | Not listed | Not listed | Not listed | Not listed |

**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** Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

**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**

Do not empty into drains. Do not flush into surface water or sanitary sewer system.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---|---|---|---|---|
| cis-1,2-Dichloroethylene | Not listed | Not listed | EC50 = 721 mg/L 5 min<br>EC50 = 905 mg/L 30 min | Not listed |

**Persistence and Degradability** No information available

**Bioaccumulation/ Accumulation** No information available.

**Mobility** No information available.

## 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** | UN1150 |
| **Proper Shipping Name** | 1,2-DICHLOROETHYLENE |
| **Hazard Class** | 3 |
| **Packing Group** | II |

**TDG**

| | |
|---|---|
| **UN-No** | UN1150 |
| **Proper Shipping Name** | 1,2-DICHLOROETHYLENE |
| **Hazard Class** | 3 |
| **Packing Group** | II |

**IATA**

| | |
|---|---|
| **UN-No** | 1150 |
| **Proper Shipping Name** | 1,2-DICHLOROETHYLENE |
| **Hazard Class** | 3 |
| **Packing Group** | II |

**IMDG/IMO**

| | |
|---|---|
| **UN-No** | 1150 |
| **Proper Shipping Name** | 1,2-DICHLOROETHYLENE |
| **Hazard Class** | 3 |
| **Packing Group** | II |

## 15. Regulatory information

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| cis-1,2-Dichloroethylene | X | - | X | 205-859-7 | - | | - | 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** Not applicable

**SARA 311/312 Hazardous Categorization**

| | |
|---|---|
| **Acute Health Hazard** | Yes |
| **Chronic Health Hazard** | No |
| **Fire Hazard** | Yes |

**Sudden Release of Pressure Hazard** No
**Reactive Hazard** No

**Clean Water Act** Not applicable

**Clean Air Act** Not applicable

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

**CERCLA**

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| cis-1,2-Dichloroethylene | 1000 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 |
|---|---|---|---|---|---|
| cis-1,2-Dichloroethylene | 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** B2 Flammable liquid
D1B Toxic materials
D2B 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-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

**COPPER**

## Section 1. Identification

| | | |
|---|---|---|
| **GHS product identifier** | : | COPPER |
| **Chemical name** | : | Mixture |
| **CAS number** | : | Mixture |
| **Other means of identification** | : | CC01053472 |
| **Product type** | : | liquid |

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

| | | |
|---|---|---|
| **Product use** | : | Industrial applications. Plastics. |
| **Supplier's details** | : | **POLYONE CORPORATION**<br>ColorMatrix Group Inc.<br>680 North Rocky River Drive, Berea, Ohio, 44017-1628, USA<br><br>+1 216 622 0100 |
| **Emergency telephone number (with hours of operation)** | : | **CHEMTREC 1-800-424-9300 (24hrs for spill, leak, fire, exposure or accident).** |

## Section 2. Hazards identification

This mixture has not been evaluated as a whole for health effects. Information provided on health effects of this product is based on the individual components. However, some vapors or contaminants may be released upon heating and the end-user (fabricator) must take the necessary precautions (mechanical ventilation, respiratory protection, etc.) to protect employees from exposure. See sections 8 and 11 for special precautions. After handling, always wash hands thoroughly with soap and water.

| | | |
|---|---|---|
| **OSHA/HCS status** | : | This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). |
| **Classification of the substance or mixture** | : | SKIN CORROSION/IRRITATION - Category 2 |

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Warning
**Hazard statements** : Causes skin irritation.

**Precautionary statements**

**General** : Not applicable.
**Prevention** : Wear protective gloves. Wash hands thoroughly after handling.
**Response** : IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention.
**Storage** : Not applicable.
**Disposal** : Not applicable.
**Supplemental label elements** : None known.
**Hazards not otherwise classified** : None known.

## Section 3. Composition/information on ingredients

**Substance/mixture** : Mixture
**Chemical name** : Mixture
**Other means of identification** : CC01053472

**CAS number/other identifiers**

| Ingredient name | % | CAS number |
|---|---|---|
| Miscellaneous Compounds Distillates, petroleum, hydrotreated middle | 10 - 30 | Not available. |
| Titanium dioxide | 5 - 10 | 13463-67-7 |

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**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**

| | | |
|---|---|---|
| **Eye contact** | : | 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. |
| **Inhalation** | : | Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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 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. |
| **Skin contact** | : | Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse. |
| **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** | : | No known significant effects or critical hazards. |
| **Skin contact** | : | Causes skin irritation. |
| **Ingestion** | : | Irritating to mouth, throat and stomach. |

**Over-exposure signs/symptoms**

| | | |
|---|---|---|
| **Eye contact** | : | Adverse symptoms may include the following:<br>pain or irritation |

watering
redness

| | | |
|---|---|---|
| **Inhalation** | : | No specific data. |
| **Skin contact** | : | Adverse symptoms may include the following:<br>irritation<br>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. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. |

**See toxicological information (Section 11)**

# Section 5. Fire-fighting measures

**Extinguishing media**

| | | |
|---|---|---|
| **Suitable extinguishing media** | : | In case of fire, use water spray (fog), foam, dry chemical or $CO_2$. |
| **Unsuitable extinguishing media** | : | None known. |
| **Specific hazards arising from the chemical** | : | In a fire or if heated, a pressure increase will occur and the container may burst. |
| **Hazardous thermal decomposition products** | : | Decomposition products may include the following materials:<br>carbon dioxide<br>carbon monoxide<br>metal oxide/oxides |
| **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. |
| **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. 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. 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. 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. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. 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 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. 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 |
|---|---|
| Titanium dioxide | **OSHA PEL 1989 (1989-03-01)**<br>PEL: Permissible Exposure Level 10 mg/m3 Form: Total dust<br>**OSHA PEL (1993-06-30)**<br>PEL: Permissible Exposure Level 15 mg/m3 Form: Total dust<br>**ACGIH TLV (1996-05-18)**<br>TLV-TWA: Threshold Limit Value - Time weighted average PEL: Permissible Exposure Level 10 mg/m3 |

| | | |
|---|---|---|
| **Appropriate engineering controls** | : | Good general ventilation should be sufficient to control worker exposure to airborne contaminants. |
| **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. |

**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.

**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 [liquid]
**Color** : BROWN
**Odor** : Faint odor.
**Odor threshold** : Not available.
**pH** : Not available.
**Melting point** : Not available.
**Boiling point** : Not available.
**Flash point** : Not available.
**Burning time** : Not available.

| | | |
|---|---|---|
| **Burning rate** | : | Not available. |
| **Evaporation rate** | : | Not available. |
| **Flammability (solid, gas)** | : | Not available. |
| **Lower and upper explosive (flammable) limits** | : | **Lower:** Not available.<br>**Upper:** Not available. |
| **Vapor pressure** | : | Not available. |
| **Vapor density** | : | Not available. |
| **Relative density** | : | Not available. |
| **Solubility** | : | Not available. |
| **Solubility in water** | : | insoluble in water. |
| **Partition coefficient: n-octanol/water** | : | Not available. |
| **Auto-ignition temperature** | : | Not available. |
| **Decomposition temperature** | : | Not available. |
| **SADT** | : | Not available. |
| **Viscosity** | : | **Dynamic:** Not available.<br>**Kinematic:** Not available. |

## Section 10. Stability and reactivity

| | | |
|---|---|---|
| **Reactivity** | : | No specific test data related to reactivity available for this product or its ingredients. |
| **Chemical stability** | : | Stable under recommended storage and handling conditions (see Section 7). |
| **Possibility of hazardous reactions** | : | Under normal conditions of storage and use, hazardous reactions will not occur. |
| **Conditions to avoid** | : | Keep away from extreme heat and oxidizing agents. |
| **Incompatible materials** | : | Keep away from strong acids.<br>Oxidizer. |
| **Hazardous decomposition products** | : | Under normal conditions of storage and use, hazardous decomposition products should not be produced. |

## Section 11. Toxicological information

This mixture has not been evaluated as a whole for health effects. Exposure effects listed are based on existing health data for the individual components which comprise the mixture.

**Information on toxicological effects**

**Acute toxicity**

| Product/ingredient name | Result | Species | Dose | Exposure |
|---|---|---|---|---|
| Titanium dioxide | | | | |

| | | | | |
|---|---|---|---|---|
| | LC50 Inhalation | Rat - Male | 6.82 Mg/l | 4 h |
| | LD50 Dermal | Rabbit | > 5,000 mg/kg | - |

**Conclusion/Summary** : Mixture.Not fully tested.

**Irritation/Corrosion**

**Conclusion/Summary**
**Skin** : Mixture.Not fully tested.
**Eyes** : Mixture.Not fully tested.
**Respiratory** : Mixture.Not fully tested.

**Sensitization**

**Conclusion/Summary**
**Skin** : Mixture.Not fully tested.
**Respiratory** : Mixture.Not fully tested.

**Mutagenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Carcinogenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Classification**

| Product/ingredient name | OSHA | IARC | NTP |
|---|---|---|---|
| Titanium dioxide | | 2B | |

**Reproductive toxicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Teratogenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Specific target organ toxicity (single exposure)**
Not available.

**Specific target organ toxicity (repeated exposure)**
Not available.

**Aspiration hazard**

| Product/ingredient name | Result |
|---|---|

| | |
|---|---|
| Miscellaneous Compounds Distillates, petroleum, hydrotreated middle | ASPIRATION HAZARD - Category 1 |

**Information on the likely routes of exposure** : Not available.

**Potential acute health effects**

**Eye contact** : Causes serious eye irritation.
**Inhalation** : No known significant effects or critical hazards.
**Skin contact** : 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**

**Potential immediate effects** : Not available.
**Potential delayed effects** : Not available.

**Potential chronic health effects**

**Conclusion/Summary** : Mixture.Not fully tested.

**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**

| Route | ATE value |
|---|---|
| Inhalation (dusts and mists) | 7.81 mg/l |

# Section 12. Ecological information

**Toxicity**

| Product/ingredient name | Result | Species | Exposure |
|---|---|---|---|
| Titanium dioxide | | | |
| | Acute LC50 > 1,000,000 µg/l Marine water | Fish - Mummichog | 96 h |
| | Acute LC50 > 1,000 mg/l Fresh water | Fish - Fathead minnow | 96 h |
| | Acute LC50 13 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute LC50 6.5 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 19.3 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 27.8 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 35.306 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |

**Conclusion/Summary** : Not available.

**Persistence and degradability**

**Conclusion/Summary** : Not available.

**Bioaccumulative potential**

| Product/ingredient name | LogPow | BCF | Potential |
|---|---|---|---|
| Titanium dioxide | | 352.00 | low |

**Mobility in soil**

| | | |
|---|---|---|
| **Soil/water partition coefficient (KOC)** | : | 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. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

**United States - RCRA Acute hazardous waste "P" List:** Not listed

**United States - RCRA Toxic hazardous waste "U" List:** Not listed

## Section 14. Transport information

| | | |
|---|---|---|
| U.S. DOT Classification | : | Not regulated for transportation. |
| ICAO/IATA | : | Not classified as dangerous good under transport regulations. |
| IMO/IMDG (maritime) | : | Not classified as dangerous good under transport regulations. |

## Section 15. Regulatory information

**U.S. Federal regulations** : **United States - TSCA 12(b) - Chemical export notification:** None of the components are listed.
**United States - TSCA 4(a) - Final Test Rules:** Not listed
**United States - TSCA 4(a) - ITC Priority list:** Not listed
**United States - TSCA 4(a) - Proposed test rules:** Not listed

**United States - TSCA 4(f) - Priority risk review:** Not listed
**United States - TSCA 5(a)2 - Final significant new use rules:** Not listed
**United States - TSCA 5(a)2 - Proposed significant new use rules:** Not listed
**United States - TSCA 5(e) - Substances consent order:** Not listed
**United States - TSCA 6 - Final risk management:** Not listed
**United States - TSCA 6 - Proposed risk management:** Not listed
**United States - TSCA 8(a) - Chemical risk rules:** Not listed
**United States - TSCA 8(a) - Dioxin/Furane precusor:** Not listed
**United States - TSCA 8(a) - Chemical Data Reporting (CDR):** Not determined
**United States - TSCA 8(a) - Preliminary assessment report (PAIR):** Not listed
**United States - TSCA 8(c) - Significant adverse reaction (SAR):** Not listed
**United States - TSCA 8(d) - Health and safety studies:** Not listed
**United States - EPA Clean water act (CWA) section 307 - Priority pollutants:** Not listed
**United States - EPA Clean water act (CWA) section 311 - Hazardous substances:** Not listed
**United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Flammable substances:** Not listed
**United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Toxic substances:** Not listed
**United States - Department of commerce - Precursor chemical:** Not listed

| | | |
|---|---|---|
| **Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs)** | : | Not 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 |

**US. EPA CERCLA Hazardous Substances (40 CFR 302)**

not applicable

**SARA 311/312**

| | | |
|---|---|---|
| **Classification** | : | Immediate (acute) health hazard |

**Composition/information on ingredients**

| Name | % | Classification |
|---|---|---|
| **Miscellaneous Compounds Distillates, petroleum, hydrotreated middle** | 10 - 30 | AH |
| **Titanium dioxide** | 5 - 10 | CH |

**SARA 313**
Not applicable.

**State regulations**

**Massachusetts** : The following components are listed:
Mica
Iron oxide
Titanium dioxide

**New York** : None of the components are listed.

**New Jersey** : The following components are listed:
Mica
Iron oxide
Titanium dioxide

**Pennsylvania** : The following components are listed:
Iron oxide
Titanium dioxide

**California Prop. 65**
WARNING: This product contains a chemical known to the State of California to cause cancer.

**United States inventory (TSCA 8b)** : All components are listed or exempted.

**Canada inventory** : All components are listed or exempted.

**International regulations**

**International lists** : **Australia inventory (AICS):** All components are listed or exempted.
**Taiwan inventory (CSNN):** Not determined.
**Malaysia Inventory (EHS Register):** Not determined.
**EINECS:** All components are listed or exempted.
**Japan inventory:** Not determined.
**China inventory (IECSC):** All components are listed or exempted.
**Korea inventory:** All components are listed or exempted.
**New Zealand Inventory of Chemicals (NZIoC):** Not determined.

**Philippines inventory (PICCS):** All components are listed or exempted.

| | | |
|---|---|---|
| **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 |

## Section 16. Other information

**History**

| | | |
|---|---|---|
| **Date of printing** | : | 05/21/2015 |
| **Date of issue/Date of revision** | : | 05/18/2015 |
| **Date of previous issue** | : | 10/30/2014 |
| **Version** | : | 1.1 |
| **Key to abbreviations** | : | ATE = Acute Toxicity Estimate<br>BCF = Bioconcentration Factor<br>GHS = Globally Harmonized System of Classification and Labelling of Chemicals<br>IATA = International Air Transport Association<br>IBC = Intermediate Bulk Container<br>IMDG = International Maritime Dangerous Goods<br>LogPow = logarithm of the octanol/water partition coefficient<br>MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)<br>UN = United Nations |
| **References** | : | Not available. |

**Notice to reader**

**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. Particularly this information may not be valid for such material used in conjunction with any other materials or in any process, unless specified in the text.**

# Safety Data Sheet

**Revision Date: 01/06/17**
www.restek.com

## 1. IDENTIFICATION

| | |
|---|---|
| **Catalog Number / Product Name:** | **31276 / Dibenzo(a,h)anthracene Standard** |
| **Company:** | Restek Corporation |
| **Address:** | 110 Benner Circle<br>Bellefonte, Pa. 16823 |
| **Phone#:** | 814-353-1300 |
| **Fax#:** | 814-353-1309 |
| **Emergency#:** | 800-424-9300 (CHEMTREC)<br>703-527-3887 (Outside the US) |
| **Email:** | www.restek.com |
| **Revision Number:** | 7 |
| **Intended use:** | For Laboratory use only |

## 2. HAZARD(S)IDENTIFICATION

**Emergency Overview:**

**GHS Hazard Symbols:**



| | |
|---|---|
| **GHS Classification:** | Carcinogenicity Category 2 |
| **GHS Signal Word:** | Warning |
| **GHS Hazard:** | Suspected of causing cancer. |
| **GHS Precautions:** | |
| **Safety Precautions:** | Obtain special instructions before use.<br>Do not handle until all safety precautions have been read and understood.<br>Wear protective gloves/protective clothing/eye protection/face protection. |
| **First Aid Measures:** | IF exposed or concerned: Get medical advice/attention. |
| **Storage:** | Store locked up. |
| **Disposal:** | Dispose of contents/container according to section 13 of the SDS. |
| **Single Exposure Target Organs:** | No data available. |
| **Repeated Exposure Target Organs:** | No data available. |

## 3. COMPOSITION / INFORMATION ON INGREDIENT

| Chemical Name | CAS # | EINEC # | % Composition |
|---|---|---|---|
| Dichloromethane | 75-09-2 | 200-838-9 | 99.900000 |
| dibenz (a,h) anthracene | 53-70-3 | 200-181-8 | 0.100000 |

## 4. FIRST-AID MEASURES

| | |
|---|---|
| **Inhalation:** | Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately |
| **Eyes:** | Immediately flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention and monitor the eye daily as advised by your physician. Serious harm (damage) may result if treatment is delayed. Continue to flush eyes while awaiting medical attention |
| **Skin Contact:** | Wash with soap and water. Remove contaminated clothing, launder immediately, and discard contaminated leather goods. Get medical attention immediately. |
| **Ingestion:** | Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS. Never give anything by mouth to an unconscious person |

## 5. FIRE- FIGHTING MEASURES

| | |
|---|---|
| **Extinguishing Media:** | Use alcohol resistant foam, carbon dioxide, or dry chemical when fighting fires. Water or foam may cause frothing if liquid is burning but it still may be a useful extinguishing agent if carefully applied to the surface of the fire. Do Not direct a stream of water into the hot burning liquid. Use methods suitable to fight surrounding fire. |
| **Fire and/or Explosion Hazards:** | No data. |
| **Fire Fighting Methods and Protection:** | Use methods for the surrounding fire. |
| **Hazardous Combustion Products:** | Carbon dioxide, Carbon monoxide |

## 6. ACCIDENTAL RELEASE MEASURES

| | |
|---|---|
| **Personal Precautions and Equipment:** | Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits. |
| **Methods for Clean-up:** | Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation. |

## 7. HANDLING AND STORAGE

| | |
|---|---|
| **Handling Technical Measures and Precautions:** | Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. |
| **Storage Technical Measures and Conditions:** | Store in a cool dry place. Isolate from incompatible materials. |

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**United States:**

| Chemical Name | CAS No. | IDLH | ACGIH STEL | ACGIH TLV-TWA | OSHA Exposure Limit |
|---|---|---|---|---|---|
| Dichloromethane | 75-09-2 | 2300 ppm IDLH | No data available. | 50 ppm TWA | 25 ppm TWA; 125 ppm STEL (15 min. TWA) |
| dibenz (a,h) anthracene | 53-70-3 | No data available. | No data available. | No data available. | No data available. |

**Personal Protection:**

| | |
|---|---|
| **Engineering Measures:** | Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure. |
| **Respiratory Protection:** | Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms. |
| **Eye Protection:** | Wear chemically resistant safety glasses with side shields when handling this product. Wear additional eye protection such as chemical splash goggles and/or face shield when the possibility exists for eye contact with splashing or spraying |

| | |
|---|---|
| | liquid, or airborne material. Do not wear contact lenses. Have an eye wash station available. |
| **Skin Protection:** | Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work. |
| **Medical Conditions Aggravated By Exposure:** | Eye disease Skin disease including eczema and sensitization Respiratory disease including asthma and bronchitis |

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| **Appearance, color:** | Colorless |
| **Odor:** | Strong |
| **Physical State:** | No data available. |
| **pH:** | No data available. |
| **Vapor Pressure:** | No data available. |
| **Vapor Density:** | 2.93 (air = 1) |
| **Boiling Point:** | No data available. |
| **Melting Point:** | -96.7 °C |
| **Flash Point:** | No data available. |
| **Upper Flammable/Explosive Limit, % in air:** | No data available. |
| **Lower Flammable/Explosive Limit, % in air:** | No data available. |
| **Autoignition Temperature:** | 556 deg C |
| **Decomposition Temperature:** | No data available. |
| **Specific Gravity:** | 1.3254 - 1.3258 g/cm3 at 20 °C |
| **Evaporation Rate:** | No data available. |
| **Odor Threshold:** | ND |
| **Solubility:** | Moderate; 50-99% |
| **Partition Coefficient: n-octanol in water:** | No data available. |
| **VOC % by weight:** | 0 |
| **Molecular Weight:** | No data available. |

## 10. STABILITY AND REACTIVITY

| | |
|---|---|
| **Stability:** | Stable under normal conditions. |
| **Conditions to Avoid:** | No data available.Contamination High temperatures |
| **Materials to Avoid / Chemical Incompatiability:** | Strong oxidizing agents Caustics (bases) |
| **Hazardous Decomposition Products:** | Carbon dioxide Carbon monoxide |

## 11. TOXICOLOGICAL INFORMATION

| | |
|---|---|
| **Routes of Entry:** | Inhalation Absorption Ingestion Skin contact Eye contact |
| **Target Organs Potentially Affected By Exposure:** | Skin, Cardiovascular System, Eyes, Liver |
| **Chemical Interactions That Change Toxicity:** | None Known |

**Immediate (Acute) Health Effects by Route of Exposure:**

| | |
|---|---|
| **Inhalation Irritation:** | Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache. |
| **Inhalation Toxicity:** | Harmful! Can cause systemic damage (see "Target Organs)Inhalation may cause severe central nervous system depression (including unconsciousness). |
| **Skin Contact:** | Contact causes severe skin irritation and possible burns. |
| **Skin Absorption:** | Harmful if absorbed through the skin. May cause severe irritation and systemic damage. |
| **Eye Contact:** | Contact with the eyes may cause moderate to severe eye injury. Eye contact may result in tearing and reddening, but not likely to permanently injure eye tissue. Temporary vision impairment (cloudy or blurred vision) is possible. |
| **Ingestion Irritation:** | Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea. |
| **Ingestion Toxicity:** | Harmful if swallowed. May cause systemic poisoning. |

**Long-Term (Chronic) Health Effects:**

| | |
|---|---|
| **Carcinogenicity:** | Contains a probable or known human carcinogen. |
| **Reproductive and Developmental Toxicity:** | No data available to indicate product or any components present at greater than 0.1% may cause birth defects. |
| **Inhalation:** | Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic |

damage upon prolonged and/or repeated exposure (see "Target Organs)

**Skin Absorption:** Upon prolonged or repeated exposure, harmful if absorbed through the skin. May cause severe irritation and systemic damage

**Component Toxicological Data:**
**NIOSH:**

| Chemical Name | CAS No. | LD50/LC50 |
|---|---|---|
| Methane, dichloro- | 75-09-2 | Inhalation LC50 Rat 53 mg/L 6 h |

**Component Carcinogenic Data:**
**OSHA:**

| Chemical Name | CAS No. | |
|---|---|---|
| Methylene chloride | 75-09-2 | 25 ppm TWA (8 hr.); 125 ppm STEL (15 min.); 12.5 ppm Action Level (see 29 CFR 1910.1051); effective date for respiratory protection for certain employers to acheive the 8-hour TWA PEL is August 31, 1998; the start up date to install engineering controls is December 10, 1998.; {OSHA - 29 CFR 1910 Specifically Regulate |
| Dibenz[a,h]anthracene | 53-70-3 | Present |

**ACGIH:**

| Chemical Name | CAS No. | |
|---|---|---|
| Dichloromethane | 75-09-2 | A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans |

**NIOSH:**

| Chemical Name | CAS No. | |
|---|---|---|
| Methylene chloride | 75-09-2 | potential occupational carcinogen |

**NTP:**

| Chemical Name | CAS No. |
|---|---|
| No data available. | |

**IARC:**

| Chemical Name | CAS No. | Group No. |
|---|---|---|
| No data. | | Group 1 |
| Dichloromethane | 75-09-2 | Group 2A |
| Dibenz[a,h]anthracene | 53-70-3 | Group 2A |
| No data. | | Group 2B |

## 12. ECOLOGICAL INFORMATION

**Overview:** Moderate ecological hazard. This product may be dangerous to plants and/or wildlife. Keep out of waterways.
**Mobility:** No data
**Persistence:** No data
**Bioaccumulation:** No data
**Degradability:** No data
**Ecological Toxicity Data:** No data available.

## 13. DISPOSAL CONSIDERATIONS

**Waste Description of Spent Product:** Spent or discarded material is a hazardous waste.
**Disposal Methods:** Incinerate spent or discarded material a permitted hazardous waste facility.
**Waste Disposal of Packaging:** Comply with all Local, State, Federal, and Provincial Environmental Regulations.

## 14. TRANSPORTATION INFORMATION

**United States:**
**DOT Proper Shipping Name:** Dichloromethane
**UN Number:** UN1593
**Hazard Class:** 6.1
**Packing Group:** III

**International:**

| | |
|---|---|
| **IATA Proper Shipping Name:** | Dichloromethane |
| **UN Number:** | UN1593 |
| **Hazard Class:** | 6.1 |
| **Packing Group:** | III |

**Marine Pollutant:** No

| Chemical Name | CAS# | Marine Pollutant | Severe Marine Pollutant |
|---|---|---|---|
| No data available. | | | |

## 15. REGULATORY INFORMATION

**United States:**

| Chemical Name | CAS# | CERCLA | SARA 313 | SARA EHS 313 | TSCA |
|---|---|---|---|---|---|
| Dichloromethane | 75-09-2 | X | X | - | X |
| dibenz (a,h) anthracene | 53-70-3 | X | X | - | X |

**The following chemicals are listed on CA Prop 65:**

| Chemical Name | CAS # | Regulation |
|---|---|---|
| Dichloromethane<br>Dichloromethane (Methylene chloride) | 75-09-2 | Prop 65 Cancer |
| Dibenz[a,h]anthracene | 53-70-3 | Prop 65 Cancer |

**State Right To Know Listing:**

| Chemical Name | CAS# | New Jersey | Massachusetts | Pennsylvania | California |
|---|---|---|---|---|---|
| Dichloromethane | 75-09-2 | X | X | X | X |
| dibenz (a,h) anthracene | 53-70-3 | X | X | X | X |

## 16. OTHER INFORMATION

**Prior Version Date:** 05/15/14

**Other Information:** Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

**References:** No data available.

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# SAFETY DATA SHEET

Version 5.5
Revision Date 05/27/2016
Print Date 07/04/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Dieldrin

Product Number : 33491
Brand : Sigma-Aldrich
Index-No. : 602-049-00-9

CAS-No. : 60-57-1

### 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 # : (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
Acute toxicity, Dermal (Category 1), H310
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372
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 + H310 Fatal if swallowed or in contact with skin
H351 Suspected of causing cancer.
H372 Causes damage to organs through prolonged or repeated exposure if swallowed.
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. |
| P260 | Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. |
| P262 | Do not get in eyes, on skin, or on clothing. |
| 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 + P310 + P330 | IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth. |
| P302 + P350 + P310 | IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician. |
| P308 + P313 | IF exposed or concerned: Get medical advice/ attention. |
| P362 | Take off contaminated clothing and wash before reuse. |
| 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 : 1,2,3,4,10,10-Hexachloro-1,4,4a,5,6,7,8,8a-octahydro-6,7-epoxy-1,4:5,8-dimethanonaphthalene

Formula : $C_{12}H_8Cl_6O$

Molecular weight : 380.91 g/mol

CAS-No. : 60-57-1

EC-No. : 200-484-5

Index-No. : 602-049-00-9

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Dieldrin** | | |
| | Acute Tox. 2; Acute Tox. 1; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H300 + H310, H351, H372, 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
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
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.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.

### 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 |
|---|---|---|---|---|
| Dieldrin | 60-57-1 | TWA | 0.100000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Central Nervous System impairment<br>Liver damage<br>Reproductive effects<br>Confirmed animal carcinogen with unknown relevance to humans | | |

| | | | | |
|---|---|---|---|---|
| | | Danger of cutaneous absorption | | |
| | | TWA | 0.250000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A<br>Potential for dermal absorption | | |
| | | TWA | 0.250000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | Skin designation | | |
| | | TWA | 0.1 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>Liver damage<br>Reproductive effects<br>Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption | | |
| | | TWA | 0.25 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A<br>Potential for dermal absorption | | |
| | | TWA | 0.25 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | Skin designation | | |
| | | TWA | 0.25 mg/m3 | USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000 |
| | | Skin notation | | |
| | | PEL | 0.25 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
| | | Skin | | |

## 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 | Melting point/range: 143 - 144 °C (289 - 291 °F) - lit. |
| f) | Initial boiling point and boiling range | No data available |
| g) | Flash point | No data available |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | No data available |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

### 9.2 Other safety information
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

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

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents

**10.6 Hazardous decomposition products**
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 - 38.3 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

**Skin corrosion/irritation**
No data available

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

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

| | |
|---|---|
| IARC: | No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. |
| 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**
Ingestion - Causes damage to organs through prolonged or repeated exposure.

**Aspiration hazard**
No data available

**Additional Information**
RTECS: IO1750000

Discomfort, Headache, Nausea, Vomiting, Dizziness, Tremors, tonic convulsions, clonic spasms, Coma., respiratory failure, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Blood - Irregularities - Based on Human Evidence
Blood - Irregularities - Based on Human Evidence

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | mortality LC50 - Carassius auratus (goldfish) - 1.6 µg/l - 96.0 h |
| Toxicity to daphnia and other aquatic invertebrates | Immobilization EC50 - Daphnia magna (Water flea) - 79.5 µg/l - 48 h |

### 12.2 Persistence and degradability
No data available

### 12.3 Bioaccumulative potential
No data available

### 12.4 Mobility in soil
No data available

### 12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

## 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: I
Proper shipping name: Toxic solids, organic, n.o.s. (Dieldrin)
Reportable Quantity (RQ): 1 lbs
Marine pollutant:yes
Poison Inhalation Hazard: No

**IMDG**
UN number: 2811 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Dieldrin)

Marine pollutant:yes

**IATA**

UN number: 2811 Class: 6.1 Packing group: I

Proper shipping name: Toxic solid, organic, n.o.s. (Dieldrin)

IATA Passenger: Not permitted for transport

## 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 |
|---|---|---|
| Dieldrin | 60-57-1 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Dieldrin | 60-57-1 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Dieldrin | 60-57-1 | 1993-04-24 |

**California Prop. 65 Components**

| | | |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause cancer. Dieldrin | CAS-No. 60-57-1 | Revision Date 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. |
| H300 + H310 | Fatal if swallowed or in contact with skin |
| H310 | Fatal in contact with skin. |
| H351 | Suspected of causing cancer. |
| H372 | Causes damage to organs through prolonged or repeated exposure if swallowed. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 4 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 4 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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**Preparation Information**

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

Version: 5.5 Revision Date: 05/27/2016 Print Date: 07/04/2016

# SAFETY DATA SHEET

Version 5.7
Revision Date 06/03/2016
Print Date 07/04/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Diesel Fuel No. 2

Product Number : UST147
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 # : (314) 776-6555

## 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
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Respiratory system, Central nervous system, H335, H336
Specific target organ toxicity - repeated exposure, Oral (Category 2), Liver, Blood, H373
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Central nervous system, H373

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)

| | |
|---|---|
| H315 | Causes skin irritation. |
| H319 | Causes serious eye irritation. |
| H335 | May cause respiratory irritation. |
| H336 | May cause drowsiness or dizziness. |
| H351 | Suspected of causing cancer. |
| H373 | May cause damage to organs (Liver, Blood) through prolonged or repeated exposure if swallowed. |
| H373 | May cause damage to organs (Central nervous system) through prolonged or repeated exposure if inhaled. |

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/ fume/ gas/ mist/ vapours/ spray. |
| P264 | Wash skin thoroughly after handling. |
| P271 | Use only outdoors or in a well-ventilated area. |
| P280 | Wear protective gloves/ protective clothing/ eye protection/ face protection. |
| P302 + P352 | IF ON SKIN: Wash with plenty of soap and water. |
| P304 + P340 + P312 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor 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

### 3.2 Mixtures

**Hazardous components**

| Component | | Classification | Concentration |
|---|---|---|---|
| **Methylene chloride** | | | |
| CAS-No.<br>EC-No.<br>Index-No. | 75-09-2<br>200-838-9<br>602-004-00-3 | Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; STOT SE 3; STOT RE 2; H315, H319, H335, H336, H351, H373, H373 | >= 90 - <= 100 % |
| **Fuels, diesel, no. 2** | | | |
| CAS-No.<br>EC-No.<br>Index-No. | 68476-34-6<br>270-676-1<br>649-227-00-2 | Flam. Liq. 4; Carc. 2; STOT SE 3; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 2; H227, H304, H336, H351, H411 | >= 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**
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**
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.

**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.

Store at Room Temperature.

**7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**8.1 Control parameters**

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| | Remarks | Potential Occupational Carcinogen<br>See Appendix A | | |
| Methylene chloride | 75-09-2 | TWA | 50.000000 ppm | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>Carboxyhemoglobinemia<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section) | | |

| | | | | |
|---|---|---|---|---|
| | | Confirmed animal carcinogen with unknown relevance to humans | | |
| | | TWA | 50 ppm | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>Carboxyhemoglobinemia<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Confirmed animal carcinogen with unknown relevance to humans | | |
| | | Substance listed; for more information see OSHA document 1910.1052 | | |
| | | Substance listed; for more information see OSHA document 1910.1052 | | |
| | | See Table Z-2 | | |
| | | PEL | 25.000000 ppm | OSHA Specifically Regulated Chemicals/Carcinogens |
| | | 1910.1052<br>This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction and shipyard employment. Methylene chloride (MC) means an organic compound with chemical formula, CH2Cl2. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole<br>OSHA specifically regulated carcinogen | | |
| | | STEL | 125.000000 ppm | OSHA Specifically Regulated Chemicals/Carcinogens |
| | | 1910.1052<br>This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction and shipyard employment. Methylene chloride (MC) means an organic compound with chemical formula, CH2Cl2. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole<br>OSHA specifically regulated carcinogen | | |
| | | PEL | 25 ppm<br>87 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
| | | see section 5202 | | |
| | | STEL | 125 ppm<br>435 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
| | | see section 5202 | | |
| Fuels, diesel, no. 2 | 68476-34-6 | TWA | 100.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Dermatitis<br>Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption<br>varies | | |
| | | TWA | 100.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Dermatitis<br>Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption<br>varies | | |
| | | TWA | 100 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Dermatitis<br>Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption<br>varies | | |

**Biological occupational exposure limits**

| Component | CAS-No. | Parameters | Value | Biological specimen | Basis |
|---|---|---|---|---|---|
| Methylene chloride | 75-09-2 | Dichloromethane | 0.3000 mg/l | Urine | 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**
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.

**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: liquid |
| 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 | 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, Hydrogen chloride gas
Hazardous decomposition products formed under fire conditions. - 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

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.

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

known or anticipated carcinogen by NTP.

OSHA: OSHA specifically regulated carcinogen (Methylene chloride)

**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.

Stomach - Irregularities - Based on Human Evidence
Stomach - 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**
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: 1593 Class: 6.1 Packing group: III
Proper shipping name: Dichloromethane, solution
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 1593 Class: 6.1 Packing group: III EMS-No: F-A, S-A

Proper shipping name: DICHLOROMETHANE, SOLUTION

**IATA**
UN number: 1593 Class: 6.1 Packing group: III
Proper shipping name: Dichloromethane, solution

## 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 |
|---|---|---|
| Methylene chloride | 75-09-2 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Methylene chloride | 75-09-2 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Methylene chloride | 75-09-2 | 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 |
|---|---|---|
| Methylene chloride | 75-09-2 | 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 |
| Asp. Tox. | Aspiration hazard |
| Carc. | Carcinogenicity |
| Eye Irrit. | Eye irritation |
| Flam. Liq. | Flammable liquids |
| H227 | Combustible liquid. |
| H304 | May be fatal if swallowed and enters airways. |
| H315 | Causes skin irritation. |
| H319 | Causes serious eye irritation. |
| H335 | May cause respiratory irritation. |
| H336 | May cause drowsiness or dizziness. |
| H351 | Suspected of causing cancer. |
| H373 | May cause damage to organs (/$/*_2ORG_REP_ORA/$/) through prolonged or repeated exposure if swallowed. |
| H411 | Toxic to aquatic life with long lasting effects. |
| Skin Irrit. | Skin irritation |
| STOT RE | Specific target organ toxicity - repeated exposure |
| STOT SE | Specific target organ toxicity - single exposure |

**HMIS Rating**
Health hazard: 2
Chronic Health Hazard: *

| | |
|---|---|
| Flammability: | 0 |
| Physical Hazard | 1 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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**Preparation Information**

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

Version: 5.7 Revision Date: 06/03/2016 Print Date: 07/04/2016

# SAFETY DATA SHEET

**Creation Date** 06-Aug-2010 **Revision Date** 30-Oct-2014 **Revision Number** 2

## 1. Identification

**Product Name** **Ethylbenzene**

**Cat No. :** **AC433800000; AC433800010; AC433801000**

**Synonyms** Ethylbenzol; Phenylethane

**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

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**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)

| | |
|---|---|
| Flammable liquids | Category 2 |
| Acute Inhalation Toxicity - Vapors | Category 4 |
| Carcinogenicity | Category 2 |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system, Central nervous system (CNS). | |
| Specific target organ toxicity - (repeated exposure) | Category 2 |
| Aspiration Toxicity | Category 1 |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Highly flammable liquid and vapor
May be fatal if swallowed and enters airways
Harmful if inhaled
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of causing cancer
May cause 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
Use personal protective equipment as required
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
**Response**
IF exposed or concerned: Get medical attention/advice
**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
**Ingestion**
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
**Fire**
In case of fire: Use CO2, dry chemical, or foam for extinction
**Storage**
Store locked up
Store in a well-ventilated place. Keep container tightly closed
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
Harmful to aquatic life with long lasting effects

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Ethylbenzene | 100-41-4 | >95 |

## 4. First-aid measures

**General Advice** If symptoms persist, call a physician.

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention. Aspiration into lungs can produce severe lung damage.

**Ingestion** Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting. Call a physician or Poison Control Center immediately. If vomiting occurs naturally, have victim lean forward.

**Most important symptoms/effects** Breathing difficulties. . Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: May cause central nervous system depression

**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

**Unsuitable Extinguishing Media** Do not use a solid water stream as it may scatter and spread fire

**Flash Point** 15 °C / 59 °F
**Method -** No information available

**Autoignition Temperature** 432 °C / 810 °F
**Explosion Limits**
**Upper** 6.8%
**Lower** 1.2%
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** Yes

**Specific Hazards Arising from the Chemical**
Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

**Hazardous Combustion Products**
Carbon monoxide (CO) Carbon dioxide ($CO_2$)
**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**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 3 | 3 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

**Environmental Precautions** 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.

**Methods for Containment and Clean Up** Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

## 7. Handling and storage

**Handling** Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| Ethylbenzene | TWA: 20 ppm | (Vacated) TWA: 100 ppm<br>(Vacated) TWA: 435 mg/m³<br>(Vacated) STEL: 125 ppm<br>(Vacated) STEL: 545 mg/m³<br>TWA: 100 ppm<br>TWA: 435 mg/m³ | IDLH: 800 ppm<br>TWA: 100 ppm<br>TWA: 435 mg/m³<br>STEL: 125 ppm<br>STEL: 545 mg/m³ |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Ethylbenzene | TWA: 100 ppm<br>TWA: 434 mg/m³<br>STEL: 125 ppm<br>STEL: 543 mg/m³ | TWA: 100 ppm<br>TWA: 435 mg/m³<br>STEL: 125 ppm<br>STEL: 545 mg/m³ | TWA: 20 ppm |

*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. Use explosion-proof electrical/ventilating/lighting/equipment. 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** 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** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Liquid |
| **Appearance** | Colorless |
| **Odor** | aromatic |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | -95 °C / -139 °F |
| **Boiling Point/Range** | 136 °C / 276.8 °F |
| **Flash Point** | 15 °C / 59 °F |
| **Evaporation Rate** | No information available |
| **Flammability (solid,gas)** | Not applicable |
| **Flammability or explosive limits** | |
| **Upper** | 6.8% |
| **Lower** | 1.2% |
| **Vapor Pressure** | No information available |
| **Vapor Density** | No information available |
| **Relative Density** | 0.860 |
| **Solubility** | Slightly soluble in water |
| **Partition coefficient; n-octanol/water** | No data available |

| | |
|---|---|
| **Autoignition Temperature** | 432 °C / 810 °F |
| **Decomposition Temperature** | No information available |
| **Viscosity** | No information available |
| **Molecular Formula** | C8 H10 |
| **Molecular Weight** | 106.17 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

**Incompatible Materials** Strong oxidizing agents

**Hazardous Decomposition Products** Carbon monoxide (CO), Carbon dioxide ($CO_2$)

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Ethylbenzene | 3500 mg/kg ( Rat ) | 15400 mg/kg ( Rabbit ) | 17.2 mg/L ( Rat ) 4 h |

**Toxicologically Synergistic Products** No information available

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

**Irritation** May cause eye, skin, and respiratory tract irritation

**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 |
|---|---|---|---|---|---|---|
| Ethylbenzene | 100-41-4 | Group 2B | Not listed | A3 | X | Not listed |

*IARC: (International Agency for Research on Cancer)*
*Group 2B - Possibly Carcinogenic to Humans*
*IARC: (International Agency for Research on Cancer)*
*Group 1 - Carcinogenic to Humans*
*Group 2A - Probably Carcinogenic to Humans*

*ACGIH: (American Conference of Governmental Industrial Hygienists)*
*A1 - Known Human Carcinogen*
*A2 - Suspected Human Carcinogen*
*A3 - Animal Carcinogen*
*ACGIH: (American Conference of Governmental Industrial Hygienists)*

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** Respiratory system Central nervous system (CNS)
**STOT - repeated exposure** None known

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: May cause central nervous system depression

**Endocrine Disruptor Information** No information available

**Other Adverse Effects** See actual entry in RTECS for complete information.

## 12. Ecological information

**Ecotoxicity**

Do not empty into drains. The product contains following substances which are hazardous for the environment. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---|---|---|---|---|
| Ethylbenzene | 2.6 - 11.3 mg/L EC50 72 h 438 mg/L EC50 > 96 h 4.6 mg/L EC50 = 72 h 1.7 - 7.6 mg/L EC50 96 h | 9.6 mg/L LC50 96 h 9.1 - 15.6 mg/L LC50 96 h 32 mg/L LC50 96 h 7.55 - 11 mg/L LC50 96 h 4.2 mg/L LC50 96 h 11.0 - 18.0 mg/L LC50 96 h | EC50 = 9.68 mg/L 30 min EC50 = 96 mg/L 24 h | 1.8 - 2.4 mg/L EC50 48 h |

**Persistence and Degradability** Insoluble in water Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation** No information available.

**Mobility** . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

| Component | log Pow |
|---|---|
| Ethylbenzene | 3.118 |

## 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** UN1175
**Proper Shipping Name** ETHYLBENZENE
**Hazard Class** 3
**Packing Group** II

**TDG**

**UN-No** UN1175
**Proper Shipping Name** ETHYLBENZENE
**Hazard Class** 3
**Packing Group** II

**IATA**

**UN-No** UN1175
**Proper Shipping Name** ETHYLBENZENE
**Hazard Class** 3
**Packing Group** II

**IMDG/IMO**

**UN-No** UN1175
**Proper Shipping Name** ETHYLBENZENE
**Hazard Class** 3
**Packing Group** II

## 15. Regulatory information

**All of the components in the product are on the following Inventory lists:** X = listed The product is classified and labeled

according to EC directives or corresponding national laws The product is classified and labeled in accordance with Directive 1999/45/EC

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ethylbenzene | X | X | - | 202-849-4 | - | | 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 % |
|---|---|---|---|
| Ethylbenzene | 100-41-4 | >95 | 0.1 |

**SARA 311/312 Hazardous Categorization**

| | |
|---|---|
| **Acute Health Hazard** | Yes |
| **Chronic Health Hazard** | Yes |
| **Fire Hazard** | Yes |
| **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 |
|---|---|---|---|---|
| Ethylbenzene | X | 1000 lb | X | X |

**Clean Air Act**

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---|---|---|---|
| Ethylbenzene | X | | - |

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

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Ethylbenzene | 1000 lb | - |

**California Proposition 65** This product contains the following Proposition 65 chemicals:

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|
| Ethylbenzene | 100-41-4 | Carcinogen | 54 µg/day<br>41 µg/day | Carcinogen |

**State Right-to-Know**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Ethylbenzene | 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** Serious risk, Grade 3

**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** B2 Flammable liquid
D2A Very toxic materials



## 16. Other information

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

**Creation Date** 06-Aug-2010
**Revision Date** 30-Oct-2014
**Print Date** 30-Oct-2014
**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 4.17
Revision Date 03/03/2015
Print Date 05/01/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Trichlorofluoromethane

Product Number : 254991
Brand : Aldrich

CAS-No. : 75-69-4

### 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, Dermal (Category 4), H312

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)
H312 Harmful in contact with skin.

Precautionary statement(s)
P280 Wear protective gloves/ protective clothing.
P302 + P352 + P312 IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P363 Wash contaminated clothing before reuse.
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 : Fluorotrichloromethane
CFC-11

| | | |
|---|---|---|
| Formula | : | $CCl_3F$ $CCl_3F$ |
| Molecular weight | : | 137.37 g/mol |
| CAS-No. | : | 75-69-4 |
| EC-No. | : | 200-892-3 |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Trichlorofluoromethane** | | |
| | Acute Tox. 4; H312 | <= 100 % |

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

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

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

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

**In case of skin contact**
Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**
Flush eyes with water as a precaution.

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

### 4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed
No data available

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

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

### 5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas, Hydrogen fluoride

### 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.
For personal protection see section 8.

### 6.2 Environmental precautions
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.

Recommended storage temperature 2 - 8 °C

Contents under pressure.
Storage class (TRGS 510): Non Combustible Liquids

### 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 |
|---|---|---|---|---|
| Trichlorofluoromethane | 75-69-4 | C | 1,000.000000 ppm | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Cardiac sensitization<br>Not classifiable as a human carcinogen | | |
| | | C | 1,000.000000 ppm<br>5,600.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 1,000.000000 ppm<br>5,600.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | The value in mg/m3 is approximate. | | |

### 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.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 480 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.2 mm
Break through time: 30 min

Material tested:Dermatril® P (KCL 743 / Aldrich Z677388, 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 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**
Do not let product enter drains.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: liquid, clear<br>Colour: colourless |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | -110.99 - -109.99 °C (-167.78 - -165.98 °F) |
| f) | Initial boiling point and boiling range | 23.7 °C (74.7 °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 | 885.7 hPa (664.3 mmHg) at 20.0 °C (68.0 °F)<br>2,701.2 hPa (2,026.1 mmHg) at 55.0 °C (131.0 °F) |
| l) | Vapour density | No data available |
| m) | Relative density | 1.494 g/cm3 at 25 °C (77 °F) |
| n) | Water solubility | 1 g/l |
| o) | Partition coefficient: n-octanol/water | log Pow: 2.53 |
| 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**

Surface tension 18.0 mN/m at 25.0 °C (77.0 °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**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents, Sodium/sodium oxides, Potassium, Magnesium, Aluminum, Zinc

**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 - > 15,000 mg/kg

LC50 Inhalation - Rat - 0.3 h - 130000 ppm
Remarks: Behavioral:Tremor. Behavioral:Convulsions or effect on seizure threshold. Respiratory disorder

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.

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: PB6125000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated., Nausea, Dizziness, Headache, Vomiting, Diarrhoea, Abdominal pain, Weakness, Unconsciousness

Liver -

## 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**

## 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)**
UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (Trichlorofluoromethane)
Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

**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 |
|---|---|---|
| Trichlorofluoromethane | 75-69-4 | 2007-07-01 |

**SARA 311/312 Hazards**
Acute Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Trichlorofluoromethane | 75-69-4 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Trichlorofluoromethane | 75-69-4 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Trichlorofluoromethane | 75-69-4 | 2007-07-01 |

**California Prop. 65 Components**

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

## 16. OTHER INFORMATION

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

| | |
|---|---|
| Acute Tox. | Acute toxicity |
| H312 | Harmful in contact with skin. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 1 |
| Chronic Health Hazard: | |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

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

**Further information**

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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 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: 4.17 Revision Date: 03/03/2015 Print Date: 05/01/2016

# SAFETY DATA SHEET

Halocarbon R-12 (Dichlorodifluoromethane)

## Section 1. Identification

**GHS product identifier** : Halocarbon R-12 (Dichlorodifluoromethane)

**Chemical name** : dichlorodifluoromethane

**Other means of identification** : ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12

**Product use** : Synthetic/Analytical chemistry.

**Synonym** : ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12

**SDS #** : 001018

**Supplier's details** : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

**Emergency telephone number (with hours of operation)** : 1-866-734-3438

## Section 2. Hazards identification

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture** : GASES UNDER PRESSURE - Liquefied gas
HAZARDOUS TO THE OZONE LAYER - Category 1

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Warning

**Hazard statements** : Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.
Harms public health and the environment by destroying ozone in the upper atmosphere.

**Precautionary statements**

**General** : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position.

**Prevention** : Use and store only outdoors or in a well ventilated place.

**Response** : Not applicable.

**Storage** : Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

**Disposal** : Refer to manufacturer/supplier for information on recovery/recycling.



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# Section 2. Hazards identification

**Hazards not otherwise classified** : Liquid can cause burns similar to frostbite.

# Section 3. Composition/information on ingredients

**Substance/mixture** : Substance

**Chemical name** : dichlorodifluoromethane

**Other means of identification** : ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12

## CAS number/other identifiers

**CAS number** : 75-71-8

**Product code** : 001018

| Ingredient name | % | CAS number |
|---|---|---|
| Methane, dichlorodifluoro- | 100 | 75-71-8 |

**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

**Eye contact** : 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 if irritation occurs.

**Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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 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. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

**Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Wash clothing before reuse. Clean shoes thoroughly before reuse.

**Ingestion** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if adverse health effects persist or are severe. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. 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. As this product rapidly becomes a gas when released, refer to the inhalation section.

## Most important symptoms/effects, acute and delayed

### Potential acute health effects

**Eye contact** : Liquid can cause burns similar to frostbite.

**Inhalation** : Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.



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# Section 4. First aid measures

**Skin contact** : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

**Frostbite** : Try to warm up the frozen tissues and seek medical attention.

**Ingestion** : Ingestion of liquid can cause burns similar to frostbite.

## Over-exposure signs/symptoms

**Eye contact** : Adverse symptoms may include the following:
frostbite

**Inhalation** : No specific data.

**Skin contact** : Adverse symptoms may include the following:
frostbite

**Ingestion** : Adverse symptoms may include the following:
frostbite

## Indication of immediate medical attention and special treatment needed, if necessary

**Notes to physician** : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

**Specific treatments** : No specific treatment.

**Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

**See toxicological information (Section 11)**

# Section 5. Fire-fighting measures

## Extinguishing media

**Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.

**Unsuitable extinguishing media** : None known.

**Specific hazards arising from the chemical** : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

**Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides

**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. Contact supplier immediately for specialist advice. 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. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.



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# 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. Avoid breathing gas. 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** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. 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). May be harmful to the environment if released in large quantities.

## Methods and materials for containment and cleaning up

**Small spill** : Immediately contact emergency personnel. Stop leak if without risk.

**Large spill** : Immediately contact emergency personnel. Stop leak if without risk. 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). Contains gas under pressure. Do not get in eyes or on skin or clothing. Avoid breathing gas. Avoid release to the environment. Refer to special instructions/safety data sheet. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

**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 away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

# Section 8. Exposure controls/personal protection

## Control parameters

### Occupational exposure limits



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# Section 8. Exposure controls/personal protection

| Ingredient name | Exposure limits |
|---|---|
| Methane, dichlorodifluoro- | **ACGIH TLV (United States, 3/2012).**<br>TWA: 4950 mg/m³ 8 hours.<br>TWA: 1000 ppm 8 hours.<br>**NIOSH REL (United States, 1/2013).**<br>TWA: 4950 mg/m³ 10 hours.<br>TWA: 1000 ppm 10 hours.<br>**OSHA PEL (United States, 6/2010).**<br>TWA: 4950 mg/m³ 8 hours.<br>TWA: 1000 ppm 8 hours.<br>**OSHA PEL 1989 (United States, 3/1989).**<br>TWA: 4950 mg/m³ 8 hours.<br>TWA: 1000 ppm 8 hours. |

**Appropriate engineering controls** : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

**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.

## 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: safety glasses with side-shields.

### 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. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. 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.

**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.



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# Section 9. Physical and chemical properties

**Appearance**

**Physical state** : Gas. [Liquefied gas]

**Color** : Colorless.

**Molecular weight** : 120.91 g/mole

**Molecular formula** : C-Cl2-F2

**Boiling/condensation point** : -29.8°C (-21.6°F)

**Melting/freezing point** : -158°C (-252.4°F)

**Critical temperature** : 111.85°C (233.3°F)

**Odor** : Characteristic.

**Odor threshold** : Not available.

**pH** : Not available.

**Flash point** : [Product does not sustain combustion.]

**Burning time** : Not applicable.

**Burning rate** : Not applicable.

**Evaporation rate** : Not available.

**Flammability (solid, gas)** : Not available.

**Lower and upper explosive (flammable) limits** : Not available.

**Vapor pressure** : 84.9 (psia)

**Vapor density** : 4.2 (Air = 1)

**Specific Volume ($ft^3/lb$)** : 3.1746

**Gas Density ($lb/ft^3$)** : 0.315

**Relative density** : Not applicable.

**Solubility** : Not available.

**Solubility in water** : 0.3 g/l

**Partition coefficient: n-octanol/water** : 2.16

**Auto-ignition temperature** : Not available.

**Decomposition temperature** : Not available.

**SADT** : Not available.

**Viscosity** : Not applicable.

# 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** : No specific data.

**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.



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# Section 10. Stability and reactivity

**Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

# Section 11. Toxicological information

## Information on toxicological effects

### Acute toxicity

Not available.

### Irritation/Corrosion

Not available.

### Sensitization

Not available.

### Mutagenicity

Not available.

### Carcinogenicity

Not available.

### 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** : Liquid can cause burns similar to frostbite.

**Inhalation** : Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

**Skin contact** : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

**Ingestion** : Ingestion of liquid can cause burns similar to frostbite.

## Symptoms related to the physical, chemical and toxicological characteristics

**Eye contact** : Adverse symptoms may include the following:
frostbite

**Inhalation** : No specific data.

**Skin contact** : Adverse symptoms may include the following:
frostbite



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# Section 11. Toxicological information

**Ingestion** : Adverse symptoms may include the following:
frostbite

## 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

**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 | $LogP_{ow}$ | BCF | Potential |
|---|---|---|---|
| Methane, dichlorodifluoro- | 2.16 | 6.17 | low |

## Mobility in soil

**Soil/water partition coefficient ($K_{OC}$)** : Not available.

**Other adverse effects** : No known significant effects or critical hazards.



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# 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. Empty Airgas-owned pressure vessels should be returned to Airgas. 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. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

**United States - RCRA Toxic hazardous waste "U" List**

| Ingredient | CAS # | Status | Reference number |
|---|---|---|---|
| Dichlorodifluoromethane; Methane, dichlorodifluoro- | 75-71-8 | Listed | U075 |

# Section 14. Transport information

| | DOT | TDG | Mexico | IMDG | IATA |
|---|---|---|---|---|---|
| **UN number** | UN1028 | UN1028 | UN1028 | UN1028 | UN1028 |
| **UN proper shipping name** | DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12 | DICHLORODIFLUOROMETHANE; OR REFRIGERANT GAS R 12 | DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12 | DICHLORODIFLUOROMETHANE (REFRIGERANT GAS R 12) | DICHLORODIFLUOROMETHANE |
| **Transport hazard class(es)** | 2.2   | 2.2   | 2.2   | 2.2   | 2.2   |
| **Packing group** | - | - | - | - | - |
| **Environment** | No. | No. | No. | No. | No. |
| **Additional information** | **Reportable quantity** 5000 lbs / 2270 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.<br><br>**Limited quantity** Yes.<br><br>**Packaging instruction**<br>**Passenger aircraft** Quantity limitation: 75 kg<br><br>**Cargo aircraft** Quantity limitation: 150 kg<br><br>**Special provisions** T50 | **Explosive Limit and Limited Quantity Index** 0.125<br><br>**Passenger Carrying Road or Rail Index** 75 | - | - | **Passenger and Cargo Aircraft** Quantity limitation: 75 kg<br>**Cargo Aircraft Only** Quantity limitation: 150 kg |

**"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."**



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# Section 14. Transport information

**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

**TSCA 12(b) annual export notification**: dichlorodifluoromethane

**United States inventory (TSCA 8b)**: This material is listed or exempted.

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Not listed

**Clean Air Act Section 602 Class I Substances** : 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** : Sudden release of pressure

### Composition/information on ingredients

| Name | % | Fire hazard | Sudden release of pressure | Reactive | Immediate (acute) health hazard | Delayed (chronic) health hazard |
|---|---|---|---|---|---|---|
| Methane, dichlorodifluoro- | 100 | No. | Yes. | No. | No. | No. |

## SARA 313

| | Product name | CAS number | % |
|---|---|---|---|
| Form R - Reporting requirements | dichlorodifluoromethane | 75-71-8 | 100 |
| Supplier notification | dichlorodifluoromethane | 75-71-8 | 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.



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# Section 15. Regulatory information

**New Jersey** : This material is listed.

**Pennsylvania** : This material is listed.

**Canada inventory** : This material is listed or exempted.

**International regulations**

**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)**: Not determined.
**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

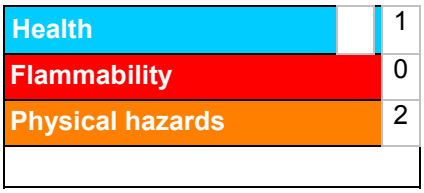
**Canada**

**WHMIS (Canada)** : Class A: Compressed gas.
**CEPA Toxic substances**: This material is 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 A: Compressed gas.

**Hazardous Material Information System (U.S.A.)**




**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.)**






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# Section 16. Other information

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**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** : 5/21/2015.

**Date of issue/Date of revision** : 5/21/2015.

**Date of previous issue** : 5/21/2015.

**Version** : 2

**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 NationsACGIH – 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.**

**Other special considerations** : WARNING: Contains (Dichlorodifluoromethane), a substance which harms the public health and environment by destroying ozone in the upper atmosphere.

## Notice to reader



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# 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.**



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## 1. IDENTIFICATION

Product Identifier: No. 2 Fuel Oil

Synonyms: No. 2 Heating Oil, #2 Fuel Oil, Heating Oil Plus™, Low Sulfur Heating Oil (LSHO), Ultra Low Sulfur Heating Oil (ULSHO)

Intended use of the product: Fuel

Contact:
Global Companies LLC
Water Mill Center
800 South St.
Waltham, MA 02454-9161
www.globalp.com

Contact Information: EMERGENCY TELEPHONE NUMBER (24 hrs.): CHEMTREC (800) 424-9300
COMPANY CONTACT (business hours): 800-542-0778

## 2. HAZARD IDENTIFICATION

**According to OSHA 29 CFR 1910.1200 HCS**

Classification of the Substance or Mixture

Classification (GHS-US):

| | | |
|---|---|---|
| Flam. Liquid | Category 3 | H226 |
| Skin Corrosion/Irritation | Category 2 | H315 |
| Aspiration Hazard | Category 1 | H304 |
| Acute toxicity – Inhalation | Category 4 | H332 |
| STOT SE | Category 3 | H336 |
| Carcinogenicity | Category 2 | H350 |
| Aquatic Chronic | Category 2 | H411 |
| Eye damage/Irritation | Category 2 | H319 |

Labeling Elements



Signal Word (GHS-US): **Danger**

Hazard Statements (GHS-US):
H226 – Flammable liquid and vapor.
H315 – Causes Skin irritation.
H304 – May be fatal if swallowed and enters airways.
H332—Harmful if inhaled.
H336 – May cause drowsiness or dizziness.
H350 – May cause cancer.
H411 – Toxic to aquatic life with long lasting effects.
H319 – May cause eye damage/irritation.

Precautionary Statements (GHS-US):
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 pursuant to applicable electrical code.
P242 – Use only non-sparking tools.
P243 – Take precautionary measures against static discharge.
P261 – Avoid breathing dust/fume/gas/mist/vapors/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 protective gloves/protective clothing/eye protection/face protection.
P303+361+353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse with water/shower.
P308+311 - If exposed or concerned: Get medical advice/attention.
P301+310 - If swallowed: Immediately call a poison center/doctor/…
P331 - Do NOT induce vomiting.
P370+P378 – In case of fire use firefighting foam or other appropriate media for Class B fires to extinguish.
P403+235 - Store in a well-ventilated place. Keep cool.
P405 - Store locked up.
P501 – Dispose of contents/container in accordance with local/regional/national/international regulation.

**Other information:**

NFPA 704
Health: 1
Fire: 2
Reactivity: 0




## 3. COMPOSITION / INFORMATION ON INGREDIENTS

**Chemical Composition Information**
Mixture

| Name | Product Identifier (CAS#) | % (w/w) | Classification |
|---|---|---|---|
| No. 2 Fuel Oil | 68476-30-2 | 95-100 | Flam Liq. 3, H226; Skin Irrit. 2, H315; Aspiration 1, H304; STOT SE 3, H336; Carc.2. H350; Aquatic chronic 2, H411 |
| Methyl Esters | N/A | 0-5 | N/A |
| Naphthalene | 91-20-3 | 0.1 | Carc. 2, H351; Acute Tox. 4, H302; Aquatic Acute 1, H400; Aquatic Chronic 1, H411 |

**Additional Formulation Information:**
No. 2 Fuel Oil consists of C9+ hydrocarbons resulting from distillation of crude oil.

Low Sulfur Heating Oil typically contains less than 500 ppm of sulfur

Ultra Low Sulfur Heating Oil typically contains less than 15 ppm of sulfur

## 4. FIRST AID MEASURES

| Route | Measures |
|---|---|
| Inhalation | Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately. |
| Ingestion | Aspiration Hazard: 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. 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 failure, and death. |
| Eye Contact | 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. In case of contact lenses, remove immediately. |
| Skin Contact | Remove contaminated clothing and shoes. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and of the area of the body burned. |

**Most Important Symptoms**
Contact with eyes and face may cause irritation. Long-term exposure may cause dermatitis (itching, irritation, pain and swelling).

Inhalation may cause irritation and significant or long term exposure could cause respiratory insufficiency and pulmonary edema.

Ingestion may cause aspiration, gastrointestinal disturbance, and CNS effects.

**Immediate Medical Attention and Special Treatment**
For contact with skin or eyes, immediately wash or flush contaminated eyes with gently flowing water. If possible, irrigate each eye continuously with 0.9% saline (NS). If ingested, rinse mouth. Do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).

If inhaled, administer oxygen or establish a patent airway if breathing is labored. Suction if necessary. Monitor closely, anticipate seizures. Consider orotracheal or nostracheal intubation of airway control if patient is unconscious or is in severe respiratory distress.

Discard any clothing or shoes contaminated as they may be flammable.

## 5. FIRE-FIGHTING MEASURES

**Extinguishing Media**
Foam, carbon dioxide, dry chemical are most suitable

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, C02, water spray, firefighting foam, or Halon. Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment.

LARGE FIRES: Foam, carbon dioxide, dry chemical. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

**Specific Hazards / Products of Combustion**
Moderate fire hazard when exposed to heat or flame with a very low flash point. Product is flammable and easily ignited when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. 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.

Combustion may produce smoke, carbon monoxide and other products of incomplete combustion.

**Special Precautions and Protective Equipment for Firefighters**
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 firefighting foam.

**Fighting Equipment/Instructions**
Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH- approved pressure-demand self-contained breathing apparatus with full face piece and protective clothing.

**Refer to Section 9 for fire properties of this chemical including flash point, auto ignition temperature, and explosive limits.**

## 6. ACCIDENTAL RELEASE MEASURES

**ACTIVATE FACILITY SPCC, SPILL CONTINGENCY or EMERGENCY PLAN.**

**Personal Precautions**
Due to high vapor density, flammable / toxic vapors may be present in low lying areas, dikes, pits, drains, or trenches. Vapors may accumulate in low lying areas and reach ignitable concentrations. Ventilate the area. Use of non-sparking tools and intrinsically safe equipment is recommended. Potential for flammable atmosphere should be monitored using a combustible gas indicator positioned downwind of the spill area. Refer to Sections 2 and 7 for further hazard warnings and handling instructions.

Use appropriate personal protective equipment to prevent eye/skin contact and absorption. Use NIOSH approved respiratory protection, if warranted, to prevent exposures above permissible limits. Refer to Section 8. Contaminated clothing should not be near sources of ignition.

**Emergency Measures**
As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Consider wind direction. Secure all ignition sources (flame, spark, hot work, hot metal, etc.) from area. Evaluate the direction of product travel, diking sewers, etc. to confirm spill areas. Do not touch or walk-through spilled material. For large spills, isolate initial action distance downwind 1,000 ft. (300 m).

**Environmental Precautions**
Stop the spill to prevent environmental release if it can be done safely. Product is toxic to aquatic life. Take action to isolate environmental receptors including drains, storm sewers and natural water bodies. Keep on impervious surface if at all possible. Use water sparingly to prevent product from spreading. Foam and absorbents may be used to reduce / prevent airborne release.

Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Follow federal, state or local requirements for reporting environmental release where necessary. Refer to Section 15 for further information.

**Containment and Clean-Up Methods**
Carefully contain and stop the source of the spill, if safe to do so. 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 firefighting 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.

Take up with dry earth, sand or other non-combustible, inert oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container with clean, non-sparking tools for reclamation or disposal. Response and cleanup crews must be properly trained and must utilize proper protective equipment. Refer to Section 8 for appropriate protective equipment.

## 7. HANDLING AND STORAGE

**USE ONLY AS A FUEL.**
**DO NOT SIPHON BY MOUTH.**

**Handling Precautions**
Handle as a flammable liquid. Keep away from heat, sparks, and open flame. No smoking. Electrical equipment should be approved for classified area. Bond and ground containers during product transfer pursuant to NFPA 70 and API RP 2003 to

reduce the possibility of static-initiated fire or explosion. Follow precautions to prevent static initiated fire.

Use good personal hygiene practices. Use only with protective equipment specified in Section 8. Avoid repeated and/or prolonged skin exposure. Use only outdoors or in well ventilated areas. 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. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

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 RP 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

**Storage**
Large quantities of fuel oil are stored in tanks or portable containers at an ambient storage temperature. Separate from incompatible chemicals (Refer to Section 10) by distance or secondary containment. Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers that are clearly labeled. Label all secondary containers that this material is transferred into with the chemical name and associated hazard(s). Empty product containers or vessels may contain flammable vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Storage tanks should have a venting system. If stored in small containers, the area should be well ventilated, away from ignition sources and protected from potential damage or vehicular traffic. Post “No Smoking” signs in product storage areas. This storage area should comply with NFPA 30 “Flammable and Combustible Liquid Code” or applicable building 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 “Safe Entry and Cleaning of Petroleum Storage Tanks”.

**Incompatibles**
Keep away from strong oxidizers, ignition sources and heat.

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Occupational Exposure Limits**

| Component | CAS # | List | Value |
|---|---|---|---|
| No. 2 Fuel Oil | 68476-30-2 | ACGIH TLV-TWA | 100 mg/m3* |
| Naphthalene | 91-20-3 | ACGIH TLV-TWA<br>OSHA PEL<br>ACGIH STEL | 10 ppm<br>10 ppm<br>15 ppm |

*Critical effects; Skin; A3; CNS impairment.

**Engineering Controls**
Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Intrinsically safe equipment and non-sparking tools shall be used in circumstances where concentrations may exceed lower flammable limits. Grounding and bonding shall be used to prevent accumulation and discharge of static electricity. Emergency shower and eyewash should be provided in proximity to handling areas in the event of exposure to decontaminate.

**Personal Protective Equipment**

| Exposure | Equipment |
|---|---|
| Eye / Face | Wear appropriate chemical protective glasses or goggles or face shields to prevent skin and eye contact especially caused from splashing. |
| Skin | Wear appropriate personal protective clothing to prevent skin contact. Gloves constructed of nitrile, neoprene or PVC are recommended when handling this material. 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. |

| Exposure | 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. 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 and limitations.<br><br>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. |
| Thermal | Product is stored at ambient temperature. No thermal protection is required except for emergency operations involving actual or potential for fire. Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. |

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| Property | Value | |
|---|---|---|
| Appearance | Clear or straw-colored liquid dyed red for distribution | |
| Odor | Mild petroleum distillate odor. | |
| Odor Threshold | <1 ppm | |
| pH | Not available | |
| Melting Point | -15 ˚F (-26 ˚C) | |
| Boiling Point Range | 320 to 690 ˚F (160 to 366 ˚C) | |
| Flash Point | >125.6 ˚F (52 ˚C) PMCC | |
| Evaporation Rate | Slow, varies with conditions | |
| Flammability | Flammable liquid | |
| Flammable Limits | 0.6 % - 7.5% | |
| Vapor Pressure | 0.009 psia @ 70 ˚F | |
| Vapor Density | >1 | (air=1) |
| Specific Gravity | 0.81-0.88 @ 60 ˚F (16 ˚C) | (water=1) |
| Solubility | Insoluble in water; miscible with other petroleum solvents. | |
| Partition Coefficient (N-octanol/water) | Log Kow range of 3.3 to >.6.0 | |
| Autoignition Temperature | 494 ˚F (257 ˚C) | |
| Decomposition Temperature | When heated it emits acrid smoke and irritating vapors. | |
| Viscosity | >3 cSt | |
| Percent Volatiles | 95-100 | |

## 10. STABILITY AND REACTIVITY

**Stability**
This is a stable material that is flammable liquid (OSHA/GHS hazard category 3). Stable during transport.

**Reactivity**
Material is not self-reacting. Flammable concentrations may be present in air. Compound can react with oxidizing materials.

**Possibility of Hazardous Reactions**
Hazardous polymerization will not occur.

**Incompatibility**
Keep away from strong oxidizers such as nitric and sulfuric acids.

**Conditions to Avoid**
Avoid high temperatures, open flames, sparks, static electricity, welding, smoking and other ignition sources.

**Hazardous Decomposition Products**
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

## 11. TOXICOLOGICAL INFORMATION

**Acute Toxicity:**
Acute Toxicity (Inhalation LC50)

No. 2 Fuel Oil (68476-30-2)
LC50 Inhalation Rat >4.6 mg/l/4h

Acute Toxicity (Dermal LD50)

No. 2 Fuel Oil (68476-30-2)
LD50 Dermal Rabbit >2000 mg/kg

Acute Toxicity (Oral LD50)

No. 2 Fuel Oil (68476-30-2)
LD50 Oral Rat >12000 mg/kg

Acute Toxicity (Oral LD50)

Methyl Esters
LD50 Oral Rat >14400 mg/kg

Skin Corrosion/Irritation: Prolonged and repeated contact may cause skin irritation leading to dermatitis. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

Serious Eye Damage/Irritation: Causes serious eye irritation.

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: OSHA: NO, IARC: Group 3, NTP: NO, ACGIH: NOIC:A3, NIOSH: NO

IARC: Group 3 – Not classifiable as to their carcinogenicity to humans ACGIH: A3 – Confirmed animal carcinogen with unknown relevance to humans

Petroleum middle distillates have been shown to produce skin tumors in laboratory animals following repeated and prolonged exposures. 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.

This product is similar to Diesel Fuel. IARC classifies whole diesel fuel exhaust particulates (byproduct of combustion of this material) carcinogenic to humans (Group 1) and NIOSH regards diesel fuel exhaust particulate as a potential occupational carcinogen.

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Specific Target Organ Toxicity (Single Exposure): Inhalation exposure may cause drowsiness or dizziness by inhalation exposure.

Aspiration 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.

Potential Health Effects: Vapor irritating to skin, eyes, nose, and throat. 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.

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.

## 12. ECOLOGICAL INFORMATION

**Toxicity**
This material is expected to be toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

Data for Component: No. 2 Fuel Oil (68476-30-2)

Material is toxic to aquatic organisms based on an acute basis (LC50/EC50 >1 but $\leq$ 10 mg/L in the most sensitive species tested).

Material is a long-term aquatic hazard based on a chronic basis (LC50/EC50 >1 but $\leq$ 10 mg/L in the most sensitive species tested).

Persistence and Degradation: This material is not expected to be readily biodegradable.

Bioaccumulative Potential: Not available

Mobility in Soil: Not available

Other Adverse Effects: None known

Other Information: Avoid release to the environment.

## 13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options. May be considered a hazardous waste if disposed. Direct solid waste (landfill) or incineration at a solid waste facility is not permissible. Do not discharge to sanitary or storm sewer. Personnel handling waste containers should follow precautions provided in this document.

Shipping containers must be DOT authorized packages. Follow licensure and regulations for transport of hazardous material and hazardous waste as applicable.

## 14. TRANSPORT INFORMATION

**US DOT**

| | |
|---|---|
| UN Identification Number | NA 1993 |
| Proper Shipping Name | Fuel oil (No. 2) |
| Hazard Class and Packing Group | 3, PGIII |
| Shipping Label | Combustible liquid |
| Placard / Bulk Package | Combustible liquid, 1993 |
| Emergency Response Guidebook Guide Number | 128 |

**IATA Information**

| | |
|---|---|
| UN Identification Number | UN 1993 |
| Proper Shipping Name | Fuel oil (No. 2) |
| Hazard Class and Packing Group | 3, PGIII |
| ICAO Label | 3 |
| Packing Instructions Cargo | 355 |
| Max Quantity Per Package Cargo | 220L |
| Packing Instructions Passenger | 344Y |
| Max Quantity per Package | 60L |

**ICAO**

| | |
|---|---|
| UN Identification Number | UN 1993 |
| Shipping Name / Description | Fuel oil (No. 2) |
| Hazard Class and Packing Group | 3, PG III |
| IMDG Label | 3 |

**IMDG**

| | |
|---|---|
| UN Identification Number | UN 1993 |
| Shipping Name / Description | Heating Oil, Light |
| Hazard Class and Packing Group | 3, PGIII |
| IMDG Label | 3 |
| EmS Number | N/A |
| Marine Pollutant | Yes |

## 15. REGULATORY INFORMATION

**U.S. Federal, State, and Local Regulatory Information**
Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

**OSHA Hazard Communication Standard**
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

**Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning And Community Right-to-Know Act of 1986) Sections 311 and 312**

| | |
|---|---|
| Immediate (Acute) Health Hazard | Yes |
| Delayed (Chronic) Health Hazard | Yes |
| Fire Hazard | Yes |
| Reactive Hazard | No |
| Sudden Release of Pressure Hazard | No |

**Clean Water Act (Oil Spills)**
Any spill or release of this product to “navigable waters” (Essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

**CERCLA Section 103 and SARA Section 304 (Release to the Environment)**
The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts this material. This product does not contain any chemicals subject to the reporting requirements of CERCLA Section 103 or SARA 304.

**SARA Section 313- Supplier Notification**
This product does not contain any chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

**EPA Notification (Oil Spills)**
If the there is a discharge of more than 1,000-gallons of oil into or upon navigable waters of the United States, or if it is the second spill event of 42 gallons or more of oil into water within a twelve (12) month period, a written report must be submitted to the Regional Administrator of the EPA within sixty days of the event.

**Pennsylvania Right to Know Hazardous Substance list:**
The following product components are cited in the Pennsylvania Special Hazardous Substance List, and are present at levels which require reporting.

| Component | CAS | Amount |
|---|---|---|
| No. 2 Fuel Oil | 68476-30-2 | 100% |

**New Jersey Right to Know Hazardous Substance list:**
The following product components are cited in the New Jersey Right to Know Hazardous Substance List, and are present at levels which require reporting.

| Component | CAS | Amount |
|---|---|---|
| No. 2Fuel Oil | 68476-30-2 | 100% |

**California Proposition 65 WARNING: This product contains chemicals known to the State of California to cause Cancer or Reproductive Toxicity.**

| Component | CAS | Amount |
|---|---|---|
| Naphthalene | 91-20-3 | <0.1% |

**U.S. Toxic Substances Control Act**
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30.

**CEPA - Domestic Substances List (DSL)**
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

**Canadian Regulatory Information (WHMIS)**
Class B3 – Combustible Liquid
Class D2A – Materials causing other toxic effects. (Very Toxic)

## 16. OTHER INFORMATION

| | |
|---|---|
| Version | 4 |
| Issue Date | May 20, 2016 |
| Prior Issue Date | May 3, 2015 |

**Description of Revisions**
Revised to meet Globally Harmonized System for chemical hazard communication requirements pursuant to OSHA regulatory revisions 77 FR 17884, March 26, 2012.

**Abbreviations**

| | |
|---|---|
| ˚F | Degrees Fahrenheit (temperature) |
| < | Less than |
| = | Equal to |
| > | Greater than |
| AP | Approximately |
| C | Centigrade (temperature) |
| kg | Kilogram |
| L | Liter |
| mg | Milligrams |
| mL | Milliliter |
| $mm^2$ | Square millimeters |
| mmHg | Millimeters of mercury (pressure) |
| N/A | Not applicable |
| N/D | Not determined |
| ppm | Parts per million |
| sec | Second |
| ug | Micrograms |

**Acronyms**

| | |
|---|---|
| ACGIH | American Conference of Governmental Industrial Hygienists |
| AIHA | American Industrial Hygiene Association |
| AL | Action Level |
| ANSI | American National Standards Institute |
| API | American Petroleum Institute |
| CAS | Chemical Abstract Service |
| CERCLA | Comprehensive Emergency Response, Compensation, and Liability Act |
| DOT | U.S. Department of Transportation |
| EC50 | Ecological concentration 50% |
| EPA | U.S. Environmental Protection Agency |
| ERPG | Emergency Response Planning Guideline |
| GHS | Global Harmonized System |

| | |
|---|---|
| HMIS | Hazardous Materials Information System |
| IARC | International Agency for Research On Cancer |
| IATA | International Air Transport Association |
| IMDG | International Maritime Dangerous Goods |
| Koc | Soil Organic Carbon |
| LC50 | Lethal concentration 50% |
| LD50 | Lethal dose 50% |
| MSHA | Mine Safety and Health Administration |
| NFPA | National Fire Protection Association |
| NIOSH | National Institute of Occupational Safety and Health |
| NOIC | Notice of Intended Change |
| NTP | National Toxicology Program |
| OPA | Oil Pollution Act of 1990 |
| OSHA | U.S. Occupational Safety & Health Administration |
| PEL | Permissible Exposure Limit (OSHA) |
| RCRA | Resource Conservation and Recovery Act Reauthorization Act of 1986 Title III |
| REL | Recommended Exposure Limit (NIOSH) |
| RVP | Reid Vapor Pressure |
| SARA | Superfund Amendments and |
| SCBA | Self Contained Breathing Apparatus |
| SPCC | Spill Prevention, Control, and Countermeasures |
| STEL | Short Term Exposure Limit (generally 15 minutes) |
| TLV | Threshold Limit Value (ACGIH) |
| TSCA | Toxic Substances Control Act |
| TWA | Time Weighted Average (8 hr.) |
| UN | United Nations |
| UNECE | United Nations Economic Commission for Europe |
| WEEL | Workplace Environmental Exposure Level (AIHA) |
| WHMIS | Canadian Workplace Hazardous Materials Information System |

**Disclaimer of Expressed and Implied Warranties**

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 Safety Data Sheet **

# SAFETY DATA SHEET

Version 5.5
Revision Date 05/27/2016
Print Date 07/13/2017

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Indeno[1,2,3-*cd*]pyrene

Product Number : 48499
Brand : Supelco

CAS-No. : 193-39-5

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

Identified uses : Laboratory chemicals, 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 2), H351

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

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Warning

Hazard statement(s)
H351 Suspected of causing cancer.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

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

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Formula : $C_{22}H_{12}$
Molecular weight : 276.33 g/mol
CAS-No. : 193-39-5
EC-No. : 205-893-2

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Indeno[1,2,3-cd]pyrene** | | |
| | Carc. 2; H351 | <= 100 % |

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

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

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

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

**In case of skin contact**
Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**
Flush eyes with water as a precaution.

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

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

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

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

No data available

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

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

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

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.

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

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

### 6.4 Reference to other sections

For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

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

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non Combustible Solids

### 7.3 Specific end use(s)

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

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**
Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

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

**Personal protective equipment**

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

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

**Body Protection**
Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: solid |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |

| | | |
|---|---|---|
| d) | pH | No data available |
| e) | Melting point/freezing point | 163.6 °C (326.5 °F) |
| f) | Initial boiling point and boiling range | 536.0 °C (996.8 °F) |
| g) | Flash point | No data available |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | No data available |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

**9.2 Other safety information**
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

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

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents

**10.6 Hazardous decomposition products**
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**
No data available

**Carcinogenicity**

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

Limited evidence of carcinogenicity in animal studies

| | |
|---|---|
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene) |
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene) |
| ACGIH: | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH. |
| NTP: | Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene) |
| NTP: | Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene) |
| OSHA: | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. |
| | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. |

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: Not available

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

## 12. ECOLOGICAL INFORMATION

**12.1 Toxicity**
No data available

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

No data available

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

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

## 14. TRANSPORT INFORMATION

**DOT (US)**
Not dangerous goods

**IMDG**
Not dangerous goods

**IATA**
Not dangerous goods

## 15. REGULATORY INFORMATION

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

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

**SARA 311/312 Hazards**
Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Indeno[1,2,3-cd]pyrene | 193-39-5 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Indeno[1,2,3-cd]pyrene | 193-39-5 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Indeno[1,2,3-cd]pyrene | 193-39-5 | 1993-04-24 |

**California Prop. 65 Components**

| | | |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause cancer. Indeno[1,2,3-cd]pyrene | CAS-No. 193-39-5 | Revision Date 2007-09-28 |
| WARNING! This product contains a chemical known to the State of California to cause cancer. | CAS-No. 193-39-5 | Revision Date 2007-09-28 |

Indeno[1,2,3-cd]pyrene

## 16. OTHER INFORMATION

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

| | |
|---|---|
| Carc. | Carcinogenicity |
| H351 | Suspected of causing cancer. |

**HMIS Rating**

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

**NFPA Rating**

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

**Further information**

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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 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: 05/27/2016 Print Date: 07/13/2017

**Iron Filings, 40 mesh**

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

**Product name** : **Iron Filings, 40 mesh**

**Manufacturer/Supplier Trade name**:

**Manufacturer/Supplier Article number**: **S25369**

**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

**Combustible Dust Hazard: :**
May form combustible dust concentrations in air (during processing).

**Other Non-GHS Classification**:

**WHMIS**
**NFPA/HMIS**



NFPA SCALE (0-4)



HMIS RATINGS (0-4)

## SECTION 3 : Composition/information on ingredients

| **Ingredients:** | | |
|---|---|---|
| CAS 7439-89-6 | Iron | 100 % |
| | | 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. Use spark-proof tools and explosion-proof 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 eyeware, gloves, and clothing. Refer to Section 8.Always obey local regulations.Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect solids in powder form using vacuum with (HEPA filter). 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:** | , , OSHA PEL TWA (Total Dust) 15 mg/m3 (50 mppcf*)<br>, , ACGIH TLV TWA (inhalable particles) 10 mg/m3 |
| **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.

## SECTION 9 : Physical and chemical properties

| | | | |
|---|---|---|---|
| **Appearance (physical state,color)**: | Solid | **Explosion limit lower**:<br>**Explosion limit upper**: | Not determined<br>Not determined |
| **Odor**: | Not Determined | **Vapor pressure**: | Not determined |
| **Odor threshold**: | Not determined | **Vapor density**: | Not determined |
| **pH-value**: | Not Determined | **Relative density**: | Not determined |
| **Melting/Freezing point**: | Not determined | **Solubilities**: | |
| **Boiling point/Boiling range**: | Not determined | **Partition coefficient (n-octanol/water)**: | Not determined |
| **Flash point (closed cup)**: | Not determined | **Auto/Self-ignition temperature**: | Not determined |
| **Evaporation rate**: | Not determined | **Decomposition temperature**: | Not determined |
| **Flammability (solid,gaseous)**: | Not determined | **Viscosity**: | a. Kinematic:Not determined<br>b. Dynamic: Not determined |
| **Density**: Not determined | | | |

## 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

| | |
|---|---|
| **Acute Toxicity**: No additional information. | |
| **Chronic Toxicity**: No additional information. | |
| **Corrosion Irritation**: No additional information. | |
| **Sensitization**: | No additional information. |
| **Single Target Organ (STOT)**: | No additional information. |
| **Numerical Measures**: | No additional information. |

| | |
|---|---|
| **Carcinogenicity**: | No additional information. |
| **Mutagenicity**: | No additional information. |
| **Reproductive Toxicity**: | No additional information. |

## 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)**:

None of the ingredients is listed

**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%)**:

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** : 03.23.2015

# SAFETY DATA SHEET

Isobutylene

## Section 1. Identification

**GHS product identifier** : Isobutylene

**Chemical name** : 2-methylpropene

**Other means of identification** : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

**Product use** : Synthetic/Analytical chemistry.

**Synonym** : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

**SDS #** : 001031

**Supplier's details** : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

**24-hour telephone** : 1-866-734-3438

## Section 2. Hazards identification

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture** : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Danger

**Hazard statements** : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.

**Precautionary statements**

**General** : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

**Prevention** : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

**Response** : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

**Storage** : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

**Disposal** : Not applicable.

**Hazards not otherwise classified** : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

# Section 3. Composition/information on ingredients

**Substance/mixture** : Substance

**Chemical name** : 2-methylpropene

**Other means of identification** : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

## CAS number/other identifiers

**CAS number** : 115-11-7

**Product code** : 001031

| Ingredient name | % | CAS number |
|---|---|---|
| Isobutylene | 100 | 115-11-7 |

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**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

**Eye contact** : 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 if irritation occurs.

**Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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 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.

**Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

**Ingestion** : As this product is a gas, refer to the inhalation section.

## Most important symptoms/effects, acute and delayed

### Potential acute health effects

**Eye contact** : No known significant effects or critical hazards.

**Inhalation** : No known significant effects or critical hazards.

**Skin contact** : No known significant effects or critical hazards.

**Frostbite** : Try to warm up the frozen tissues and seek medical attention.

**Ingestion** : As this product is a gas, refer to the inhalation section.

### Over-exposure signs/symptoms

**Eye contact** : No specific data.

**Inhalation** : No specific data.

**Skin contact** : No specific data.

**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.

# Section 4. First aid measures

**Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

**See toxicological information (Section 11)**

# Section 5. Fire-fighting measures

## Extinguishing media

**Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.

**Unsuitable extinguishing media** : None known.

**Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

**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. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

**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** : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. 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** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. 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** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

**Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. 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). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. 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. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

**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 away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

# Section 8. Exposure controls/personal protection

## Control parameters

### Occupational exposure limits

| Ingredient name | Exposure limits |
|---|---|
| Isobutylene | **ACGIH TLV (United States, 3/2015).** TWA: 250 ppm 8 hours. |

**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.

## 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: safety glasses with side-shields.

## Skin protection

## Section 8. Exposure controls/personal 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** : Gas. [Liquefied compressed gas.]

**Color** : Colorless.

**Molecular weight** : 56.12 g/mole

**Molecular formula** : C4-H8

**Boiling/condensation point** : -6.9°C (19.6°F)

**Melting/freezing point** : -140.7°C (-221.3°F)

**Critical temperature** : 144.75°C (292.6°F)

**Odor** : Characteristic.

**Odor threshold** : Not available.

**pH** : Not available.

**Flash point** : Closed cup: -76.1°C (-105°F)

**Burning time** : Not applicable.

**Burning rate** : Not applicable.

**Evaporation rate** : Not available.

**Flammability (solid, gas)** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

**Lower and upper explosive (flammable) limits** : Lower: 1.8%
Upper: 9.6%

**Vapor pressure** : 24.3 (psig)

**Vapor density** : 1.94 (Air = 1)

**Specific Volume (ft $^3$/lb)** : 6.6845

**Gas Density (lb/ft $^3$)** : 0.1496 (25°C / 77 to °F)

**Relative density** : Not applicable.

**Solubility** : Not available.

**Solubility in water** : 0.263 g/l

**Partition coefficient: n-octanol/water** : 2.34

**Auto-ignition temperature** : 465°C (869°F)

**Decomposition temperature** : Not available.

**SADT** : Not available.

## Section 9. Physical and chemical properties

**Viscosity** : Not applicable.

## 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.

**Incompatible materials** : Oxidizers

**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 |
|---|---|---|---|---|
| Isobutylene | LC50 Inhalation Vapor | Rat | 550000 mg/m³ | 4 hours |

#### Irritation/Corrosion

Not available.

#### Sensitization

Not available.

#### Mutagenicity

Not available.

#### Carcinogenicity

Not available.

#### 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.

# Section 11. Toxicological information

**Information on the likely routes of exposure** : Not available.

## Potential acute health effects

**Eye contact** : No known significant effects or critical hazards.

**Inhalation** : No known significant effects or critical hazards.

**Skin contact** : No known significant effects or critical hazards.

**Ingestion** : As this product is a gas, refer to the inhalation section.

## Symptoms related to the physical, chemical and toxicological characteristics

**Eye contact** : No specific data.

**Inhalation** : No specific data.

**Skin contact** : No specific data.

**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

**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 | $LogP_{ow}$ | BCF | Potential |
|---|---|---|---|
| Isobutylene | 2.34 | - | low |

## Section 12. Ecological information

**Mobility in soil**

**Soil/water partition coefficient ($K_{OC}$)** : 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. Empty Airgas-owned pressure vessels should be returned to Airgas. 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. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

## Section 14. Transport information

| | DOT | TDG | Mexico | IMDG | IATA |
|---|---|---|---|---|---|
| **UN number** | UN1055 | UN1055 | UN1055 | UN1055 | UN1055 |
| **UN proper shipping name** | ISOBUTYLENE | ISOBUTYLENE | ISOBUTYLENE | ISOBUTYLENE | ISOBUTYLENE |
| **Transport hazard class(es)** | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   |
| **Packing group** | - | - | - | - | - |
| **Environment** | No. | No. | No. | No. | No. |
| **Additional information** | **Limited quantity** Yes.<br><br>**Packaging instruction**<br>**Passenger aircraft** Quantity limitation: Forbidden.<br><br>**Cargo aircraft** Quantity limitation: 150 kg<br><br>**Special provisions** 19, T50 | Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).<br><br>**Explosive Limit and Limited Quantity Index** 0.125<br><br>**ERAP Index** 3000<br><br>**Passenger Carrying Ship Index** Forbidden<br><br>**Passenger Carrying Road or Rail Index** Forbidden<br><br>**Special provisions** 29 | - | - | **Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden<br>**Cargo Aircraft Only** Quantity limitation: 150 kg |

**"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."**

# Section 14. Transport information

**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 Air Act (CAA) 112 regulated flammable substances**: isobutylene

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Not 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
Sudden release of pressure

### Composition/information on ingredients

| Name | % | Fire hazard | Sudden release of pressure | Reactive | Immediate (acute) health hazard | Delayed (chronic) health hazard |
|---|---|---|---|---|---|---|
| Isobutylene | 100 | Yes. | Yes. | No. | No. | No. |

## State regulations

**Massachusetts** : This material is listed.

**New York** : This material is not listed.

**New Jersey** : This material is listed.

**Pennsylvania** : This material is listed.

## International regulations

### International lists

### National inventory

**Australia** : This material is listed or exempted.

**Canada** : This material is listed or exempted.

**China** : This material is listed or exempted.

**Europe** : This material is listed or exempted.

**Japan** : This material is listed or exempted.

**Malaysia** : Not determined.

# Section 15. Regulatory information

**New Zealand** : This material is listed or exempted.

**Philippines** : This material is listed or exempted.

**Republic of Korea** : This material is listed or exempted.

**Taiwan** : This material is listed or exempted.

## Canada

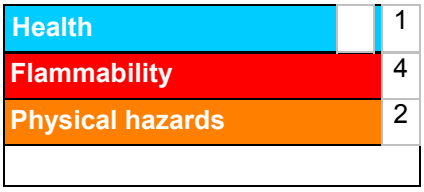
**WHMIS (Canada)** : Class A: Compressed gas.
Class B-1: Flammable gas.

**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 A: Compressed gas.
Class B-1: Flammable gas.

## Hazardous Material Information System (U.S.A.)




**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.)




**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.**

## Procedure used to derive the classification

| Classification | Justification |
|---|---|
| Flam. Gas 1, H220<br>Press. Gas Liq. Gas, H280 | Expert judgment<br>Expert judgment |

## History

**Date of printing** : 7/11/2016

**Date of issue/Date of revision** : 7/11/2016

**Date of previous issue** : No previous validation

# Section 16. Other information

**Version** : 0.01

**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

**References** : Not available.

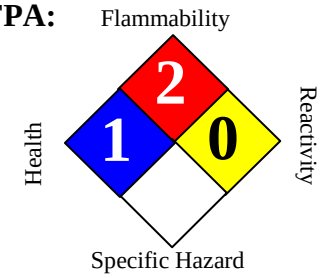
**Indicates information that has changed from previously issued version.**

## Notice to reader

**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.**

# Safety Data Sheet
# Kerosene

**NFPA:**




## SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

| | | | | | |
|---|---|---|---|---|---|
| **Product name** | : | Kerosene | | | |
| **Synonyms** | : | Dual Purpose, K1, Dyed K1, Kerosine, Low Aromatic Feedstock, SRK Solvent, Arctic Grade Fuel Oil (DFA), Heater Oil, Range Oil, Coal Oil, K2, Gas Oil, 888100004861 | | | |
| **SDS Number** | : | 888100004861 | **Version** | : | 2.16 |
| **Product Use Description** | : | Fuel | | | |
| **Company** | : | For: Tesoro Refining & Marketing Co.<br>19100 Ridgewood Parkway, San Antonio, TX 78259 | | | |
| **Tesoro Call Center** | : | (877) 783-7676 | **Chemtrec (Emergency Contact)** | : | (800) 424-9300 |

## SECTION 2. HAZARDS IDENTIFICATION

**Classifications** : Flammable Liquid – Category 3
Aspiration Hazard – Category 1
Skin Irritation – Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3
Chronic Aquatic Toxicity – Category 2

**Pictograms**



**Signal Word** : **Danger**

**Hazard Statements** : Flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon by mouth.
Causes skin irritation. Repeated or prolonged skin contact can cause skin irritation and dermatitis.
May cause drowsiness or dizziness by inhalation.
May cause irritation of respiratory system.
Toxic to aquatic life with long lasting effects.

**Precautionary statements:**

**Prevention** : Keep away from heat, sparks, open flames, welding and hot surfaces.

| | |
|---|---|
| | No smoking.<br>Keep container tightly closed.<br>Ground and/or bond container and receiving equipment.<br>Use explosion-proof electrical equipment.<br>Use only non-sparking tools if tools are used in flammable atmosphere.<br>Take precautionary measures against static discharge.<br>Wear gloves, eye protection and face protection as needed to prevent skin and eye contact with liquid.<br>Wash hands or liquid-contacted skin thoroughly after handling.<br>Do not eat, drink or smoke when using this product.<br>Do not breathe vapors or mists.<br>Use only outdoors or in a well-ventilated area. |
| **Response** | In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish.<br>If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.<br>If skin irritation persists, get medical attention.<br>If inhaled: Remove person to fresh air and keep comfortable for breathing.<br>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. |
| **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 % |
|---|---|---|
| **Kerosene (petroleum)** | 8008-20-6 | 100% |
| **Naphthalene** | 91-20-3 | 0 to 3% |
| **Ethyl Benzene** | 100-41-4 | 0 to 1% |

## SECTION 4. FIRST AID MEASURES

| | | |
|---|---|---|
| **Inhalation** | : | Move to fresh air. If not breathing, give artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately. |
| **Skin contact** | : | Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, seek medical attention. |
| **Eye contact** | : | Remove contact lenses. In case of eye contact, immediately flush with low pressure, cool water for at least 15 minutes, opening eyelids to ensure flushing. Seek medical advice. |
| **Ingestion** | : | Do NOT induce vomiting. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Obtain medical attention. Do not give liquids. Small amounts of material which enter the mouth should be rinsed out until the |

taste is dissipated.

**Notes to physician** : Symptoms: Aspiration may cause pulmonary edema and pneumonitis. Treatment: Do not induce vomiting, use gastric lavage only. Remove from further exposure and treat symptomatically.

## SECTION 5. FIRE-FIGHTING MEASURES

**Suitable extinguishing media** : Carbon dioxide (CO2), Water spray, Dry chemical, Foam, Keep containers and surroundings cool with water spray., Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

**Specific hazards during fire fighting** : Fire Hazard Do not use a solid water stream as it may scatter and spread fire. Cool closed containers exposed to fire with water spray. Sealed containers may rupture when heated. Above the flash point, explosive vapor-air mixtures may be formed. Vapors can flow along surfaces to distant ignition source and flash back.

**Special protective equipment for fire-fighters** : 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.

## SECTION 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions** : ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN if applicable. Consider wind direction; stay upwind and uphill, if possible. Evacuate nonessential personnel and remove or secure all ignition sources. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

**Environmental precautions** : Carefully contain and stop the source of the spill, if safe to do so. 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.

**Methods for cleaning up** : Take up with sand or 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. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

## 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-initated 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 gasoline or naphtha).

(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated 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".

: Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

: Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### Exposure Guidelines

| List | Components | CAS-No. | Type: | Value |
|---|---|---|---|---|
| **OSHA Z1** | Naphthalene | 91-20-3 | PEL | 10 ppm 50 mg/m3 |
| | Ethylbenzene | 100-41-4 | PEL | 100ppm 435 mg/m3 |
| **ACGIH** | Kerosene (petroleum) | 8008-20-6 | TWA | 200 mg/m3 |
| | Ethylbenzene | 100-41-4 | TWA<br>STEL | 100ppm 434 mg/m3<br>125ppm 543 mg/m3 |
| | Naphthalene | 91-20-3 | TWA | 10 ppm |
| | | 91-20-3 | STEL | 15 ppm |

**Engineering measures**

: 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. Emergency eye wash capability should be available in the vicinity of any potential splash exposure.

| | | |
|---|---|---|
| **Eye protection** | : | Goggles and face shield as needed to prevent eye and face contact. |
| **Hand protection** | : | Gloves constructed of nitrile, neoprene, or PVC are recommended. |
| **Skin and body protection** | : | Chemical protective clothing such as DuPont TyChem ®, Barricade or equivalent, recommended based on degree of exposure. Consult manufacturer specifications for further information. |
| **Respiratory protection** | : | 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. |
| **Work / Hygiene practices** | : | 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

| | | |
|---|---|---|
| **Appearance** | : | Clear to straw colored liquid |
| **Odor** | | Characteristic petroleum or kerosene-like odor |
| **Odor threshold** | | 0.1 - 1 ppm typically reported |
| **pH** | | Not applicable |
| **Melting point/freezing point** | | Gel point can be about -15°F; freezing requires laboratory conditions |
| **Initial boiling point & range** | | 154 - 372 °C (310° - 702 °F) |
| **Flash point** | | 38°C (100°F) Minimum |
| **Evaporation rate** | | Higher initially and declining as lighter components evaporate |
| **Flammability (solid, gas)** | | Flammable vapor released by liquid |
| **Upper explosive limit** | | 5.0 %(V) |
| **Lower explosive limit** | | 0.7 %(V) |
| **Vapor pressure** | | < 2 mm Hg at 20 °C |
| **Vapor density (air = 1)** | | > 4.5 |
| | | 0.8 g/mL |

| | |
|---|---|
| **Relative density (water = 1)** | |
| | 0.0005 g/100 mL |
| **Solubility (in water)** | |
| | 3.3 to 6 as log Pow |
| **Partition coefficient (n-octanol/water)** | |
| | 210 °C (410°F) |
| **Auto-ignition temperature** | |
| | Will evaporate or boil and possibly ignite before decomposition occurs. |
| **Decomposition temperature** | |
| | 1.6 $mm^2/s$ at 40°C |
| **Kinematic viscosity** | |
| **Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature** | Diesel Fuel Oils at terminal load rack: At least 25 pS/m<br>Ultra Low Sulfur Diesel (ULSD) without conductivity additive: 0 pS/m to 5 pS/m<br>ULSD at terminal load rack with conductivity additive: At least 50 pS/m<br>JP-8 at terminal load rack: 150 pS/m to 600 pS/m |

## 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, acids and alkalies |
| **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, non-combusted hydrocarbons (smoke) and, depending on formulation, trace amounts of sulfur dioxide. Diesel exhaust particals may be a lung hazard (see Section 11). |

## SECTION 11. TOXICOLOGICAL INFORMATION

| | | |
|---|---|---|
| **Skin irritation** | : | Irritating to skin. Repeated or prolonged contact can cause dryness, cracking and dermatitis. Liquid may be absorbed through skin in toxic amounts if large areas of the skin are repeatedly exposed. |
| **Eye irritation** | : | May cause eye irritation. |
| **Inhalation** | | Inhalation of vapors or mist may result in respiratory tract irritation and central nervous system effects including headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure and death. |
| **Chronic Exposure** | | Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposure has not been determined. |
| **Further information** | : | Kerosene does not have a measurable effect on human reproduction or development.<br>Kerosene is not listed as carcinogenic by NTP, OSHA, and ACGIH. IARC has listed kerosene as a probable human carcinogen.<br>Some petroleum distillates have been found to cause adverse reproductive effects |

in laboratory animals.
Acute and chronic exposure to kerosene may result in CNS effects including irritability, restlessness, ataxia, drowsiness, convulsions, coma and death. The most common health effect associated with chronic kerosene exposure is dermatitis.

**Component**:

| | | |
|---|---|---|
| **Kerosene (petroleum)** | 8008-20-6 | Acute oral toxicity: LD50 rat 4 hour<br>Dose: >5,000 mg/kg<br><br>Acute dermal toxicity: LD50 rabbit<br>Dose: >2,001 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: >5,000 mg/l<br>Exposure time: 4 h<br>Skin irritation: Classification: Irritating to skin.<br>Result: Skin irritation |
| **Naphthalene** | 91-20-3 | Acute oral toxicity: LD50 rat<br>Dose: 2,001 mg/kg<br><br>Acute dermal toxicity: LD50 rat<br>Dose: 2,501 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 101 mg/l<br>Exposure time: 4 h<br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br><br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation<br><br>Carcinogenicity: N11.00422130 |

**Carcinogenicity**

| | |
|---|---|
| **NTP** | Naphthalene (CAS-No.: 91-20-3) |
| **IARC** | Kerosene is not listed as carcinogenic by NTP, OSHA, and ACGIH. IARC has listed kerosene as a probable human carcinogen.<br>naphthalene (CAS-No.: 91-20-3)<br>Kerosene (petroleum) (CAS-No.: 8008-20-6) |
| **CA Prop 65** | WARNING! This product contains a chemical known to the State of California to cause cancer.<br>Naphthalene (CAS-No.: 91-20-3) |

## SECTION 12. ECOLOGICAL INFORMATION

**Additional ecological information** : Release of this product should be prevented from contaminating soil and water and from entering drainage and sewer systems. U.S.A. regulations require reporting spills of this material that could reach any surface waters. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802. Naphthalene (91-20-3) one of the ingredients in this mixture is classified as a Marine Pollutant.

**Component:**

| | | |
|---|---|---|
| **Naphthalene** | 91-20-3 | Toxicity to algae:<br>EC50<br>Species:<br>Dose: 33 mg/l<br>Exposure time: 24 h |

## SECTION 13. DISPOSAL CONSIDERATIONS

**Disposal** : Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility.
Processing, use or contamination of this product may change the waste management options.
State and local disposal regulations may differ from federal disposal regulations.
Dispose of container and unused contents in accordance with federal, state and local requirements.

## SECTION 14. TRANSPORT INFORMATION

**CFR**

| | |
|---|---|
| Proper shipping name | : Kerosene |
| UN-No. | : 1223 |
| Class | : 3 |
| Packing group | : III |

**TDG**

| | |
|---|---|
| Proper shipping name | : Kerosene |
| UN-No. | : UN1223 |
| Class | : 3 |
| Packing group | : III |

**IATA Cargo Transport**

| | |
|---|---|
| UN UN-No. | : UN1223 |
| Description of the goods | : Kerosene |
| Class | : 3 |
| Packaging group | : III |
| ICAO-Labels | : 3 |
| Packing instruction (cargo aircraft) | : 366 |
| Packing instruction (cargo aircraft) | : Y344 |

**IATA Passenger Transport**

| | |
|---|---|
| UN UN-No. | : UN1223 |
| Description of the goods | : Kerosene |
| Class | : 3 |
| Packaging group | : III |
| ICAO-Labels | : 3 |
| Packing instruction (passenger aircraft) | : 355 |
| Packing instruction (passenger aircraft) | : Y344 |

**IMDG-Code**

| | | |
|---|---|---|
| UN-No. | : | UN 1223 |
| Description of the goods | : | Kerosene |
| Class | : | 3 |
| Packaging group | : | III |
| IMDG-Labels | : | 3 |
| EmS Number | : | F-E S-E |
| Marine pollutant | : | Yes |

## SECTION 15. REGULATORY INFORMATION

TSCA Status : On TSCA Inventory

DSL Status : All components of this product are on the Canadian DSL list.

SARA 311/312 Hazards : Acute Health Hazard
Chronic Health Hazard
Fire Hazard

**CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)**
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 cancer.

Naphthalene 91-20-3

## 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** : 11/17/2012

Fisher Scientific

Part of Thermo Fisher Scientific

# SAFETY DATA SHEET

**Creation Date** 12-Sep-2014 **Revision Date** 12-Dec-2014 **Revision Number** 1

## 1. Identification

**Product Name** **Lead**

**Cat No. :** **L27-1RL**

**Synonyms** Lead metal.

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

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

**Emergency Telephone Number**
Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

## 2. Hazard(s) identification

**Classification**

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

| | |
|---|---|
| Acute oral toxicity | Category 4 |
| Acute Inhalation Toxicity - Dusts and Mists | Category 4 |
| Carcinogenicity | Category 1B |
| Reproductive Toxicity | Category 1A |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Central nervous system (CNS). | |
| Specific target organ toxicity - (repeated exposure) | Category 2 |
| Target Organs - Kidney, Blood. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Harmful if swallowed
Harmful if inhaled
May cause drowsiness or dizziness
May cause cancer
May damage the unborn child. Suspected of damaging fertility
May cause 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
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
**Response**
IF exposed or concerned: Get medical attention/advice
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
**Ingestion**
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
**Storage**
Store locked up
Store in a well-ventilated place. Keep container tightly closed
**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
**Other hazards**
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.

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Lead | 7439-92-1 | > 99 |

## 4. First-aid measures

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

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes.

**Inhalation** Move to fresh air.

**Ingestion** Do not induce vomiting.

**Most important symptoms/effects** No information available.
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Unsuitable Extinguishing Media** No information available

**Flash Point** No information available

**Method -** No information available

**Autoignition Temperature** No information available
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** 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**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 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.

## 7. Handling and storage

**Handling** Wear personal protective equipment. 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 |
|---|---|---|---|
| Lead | TWA: 0.05 mg/m³ | TWA: 50 µg/m³ | IDLH: 100 mg/m³<br>TWA: 0.050 mg/m³ |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Lead | TWA: 0.05 mg/m³ | TWA: 0.15 mg/m³ | TWA: 0.05 mg/m³ |

*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** Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

**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

| | |
|---|---|
| **Physical State** | Solid |
| **Appearance** | Light blue |
| **Odor** | Odorless |
| **Odor Threshold** | No information available |
| **pH** | Not applicable |
| **Melting Point/Range** | 327.4 °C / 621.3 °F |
| **Boiling Point/Range** | 1740 °C / 3164 °F |
| **Flash Point** | No information available |
| **Evaporation Rate** | No information available |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | 1.3 mmHg @ 970 °C |
| **Vapor Density** | No information available |
| **Relative Density** | 11.3 |
| **Solubility** | Insoluble in water |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | No information available |
| **Decomposition Temperature** | No information available |
| **Viscosity** | No information available |
| **Molecular Formula** | Pb |
| **Molecular Weight** | 207.19 |

## 10. Stability and reactivity

| | |
|---|---|
| **Reactive Hazard** | None known, based on information available |
| **Stability** | Stable under normal conditions. |
| **Conditions to Avoid** | Incompatible products. |
| **Incompatible Materials** | Strong oxidizing agents |
| **Hazardous Decomposition Products** | None under normal use conditions |
| **Hazardous Polymerization** | Hazardous polymerization does not occur. |
| **Hazardous Reactions** | 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 |
|---|---|---|---|---|---|---|
| Lead | 7439-92-1 | Group 2B | Reasonably Anticipated | A3 | X | A3 |

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

*NTP: (National Toxicity Program)*

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

*Mexico - Occupational Exposure Limits - Carcinogens*

*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)*

*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** Central nervous system (CNS)
**STOT - repeated exposure** Kidney Blood

**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.

## 12. Ecological information

(Bad file name)

**Ecotoxicity**

.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---|---|---|---|---|
| Lead | Not listed | 1.32 mg/L LC50 96 h 1.17 mg/L LC50 96 h 0.44 mg/L LC50 96 h | Not listed | 600 µg/L EC50 = 48 h |

**Persistence and Degradability** No information available

**Bioaccumulation/ Accumulation** No information available.

**Mobility** No information available.

## 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** Not regulated
**TDG** Not regulated
**IATA** Not regulated
**IMDG/IMO** Not regulated

## 15. Regulatory information

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lead | X | X | - | 231-100-4 | - | | 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 % |
|---|---|---|---|
| Lead | 7439-92-1 | > 99 | 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 |
|---|---|---|---|---|
| Lead | - | - | X | X |

**Clean Air Act**

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---|---|---|---|
| Lead | X | | - |

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

| Component | Specifically Regulated Chemicals | Highly Hazardous Chemicals |
|---|---|---|
| Lead | 30 µg/m³ Action Level<br>50 µg/m³ TWA | - |

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Lead | 10 lb | - |

**California Proposition 65** This product contains the following Proposition 65 chemicals:

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|
| Lead | 7439-92-1 | Carcinogen<br>Developmental<br>Female Reproductive<br>Male Reproductive | 15 µg/day | Developmental<br>Carcinogen |

**State Right-to-Know**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Lead | X | X | X | X | X |

**U.S. Department of Transportation**

Reportable Quantity (RQ): Y
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
D1B Toxic materials



## 16. Other information

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

**Creation Date** 12-Sep-2014
**Revision Date** 12-Dec-2014
**Print Date** 12-Dec-2014
**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

**Creation Date** 17-Jan-2011 **Revision Date** 03-Aug-2015 **Revision Number** 3

## 1. Identification

**Product Name** **Magnesium**

**Cat No. :** **AC191080000; AC191080025; AC191080100; AC191085000**

**Synonyms** Magnesium metal (ribbons/turnings)

**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

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**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)

| | |
|---|---|
| Flammable solids | Category 1 |
| Self-heating substances and mixtures | Category 2 |
| Substances/mixtures which, in contact with water, emit flammable gases | Category 2 |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Flammable solid
Self-heating in large quantities; may catch fire
In contact with water releases flammable gas



**Precautionary Statements**
**Prevention**
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Wear protective gloves/protective clothing/eye protection/face protection
Keep cool. Protect from sunlight
Keep away from any possible contact with water, because of violent reaction and possible flash fire
Handle under inert gas. Protect from moisture
**Skin**
Brush off loose particles from skin. Immerse in cool water/wrap with wet bandages
**Fire**
In case of fire: Use CO2, dry chemical, or foam for extinction
**Storage**
Maintain air gap between stacks/pallets
Store away from other materials
Store in a dry place. Store in a closed container
Store bulk masses at temperatures not exceeding manufacturer recommendations
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
May form combustible dust concentrations in air

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Magnesium | 7439-95-4 | >95 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Remove from exposure, lie down. Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration.

**Ingestion** Do not induce vomiting. Get medical attention.

**Most important symptoms/effects** No information available.
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Dry chemical. approved class D extinguishers. clay. sodium carbonate. Do not use a solid water stream as it may scatter and spread fire.

**Unsuitable Extinguishing Media** No information available

**Flash Point** 500 °C / 932 °F
**Method -** No information available

**Autoignition Temperature** 472.8 °C / 883 °F
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available

**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Dust can form an explosive mixture in air. Water reactive. Produce flammable gases on contact with water. Flammable.

**Hazardous Combustion Products**
Magnesium oxides
**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**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 0 | 4 | 2 | W |

## 6. Accidental release measures

**Personal Precautions** Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Remove all sources of ignition.

**Environmental Precautions** See Section 12 for additional ecological information.

**Methods for Containment and Clean Up** Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation. Remove all sources of ignition. Ground and bond containers when transferring material. Use spark-proof tools and explosion-proof equipment.

## 7. Handling and storage

**Handling** Avoid contact with skin and eyes. Do not breathe dust. Use explosion-proof equipment. Use only non-sparking tools. Wash hands before breaks and immediately after handling the product. Ensure adequate ventilation. Wear personal protective equipment. Avoid dust formation.

**Storage** Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat and sources of ignition. Never allow product to get in contact with water during storage. Store under an inert atmosphere.

## 8. Exposure controls / personal protection

**Exposure Guidelines** This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

**Engineering Measures** Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

**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

| | |
|---|---|
| **Physical State** | Solid |
| **Appearance** | Silver |
| **Odor** | Odorless |
| **Odor Threshold** | No information available |
| **pH** | 7 |
| **Melting Point/Range** | 651 °C / 1203.8 °F |
| **Boiling Point/Range** | 1107 °C / 2024.6 °F |
| **Flash Point** | 500 °C / 932 °F |
| **Evaporation Rate** | Not applicable |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | negligible |
| **Vapor Density** | Not applicable |
| **Specific Gravity** | No information available |
| **Solubility** | No information available |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | 472.8 °C / 883 °F |
| **Decomposition Temperature** | No information available |
| **Viscosity** | Not applicable |
| **Molecular Formula** | Mg |
| **Molecular Weight** | 24.3 |

## 10. Stability and reactivity

**Reactive Hazard** Yes

**Stability** Stable under normal conditions. Air sensitive. Water reactive.

**Conditions to Avoid** Protect from water. Exposure to air. Incompatible products. Exposure to moist air or water.

**Incompatible Materials** Acids, Strong oxidizing agents, Halogens, Acid chlorides

**Hazardous Decomposition Products** Magnesium oxides

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Magnesium | 230 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**

**Irritation** May cause irritation

**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 |
|---|---|---|---|---|---|---|
| Magnesium | 7439-95-4 | Not listed | Not listed | Not listed | Not listed | Not listed |

| | |
|---|---|
| **Mutagenic Effects** | No information available |
| **Reproductive Effects** | No information available. |
| **Developmental Effects** | No information available. |
| **Teratogenicity** | No information available. |
| **STOT - single exposure** | None known |
| **STOT - repeated exposure** | 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** | See actual entry in RTECS for complete information. |

## 12. Ecological information

**Ecotoxicity**

Do not empty into drains.

| | |
|---|---|
| **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** | UN1869 |
| **Proper Shipping Name** | MAGNESIUM |
| **Hazard Class** | 4.1 |
| **Packing Group** | III |

**TDG**

| | |
|---|---|
| **UN-No** | UN1869 |
| **Proper Shipping Name** | MAGNESIUM |
| **Hazard Class** | 4.1 |
| **Packing Group** | III |

**IATA**

| | |
|---|---|
| **UN-No** | UN1869 |
| **Proper Shipping Name** | MAGNESIUM |
| **Hazard Class** | 4.1 |
| **Packing Group** | III |

**IMDG/IMO**

| | |
|---|---|
| **UN-No** | UN1869 |
| **Proper Shipping Name** | MAGNESIUM |
| **Hazard Class** | 4.1 |
| **Packing Group** | III |

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Magnesium | X | X | - | 231-104-6 | - | | 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** Not applicable

**SARA 311/312 Hazardous Categorization**

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

**Clean Water Act** Not applicable

**Clean Air Act** Not applicable

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

**CERCLA**
Not applicable

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

**State Right-to-Know**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Magnesium | 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** | B6 Reactive flammable material<br>B4 Flammable solid<br>F Dangerously reactive material |



## 16. Other information

| | |
|---|---|
| **Prepared By** | Regulatory Affairs<br>Thermo Fisher Scientific<br>Email: EMSDS.RA@thermofisher.com |
| **Creation Date** | 17-Jan-2011 |
| **Revision Date** | 03-Aug-2015 |
| **Print Date** | 03-Aug-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 4.6
Revision Date 10/09/2015
Print Date 05/01/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Manganese

Product Number : 266167
Brand : Aldrich

CAS-No. : 7439-96-5

### 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 # : (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 aquatic toxicity (Category 2), H401

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

### 2.2 GHS Label elements, including precautionary statements

Pictogram none

Signal word none

Hazard statement(s)
H401 Toxic to aquatic life.

Precautionary statement(s)
P273 Avoid release to the environment.
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 : Mn
Molecular weight : 54.94 g/mol
CAS-No. : 7439-96-5
EC-No. : 231-105-1

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Manganese** | | |
| | Aquatic Acute 2; H401 | <= 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
Manganese/manganese 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. Ensure adequate ventilation.
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
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.

Moisture sensitive. Handle and store under inert gas.
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 |
|---|---|---|---|---|
| Manganese | 7439-96-5 | TWA | 0.200000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Central Nervous System impairment<br>Adopted values or notations enclosed are those for which changes are proposed in the NIC<br>See Notice of Intended Changes (NIC) | | |
| | | C | 5 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | Ceiling limit is to be determined from breathing-zone air samples. | | |
| | | C | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | Ceiling limit is to be determined from breathing-zone air samples. | | |
| | | TWA | 1.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | ST | 3.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 1.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | ST | 3.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | C | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | Ceiling limit is to be determined from breathing-zone air samples. | | |
| | | TWA | 1.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | ST | 3.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 0.200000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>Adopted values or notations enclosed are those for which changes are proposed in the NIC<br>See Notice of Intended Changes (NIC)<br>varies | | |
| | | TWA | 0.100000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>2015 Adoption<br>varies | | |

| | | | | |
|---|---|---|---|---|
| | | TWA | 0.020000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>2015 Adoption<br>varies | | |
| | | TWA | 0.1 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>varies | | |
| | | TWA | 0.02 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>varies | | |

### 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**
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**
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**
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: chips<br>Colour: grey, brown, silver |
| b) | Odour | odourless |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 1,244 °C (2,271 °F) - lit. |
| f) | Initial boiling point and boiling range | 1,962 °C (3,564 °F) - lit. |
| g) | Flash point | Not applicable |
| 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 | 7.3 g/mL at 25 °C (77 °F) |
| n) | Water solubility | 0.0007 g/l at 20 °C (68 °F) - slightly soluble |
| 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**
Avoid moisture.

**10.5 Incompatible materials**
acids, Halogens, Bases, Phosphorus, Sulphur oxides, Hydrogen peroxide, Oxidizing agents, Nitric acid, Sodium Hydroxide, Carbon dioxide ($CO_2$), Nitryl Flouride, Steam

**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 - female - > 2,000 mg/kg
(OECD Test Guideline 420)

LC50 Inhalation - Rat - male and female - 4 h - > 5.14 mg/l
(OECD Test Guideline 403)

Dermal: No data available

No data available

**Skin corrosion/irritation**
Skin - Rabbit
Result: No skin irritation
(OECD Test Guideline 404)

**Serious eye damage/eye irritation**
Eyes - Rabbit
Result: No eye irritation - 72 h
(OECD Test Guideline 405)

**Respiratory or skin sensitisation**
- Mouse
Result: Does not cause skin sensitisation.
(OECD Test Guideline 429)

**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**

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: Not available

Men exposed to manganese dusts showed a decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. A stolid mask-like appearance of the face, emotional disturbances such as uncontrollable laughter and a spastic gait with tendency to fall in walking are findings in more advanced cases. High incidence of pneumonia has been found in workers exposed to the dust or fume of some manganese compounds., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | semi-static test NOEC - Oncorhynchus mykiss (rainbow trout) - 3.6 mg/l - 96 h<br>(OECD Test Guideline 203) |
| Toxicity to daphnia and other aquatic invertebrates | Immobilization NOEC - Daphnia magna (Water flea) - 1.6 mg/l - 48 h<br>(OECD Test Guideline 202) |
| Toxicity to algae | Growth inhibition EC50 - Desmodesmus subspicatus (Scenedesmus subspicatus) - 4.5 mg/l - 72 h<br>(OECD Test Guideline 201) |
| Toxicity to bacteria | Respiration inhibition EC50 - Sludge Treatment - 1,000 mg/l - 3 h<br>(OECD Test Guideline 209) |

**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.
Toxic to aquatic life.

## 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**
The following components are subject to reporting levels established by SARA Title III, Section 313:

| | CAS-No. | Revision Date |
|---|---|---|
| Manganese | 7439-96-5 | 2007-07-01 |

**SARA 311/312 Hazards**
Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Manganese | 7439-96-5 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Manganese | 7439-96-5 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Manganese | 7439-96-5 | 2007-07-01 |

**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.**

| | |
|---|---|
| Aquatic Acute | Acute aquatic toxicity |
| H401 | Toxic to aquatic life. |

**HMIS Rating**

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

**NFPA Rating**

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

**Further information**

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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 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: 10/09/2015 Print Date: 05/01/2016

# Safety Data Sheet
# Mercury (Metallic)

**SDS Revision Date:** **05/01/2015**

## 1. Identification

### 1.1. Product identifier

| | |
|---|---|
| **Product Identity** | Mercury (Metallic) |
| **Alternate Names** | Quicksilver; Hydrargyrum; Liquid Silver |

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

| | |
|---|---|
| **Intended use** | See Technical Data Sheet. |
| **Application Method** | See Technical Data Sheet. |

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

| | |
|---|---|
| **Company Name** | WM Mercury Waste Inc.<br>21211 Durand Avenue<br>Union Grove, WI 53182 |
| **Emergency** | |
| **CHEMTREC (USA)** | (800) 424-9300 |
| **Customer Service: WM Mercury Waste Inc.** | (800) 741-3343 |

## 2. Hazard(s) identification

### 2.1. Classification of the substance or mixture

| | |
|---|---|
| Acute Tox. 2;H330 | Fatal if inhaled. |
| Repr. 1B;H360D | May damage the unborn child. |
| STOT RE 1;H372 | Causes damage to organs through prolonged or repeated exposure. Specific Target Organs: (Central Nervous System) |
| Aquatic Chronic 1;H410 | Very toxic to aquatic life with long lasting effects. |

### 2.2. Label elements

Using the Toxicity Data listed in section 11 and 12 the product is labeled as follows.



**Danger**

H330 Fatal if inhaled.

H360D May damage the unborn child.

H372 Causes damage to organs through prolonged or repeated exposure.

H410 Very toxic to aquatic life with long lasting effects.

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**[Prevention]:**

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

P260 Do not breathe mist / vapors / spray.

P264 Wash 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.

P281 Use personal protective equipment as required.

P284 Wear respiratory protection.

**[Response]:**

P304+340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P308+313 IF exposed or concerned: Get medical advice / attention.

P310 Immediately call a POISON CENTER or doctor / physician.

P314 Get Medical advice / attention if you feel unwell.

P320 Specific treatment is urgent (see information on this label).

P391 Collect spillage.

**[Storage]:**

P403+233 Store in a well ventilated place. Keep container tightly closed.

P405 Store locked up.

**[Disposal]:**

P501 Dispose of contents / container in accordance with local / national regulations.

## 3. Composition/information on ingredients

This product contains the following substances that present a hazard within the meaning of the relevant State and Federal Hazardous Substances regulations.

| Ingredient/Chemical Designations | Weight % | GHS Classification | Notes |
|---|---|---|---|
| **Mercury**<br>**CAS Number: 0007439-97-6** | **100** | **Repr. 1B;H360D**<br>**Acute tox. 2;H330**<br>**STOT RE 1;H372**<br>**Aquatic Acute 1;H400**<br>**Aquatic Chronic 1;H410** | **[1][2]** |

In accordance with paragraph (i) of §1910.1200, the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

[1] Substance classified with a health or environmental hazard.

[2] Substance with a workplace exposure limit.

[3] PBT-substance or vPvB-substance.

*The full texts of the phrases are shown in Section 16.

# 4. First aid measures

### 4.1. Description of first aid measures

**General** In all cases of doubt, or when symptoms persist, seek medical attention.
Never give anything by mouth to an unconscious person.

**Inhalation** Remove to fresh air, keep patient warm and at rest. If breathing is irregular or stopped, give artificial respiration. If unconscious place in the recovery position and obtain immediate medical attention. Give nothing by mouth.

**Eyes** Irrigate copiously with clean water for at least 15 minutes, holding the eyelids apart and seek medical attention.

**Skin** Remove contaminated clothing. Wash skin thoroughly with soap and water or use a recognized skin cleanser.

**Ingestion** If swallowed, wash out mouth with water, obtain immediate medical attention. Keep at rest. Do NOT induce vomiting.

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

**Overview** **Eye:** Contact with eyes may cause severe irritation, and possible eye burns. Vapors may cause eye irritation.
**Skin:** May cause skin irritation. May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes.
**Ingestion:** May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause effects similar to those for inhalation exposure.
**Inhalation:** Causes respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. May cause severe respiratory tract irritation.
**Chronic:** Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes.

**Notes to Physician:** Treat symptomatically and supportively.
**Antidote:** The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel. The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. See section 2 for further details.

**Inhalation** Fatal if inhaled.

# 5. Fire-fighting measures

### 5.1. Extinguishing media

Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

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

Hazardous decomposition: Mercury/mercury oxides.

Do not breathe mist / vapors / spray.

### 5.3. Advice for fire-fighters

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Combustion generates toxic fumes.

**ERG Guide No.** 172

## 6. Accidental release measures

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

Put on appropriate personal protective equipment (see section 8).

### 6.2. Environmental precautions

Do not allow spills to enter drains or waterways.

Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

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

Vacuum or sweep up material and place into a suitable disposal container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section).

## 7. Handling and storage

### 7.1. Precautions for safe handling

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid breathing dust, vapor, mist, or gas. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

See section 2 for further details. - [Prevention]:

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

Handle containers carefully to prevent damage and spillage.

Incompatible materials: Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.

Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Poison room locked.

See section 2 for further details. - [Storage]:

### 7.3. Specific end use(s)

No data available.

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# 8. Exposure controls and personal protection

### 8.1. Control parameters

**Exposure**

| CAS No. | Ingredient | Source | Value |
|---|---|---|---|
| 0007439-97-6 | Mercury | OSHA | TWA 0.1 mg/m3 |
| | | ACGIH | Alkyl compounds TWA: 0.01 mg/m3 STEL 0.03 mg/m3 Skin<br>Aryl compounds TWA: 0.05 mg/m3 C 0.1 mg/m3 Skin<br>Elemental/Inorganic 0.025mg/m3 Skin |
| | | NIOSH | No Established Limit |
| | | Supplier | No Established Limit |

**Carcinogen Data**

| CAS No. | Ingredient | Source | Value |
|---|---|---|---|
| 0007439-97-6 | Mercury | OSHA | Select Carcinogen: No |
| | | NTP | Known: No; Suspected: No |
| | | IARC | Group 1: No; Group 2a: No; Group 2b: No; Group 3: Yes; Group 4: No; |

### 8.2. Exposure controls

**Respiratory** Follow the OSHA respirator regulations found in 29CFR §1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**Eyes** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin** Wear appropriate protective clothing to prevent skin exposure. Wear appropriate gloves to prevent skin exposure.

**Engineering Controls** Provide adequate ventilation. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction. If these are not sufficient to maintain concentrations of particulates and any vapor below occupational exposure limits suitable respiratory protection must be worn.

**Other Work Practices** Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

See section 2 for further details. - [Prevention]:

# 9. Physical and chemical properties

| | |
|---|---|
| **Appearance** | Silver Liquid |
| **Odor** | Odorless |
| **Odor threshold** | Not Measured |
| **pH** | Not Applicable |
| **Melting point / freezing point** | -38.87 deg C |

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| | |
|---|---|
| **Initial boiling point and boiling range** | 356.5 deg C @ 760.00mmHg |
| **Flash Point** | Not Measured |
| **Evaporation rate (Ether = 1)** | Not Available |
| **Flammability (solid, gas)** | Not Applicable |
| **Upper/lower flammability or explosive limits** | **Lower Explosive Limit:** Not Measured<br>**Upper Explosive Limit:** Not Measured |
| **Vapor pressure (Pa)** | 0.002 mmHg @ 25C |
| **Vapor Density** | 7 (Air=1) |
| **Specific Gravity** | 13.5400g/cm3 (Water=1) |
| **Solubility in Water** | Insoluble |
| **Partition coefficient n-octanol/water (Log Kow)** | Not Measured |
| **Auto-ignition temperature** | Not Measured |
| **Decomposition temperature** | Not Available |
| **Viscosity (cSt)** | 1.554 cP 20.00 |
| **Molecular Formula** | Hg |
| **Molecular Weight** | 200.59 |

**9.2. Other information**

No other relevant information.

## 10. Stability and reactivity

**10.1. Reactivity**

Hazardous Polymerization will not occur.

**10.2. Chemical stability**

Stable under normal circumstances.

**10.3. Possibility of hazardous reactions**

No data available.

**10.4. Conditions to avoid**

High temperatures, incompatible materials, metals.

**10.5. Incompatible materials**

Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.

**10.6. Hazardous decomposition products**

Mercury/mercury oxides.

## 11. Toxicological information

**Acute toxicity**

| Ingredient | Oral LD50, mg/kg | Skin LD50, mg/kg | Inhalation Vapor LC50, mg/L/4hr | Inhalation Dust/Mist LC50, mg/L/4hr | Inhalation Gas LC50, ppm |
|---|---|---|---|---|---|

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| | | | | | |
|---|---|---|---|---|---|
| Mercury - (7439-97-6) | 37.00, Rat - Category: 2 | No data available | No data available | No data available | No data available |

Note: When no route specific LD50 data is available for an acute toxin, the converted acute toxicity point estimate was used in the calculation of the product's ATE (Acute Toxicity Estimate).

| Classification | Category | Hazard Description |
|---|---|---|
| Acute toxicity (oral) | 2 | Fatal if swallowed. |
| Acute toxicity (dermal) | --- | Not Applicable |
| Acute toxicity (inhalation) | 2 | Fatal if inhaled. |
| Skin corrosion/irritation | --- | Not Applicable |
| Serious eye damage/irritation | --- | Not Applicable |
| Respiratory sensitization | --- | Not Applicable |
| Skin sensitization | --- | Not Applicable |
| Germ cell mutagenicity | --- | Not Applicable |
| Carcinogenicity | --- | Not Applicable |
| Reproductive toxicity | 1B | May damage the unborn child. |
| STOT-single exposure | --- | Not Applicable |
| STOT-repeated exposure | 1 | Causes damage to organs through prolonged or repeated exposure. |
| Aspiration hazard | --- | Not Applicable |

## 12. Ecological information

### 12.1. Toxicity

Very toxic to aquatic life with long lasting effects.

No additional information provided for this product. See Section 3 for chemical specific data.

**Aquatic Ecotoxicity**

| Ingredient | 96 hr LC50 fish, mg/l | 48 hr EC50 crustacea, mg/l | ErC50 algae, mg/l |
|---|---|---|---|
| Mercury - (7439-97-6) | Not Available | 0.0052, Daphnia magna | Not Available |

### 12.2. Persistence and degradability

There is no data available on the preparation itself.

### 12.3. Bioaccumulative potential

Not Measured

### 12.4. Mobility in soil

No data available.

### 12.5. Results of PBT and vPvB assessment

**SDS Revision Date:** **05/01/2015**

This product contains no PBT/vPvB chemicals.

**12.6. Other adverse effects**

No data available.

## 13. Disposal considerations

**13.1. Waste treatment methods**

Observe all federal, state and local regulations when disposing of this substance.

## 14. Transport information

| | DOT (Domestic Surface Transportation) | IMO / IMDG (Ocean Transportation) | ICAO/IATA |
|---|---|---|---|
| **14.1. UN number** | UN2809 | UN2809 | UN2809 |
| **14.2. UN proper shipping name** | UN2809, Mercury, 8, III | Mercury | Mercury |
| **14.3. Transport hazard class(es)** | **DOT Hazard Class:** 8 (6.1) | **IMDG:** 8<br>**Sub Class:** 6.1 | **Air Class:** 8 |
| **14.4. Packing group** | III | III | III |

**14.5. Environmental hazards**

**IMDG** Marine Pollutant: Yes ( Mercury )

**14.6. Special precautions for user**

No further information

## 15. Regulatory information

**Regulatory Overview** The regulatory data in Section 15 is not intended to be all-inclusive, only selected regulations are represented.

**Toxic Substance Control Act ( TSCA)** All components of this material are either listed or exempt from listing on the TSCA Inventory.

**WHMIS Classification** D1A

**US EPA Tier II Hazards**

**Fire:** No
**Sudden Release of Pressure:** No
**Reactive:** No
**Immediate (Acute):** Yes
**Delayed (Chronic):** Yes

**EPCRA 311/312 Chemicals and RQs (lbs):**

Mercury ( 1.00)

**EPCRA 302 Extremely Hazardous:**

To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

**SDS Revision Date:** **05/01/2015**

**EPCRA 313 Toxic Chemicals:**

Mercury

**Proposition 65 - Carcinogens (>0.0%):**
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

**Proposition 65 - Developmental Toxins (>0.0%):**
Mercury

**Proposition 65 - Female Repro Toxins (>0.0%):**
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

**Proposition 65 - Male Repro Toxins (>0.0%):**
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

**New Jersey RTK Substances (>1%):**

Mercury

**Pennsylvania RTK Substances (>1%):**

Mercury

## 16. Other information

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our products. Customers/users of this product must comply with all applicable health and safety laws, regulations, and orders.

The full text of the phrases appearing in section 3 is:

H330 Fatal if inhaled.

H360D May damage 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.

**This is the first version in the GHS SDS format. Listings of changes from previous versions in other formats are not applicable.**

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall WM Mercury Waste Inc. be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages.

End of Document

# Safety Data Sheet

**Material Name: Hess 10W30 Motor Oil**

**SDS No. 8957**
**US GHS**

**Synonyms:** Valvoline Product Code 52670413

## * * * 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 (Environment, Health, Safety Internet Website)

## * * * Section 2 - Hazards Identification * * *

### GHS Classification:

Skin Corrosion/Irritation – Category 2
Specific Target Organ Toxicity – Category 3 (narcosis)
Carcinogenicity - Category 1B

### GHS LABEL ELEMENTS

### Symbol(s)



### Signal Word

WARNING

### Hazard Statements

Causes skin irritation.
May cause cancer.
May cause drowsiness or dizziness.

### Precautionary Statements

**Prevention**

Wash hands and forearms thoroughly after handling.
Wear protective gloves/protective clothing/eye protection.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid breathing fume/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.

**Response**

If on skin: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.
If exposed or concerned: Get medical advice/attention.
If inhaled: Remove person to fresh air and keep in a position comfortable for breathing. Call poison center or doctor if you feel unwell.

**Storage**

Store locked up.
Store in a well-ventilated place.
Keep container tightly closed.

**Disposal**

Dispose of contents/container in accordance with local/regional/national/international regulations.

## * * * Section 3 - Composition / Information on Ingredients * * *

| CAS # | Component | Percent |
|---|---|---|
| 64742-65-0 | Petroleum distillates, solvent dewaxed heavy paraffinic | 83-93 |

Petroleum-based lubricating oil with detergent/dispersant engine oil package with zinc compounds.

## * * * Section 4 - First Aid Measures * * *

### First Aid: Eyes

If symptoms develop, move individual away from exposure and into fresh air. Flush eyes gently with water while holding eyelids apart. If symptoms persist or there is visual difficulty, seek medical attention.

### First Aid: Skin

Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

### First Aid: Ingestion

Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

### 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.

### First Aid: Notes to Physician

Acute aspiration of large amounts of oil-laden material may produce a serious aspiration hazard. Patients who aspirate these oils should be followed for the development of long-term sequelae. Repeated aspiration of mineral oil can produce chronic inflammation of the lungs (i.e. lipoid pneumonia) that may progress to pulmonary fibrosis. Symptoms are often subtle and radiological changes appear worse than clinical abnormalities. Occasionally, persistent cough, irritation of the upper respiratory tract, shortness of breath with exertion, fever, and bloody sputum occur. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities. Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin.

## * * * Section 5 - Fire Fighting Measures * * *

### General Fire Hazards

See Section 9 for Flammability Properties.
Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively. No special fire hazards are known to be associated with this product. Dense smoke may be generated while burning.

### Hazardous Combustion Products

May form: carbon dioxide and carbon monoxide, oxides of sulfur, nitrogen and phosphorous, various hydrocarbons.

### Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or gaseous extinguishing agent.

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.

SMALL SPILL: Absorb liquid on vermiculite, floor absorbent or other absorbent material. Persons not wearing proper personal protective equipment should be excluded from area of spill.

LARGE SPILL: Prevent run-off to sewers, streams, or other bodies of water. If run-off occurs, notify authorities as required, that a spill has occurred. Persons not wearing proper personal protective equipment should be excluded from area of spill until clean-up has been completed.

### 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.

### 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, and open flame! Electrical equipment should be approved for classified area. 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

Avoid contact with: acids, halogens, strong oxidizing agents.

## * * * Section 8 - Exposure Controls / Personal Protection * * *

### Component Exposure Limits

ACGIH, OSHA, and NIOSH have not developed exposure limits for any of this product's components.

### 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

Not normally required. However, wear resistant gloves such as nitrile rubber to prevent irritation which may result from prolonged or repeated skin contact with product.

### 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

To prevent repeated or prolonged skin contact, wear impervious clothing and boots. Wear normal work clothing covering arms and legs.

### Hygiene Measures

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 & Chemical Properties * * *

| | | | |
|---|---|---|---|
| **Appearance:** | Dry, clear and bright | **Odor:** | None |
| **Physical State:** | Liquid | **pH:** | ND |
| **Vapor Pressure:** | ND | **Vapor Density:** | ND |
| **Boiling Point:** | >425 °F (218.3°C) @ 760.00 mmHg | **Melting Point:** | ND |
| **Solubility (H2O):** | Negligible | **Specific Gravity:** | 0.881 @ 60°F (16°C) |
| **Evaporation Rate:** | Slower than ethyl ether | **VOC:** | ND |
| **Viscosity:** | <= 3300.0 cps @ -20°C; 10.0 - 11.0 cst @ 100°C | **Octanol/H2O Coeff.:** | ND |
| **Flash Point:** | 430 °F (221.1 °C) | **Flash Point Method:** | COC |
| **Upper Flammability Limit (UFL):** | ND | **Lower Flammability Limit (LFL):** | ND |
| **Burning Rate:** | ND | **Auto Ignition:** | ND |

## * * * Section 10 - Chemical Stability & Reactivity Information * * *

### Chemical Stability

This is a stable material.

### Hazardous Reaction Potential

Will not occur.

### Conditions to Avoid

None

### Incompatible Products

Avoid contact with: acids, halogens, strong oxidizing agents.

### Hazardous Decomposition Products

May form: aldehydes, carbon dioxide and carbon monoxide, hydrogen sulfide, oxides of sulfur, nitrogen and phosphorus, toxic fumes, various hydrocarbons.

## * * * Section 11 - Toxicological Information * * *

### Acute Toxicity

#### A: General Product Information

Harmful if large amounts are swallowed.

#### B: Component Analysis - LD50/LC50

**Petroleum distillates, solvent dewaxed heavy paraffinic (64742-65-0)**

Inhalation LC50 Rat >4.7 mg/L 4 h; Oral LD50 Rat >5000 mg/kg; Dermal LD50 Rabbit >5000 mg/kg

### Potential Health Effects: Skin Corrosion Property/Stimulativeness

May cause mild skin irritation. Prolonged or repeated contact may dry the skin. Symptoms include redness, burning, drying and cracking of the skin, and skin burns. Additional symptoms of skin contact include: acne. Passage of this material into the body through the skin is possible, but it is unlikely that this would result in harmful effects during safe handling and use.

### Potential Health Effects: Eye Critical Damage/ Stimulativeness

May cause mild eye irritation. Symptoms include stinging, tearing, and redness.

### Potential Health Effects: Ingestion

Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

### Potential Health Effects: Inhalation

It is possible to breathe this material under certain conditions of handling and use (for example, during heating, spraying, or stirring). Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful. Symptoms usually occur at air concentrations higher than the recommended exposure limits.

### Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

### Generative Cell Mutagenicity

This product is not reported to have any mutagenic effects.

### Carcinogenicity

#### A: General Product Information

May cause cancer.

Used motor oil has been shown to cause skin cancer in laboratory animal continually exposed by repeated applications.

#### B: Component Carcinogenicity

None of this product's components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

### 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

Acute aspiration of large amounts of oil-laden material may produce a serious aspiration hazard.

## * * * 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

**Petroleum distillates, solvent dewaxed heavy paraffinic (64742-65-0)**

| Test & Species | Conditions |
|---|---|
| 96 Hr LC50 Oncorhynchus mykiss | >5000 mg/L |
| 48 Hr EC50 Daphnia magna | >1000 mg/L |

### 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:** Not Regulated

## * * * Section 15 - Regulatory Information * * *

### Regulatory Information

**Component Analysis**

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), or CERCLA (40 CFR 302.4).

**SARA Section 311/312 – Hazard Classes**

| Acute Health | Chronic Health | Fire | Sudden Release of Pressure | Reactive |
|---|---|---|---|---|
| X | X | -- | -- | -- |

**SARA SECTION 313 - SUPPLIER NOTIFICATION**

ZINC C1-C14 ALKYLDITHIOPHOSPHATE (CAS No. 68649-42-3)

**State Regulations**

**Component Analysis - State**

None of this product's components are listed on the state lists from CA, MA, MN, NJ, PA, or RI.

**Component Analysis - WHMIS IDL**

No components are listed in the WHMIS IDL.

**Additional Regulatory Information**

**Component Analysis - Inventory**

| Component | CAS # | TSCA | CAN | EEC |
|---|---|---|---|---|
| Petroleum distillates, solvent dewaxed heavy paraffinic | 64742-65-0 | Yes | DSL | EINECS |

## * * * Section 16 - Other Information * * *

**NFPA® Hazard Rating**

| | |
|---|---|
| Health | 1 |
| Fire | 1 |
| Reactivity | 0 |




**HMIS® Hazard Rating**

| | | |
|---|---|---|
| Health | 1* | Slight |
| Fire | 1 | Slight |
| Physical | 0 | Minimal |
| | | *Chronic |

### Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

### 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

# SAFETY DATA SHEET

Version 5.5
Revision Date 05/27/2016
Print Date 07/13/2017

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Methyl *tert*-butyl ether

Product Number : 48027
Brand : Supelco
Index-No. : 603-181-00-X

CAS-No. : 1634-04-4

### 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 liquids (Category 2), H225
Skin irritation (Category 2), H315

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)
H225 Highly flammable liquid and vapour.
H315 Causes skin irritation.

Precautionary statement(s)
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.
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/ eye protection/ face protection.

| | |
|---|---|
| P303 + P361 + P353 | IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower. |
| P332 + P313 | If skin irritation occurs: Get medical advice/ 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. |
| P403 + P235 | Store in a well-ventilated place. Keep cool. |
| 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 : MTBE
*tert*-Butyl methyl ether
Methyl *tert*-butyl ether

Formula : $C_5H_{12}O$
Molecular weight : 88.15 g/mol
CAS-No. : 1634-04-4
EC-No. : 216-653-1
Index-No. : 603-181-00-X
Registration number : 01-2119452786-27-XXXX

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **tert-Butyl methyl ether** | | |
| | Flam. Liq. 2; Skin Irrit. 2; H225, H315 | <= 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
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).

### 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.
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. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Storage class (TRGS 510): Flammable liquids

### 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 |
|---|---|---|---|---|
| tert-Butyl methyl ether | 1634-04-4 | TWA | 50.000000 ppm | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Upper Respiratory Tract irritation<br>Kidney damage<br>Confirmed animal carcinogen with unknown relevance to humans | | |
| | | PEL | 40 ppm<br>144 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

### 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: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 230 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, 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, 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: liquid |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: -108.6 °C (-163.5 °F) |
| f) | Initial boiling point and boiling range | 55 - 56 °C (131 - 133 °F) - lit. |
| g) | Flash point | -33.0 °C (-27.4 °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: 15.1 %(V)<br>Lower explosion limit: 1.6 %(V) |
| k) | Vapour pressure | 1,018.7 hPa (764.1 mmHg) at 55.0 °C (131.0 °F)<br>279.2 hPa (209.4 mmHg) at 20.0 °C (68.0 °F) |
| l) | Vapour density | No data available |
| m) | Relative density | 0.74 g/cm3 at 25 °C (77 °F) |

| | | |
|---|---|---|
| n) | Water solubility | 42 g/l at 20 °C (68 °F) - OECD Test Guideline 105 |
| o) | Partition coefficient: n-octanol/water | log Pow: 1.06 |
| p) | Auto-ignition temperature | 374.0 °C (705.2 °F) |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | 0.464 mm2/s at 20 °C (68 °F) - 0.409 mm2/s at 40 °C (104 °F) - |
| 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**
Vapours may form explosive mixture with air.

**10.4 Conditions to avoid**
Heat, flames and sparks.

**10.5 Incompatible materials**
Oxidizing agents, Strong acids

**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 - 4,000 mg/kg

LC50 Inhalation - Rat - 4 h - 23576 ppm

Dermal: No data available

No data available

**Skin corrosion/irritation**
Skin - Rabbit
Result: Skin irritation

**Serious eye damage/eye irritation**
Eyes - Rabbit
Result: No eye irritation

**Respiratory or skin sensitisation**
Will not occur

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

**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: KN5250000

Nausea, Vomiting, Dizziness, Central nervous system depression, Aspiration or inhalation may cause chemical pneumonitis., MTBE (methyl-tert-butyl ether) is reported to metabolize to tert-butyl alcohol and formaldehyde by microsomal demethylation, MTBE (methyl-tert-butyl ether) should be considered a "potential human carcinogen" due to an increase in leydig interstitial cell tumors of testes in male rats and an increase in lymphomas, leukemias, and uterine sarcomas in female rats., In another unpublished study MTBE was shown to be carcinogenic due to "increased incidence of a rare type of kidney tumor" in male rats and an "increase in the incidence of hepatocellular adenomas" in female mice., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system -

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | LC50 - Pimephales promelas (fathead minnow) - 672.00 mg/l - 96 h |
| | LC50 - other fish - > 1,000.00 mg/l - 96 h |
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 472 mg/l - 48 h |
| Toxicity to algae | EC50 - Pseudokirchneriella subcapitata (green algae) - 491 mg/l - 96 h |

### 12.2 Persistence and degradability

| | |
|---|---|
| Biodegradability | Result: 0 % - Not readily biodegradable.<br>(OECD Test Guideline 301D) |

### 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: 2398 Class: 3 Packing group: II
Proper shipping name: Methyl tert-butyl ether
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 2398 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: METHYL tert-BUTYL ETHER

**IATA**
UN number: 2398 Class: 3 Packing group: II
Proper shipping name: Methyl tert-butyl ether

## 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 |
|---|---|---|
| tert-Butyl methyl ether | 1634-04-4 | 2007-07-01 |

**SARA 311/312 Hazards**
Fire Hazard, Acute Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| tert-Butyl methyl ether | 1634-04-4 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| tert-Butyl methyl ether | 1634-04-4 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| tert-Butyl methyl ether | 1634-04-4 | 2007-07-01 |

## 16. OTHER INFORMATION

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

| | |
|---|---|
| Flam. Liq. | Flammable liquids |
| H225 | Highly flammable liquid and vapour. |
| H315 | Causes skin irritation. |
| Skin Irrit. | Skin irritation |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Chronic Health Hazard: | |
| Flammability: | 3 |
| Physical Hazard | 0 |

**NFPA Rating**
Health hazard: 2

| | |
|---|---|
| Fire Hazard: | 3 |
| Reactivity Hazard: | 0 |

**Further information**

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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 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: 05/27/2016 Print Date: 07/13/2017

Fisher Scientific

Part of Thermo Fisher Scientific

# SAFETY DATA SHEET

**Creation Date** 27-Sep-2010 **Revision Date** 12-Oct-2015 **Revision Number** 3

## 1. Identification

**Product Name** **Naphthalene**

**Cat No. :** **N7-500**

**Synonyms** Tar camphor; Naphthalin; Coal tar camphor

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

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

**Emergency Telephone Number**
Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

## 2. Hazard(s) identification

**Classification**

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

| | |
|---|---|
| Flammable solids | Category 2 |
| Acute oral toxicity | Category 4 |
| Carcinogenicity | Category 1B |
| Target Organs - Liver, Kidney. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Flammable solid
Harmful if swallowed
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
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment

**Response**

IF exposed or concerned: Get medical attention/advice

**Inhalation**

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

**Ingestion**

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth

**Fire**

In case of fire: Use CO2, dry chemical, or foam for extinction

**Storage**

Store locked up
Store in a well-ventilated place. Keep container tightly closed

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

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Naphthalene | 91-20-3 | >95 |

## 4. First-aid measures

**General Advice** If symptoms persist, call a physician.

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

**Ingestion** Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

**Most important symptoms/effects** . Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

**Unsuitable Extinguishing Media** No information available

**Flash Point** 78 °C / 172.4 °F
**Method -** No information available

| | |
|---|---|
| **Autoignition Temperature** | Not applicable 526 °C / 978.8 °F |
| **Explosion Limits** | |
| **Upper** | 5.9 vol % |
| **Lower** | 0.9 vol % |
| **Sensitivity to Mechanical Impact** | No information available |
| **Sensitivity to Static Discharge** | No information available |

**Specific Hazards Arising from the Chemical**
Combustible material. Containers may explode when heated. Do not allow run-off from fire fighting to enter drains or water courses.

**Hazardous Combustion Products**
Carbon monoxide (CO) Carbon dioxide ($CO_2$)
**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**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 2 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Remove all sources of ignition. Take precautionary measures against static discharges.

**Environmental Precautions** 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.

**Methods for Containment and Clean Up** Sweep up or vacuum up spillage and collect in suitable container for disposal. Keep in suitable, closed containers for disposal. Remove all sources of ignition.

## 7. Handling and storage

**Handling** Wear personal protective equipment. Ensure adequate ventilation. Avoid ingestion and inhalation. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| Naphthalene | TWA: 10 ppm<br>Skin | (Vacated) TWA: 10 ppm<br>(Vacated) TWA: 50 mg/m³<br>(Vacated) STEL: 15 ppm<br>(Vacated) STEL: 75 mg/m³<br>TWA: 10 ppm<br>TWA: 50 mg/m³ | IDLH: 250 ppm<br>TWA: 10 ppm<br>TWA: 50 mg/m³<br>STEL: 15 ppm<br>STEL: 75 mg/m³ |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Naphthalene | TWA: 10 ppm<br>TWA: 52 mg/m³<br>STEL: 15 ppm<br>STEL: 79 mg/m³ | TWA: 10 ppm<br>TWA: 50 mg/m³<br>STEL: 15 ppm<br>STEL: 75 mg/m³ | TWA: 10 ppm<br>STEL: 15 ppm<br>Skin |

*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. Use explosion-proof electrical/ventilating/lighting/equipment. 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** 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** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Solid |
| **Appearance** | White |
| **Odor** | Characteristic |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | 79 - 82 °C / 174.2 - 179.6 °F |
| **Boiling Point/Range** | 218 °C / 424.4 °F |
| **Flash Point** | 78 °C / 172.4 °F |
| **Evaporation Rate** | Not applicable |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | 5.9 vol % |
| **Lower** | 0.9 vol % |
| **Vapor Pressure** | 0.08 mbar @ 20 °C |
| **Vapor Density** | Not applicable |
| **Specific Gravity** | 0.990 |
| **Solubility** | slightly soluble |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | Not applicable 526 °C / 978.8 °F |
| **Decomposition Temperature** | 540 °C |
| **Viscosity** | Not applicable |
| **Molecular Formula** | C10H8 |
| **Molecular Weight** | 128.17 |

## 10. Stability and reactivity

**Reactive Hazard** Yes

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products. Excess heat. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

**Incompatible Materials** Strong oxidizing agents

**Hazardous Decomposition Products** Carbon monoxide (CO), Carbon dioxide ($CO_2$)

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Naphthalene | LD50 = 490 mg/kg ( Rat )<br>LD50 = 1110 mg/kg ( Rat ) | LD50 > 20 g/kg ( Rabbit )<br>LD50 = 1120 mg/kg ( Rabbit ) | LC50 > 340 mg/m³ ( Rat ) 1 h |

**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 |
|---|---|---|---|---|---|---|
| Naphthalene | 91-20-3 | Group 2B | Reasonably Anticipated | A3 | X | Not listed |

*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)*

*NTP: (National Toxicity Program)*
*Known - Known Carcinogen*
*Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*

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

*A1 - Known Human Carcinogen*
*A2 - Suspected Human Carcinogen*
*A3 - Animal Carcinogen*
*ACGIH: (American Conference of Governmental Industrial Hygienists)*

**Mutagenic Effects** Not mutagenic in AMES Test

**Reproductive Effects** Experiments have shown reproductive toxicity effects on laboratory animals.

**Developmental Effects** Developmental effects have occurred in experimental animals.

**Teratogenicity** Teratogenic effects have occurred in experimental animals.

**STOT - single exposure** None known

**STOT - repeated exposure** Liver Kidney

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

**Endocrine Disruptor Information** No information available

**Other Adverse Effects** Tumorigenic effects have been reported in experimental animals.

## 12. Ecological information

**Ecotoxicity**

Very toxic 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 |
|---|---|---|---|---|
| Naphthalene | EC50: = 0.4 mg/L, 72h (Skeletonema costatum) | LC50 96 h 1-6.5 mg/L (Pimephales promelas) | EC50 = 0.93 mg/L 30 min EC50 > 20 mg/L 18 h | EC50: 1.09 - 3.4 mg/L, 48h Static (Daphnia magna) EC50: = 1.96 mg/L, 48h Flow through (Daphnia magna) LC50: = 2.16 mg/L, 48h (Daphnia magna) |

**Persistence and Degradability** Soluble in 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 |
|---|---|
| Naphthalene | 3.3 |

## 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 |
|---|---|---|
| Naphthalene - 91-20-3 | U165 | - |

## 14. Transport information

**DOT**
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

**TDG**
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

**IATA**
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

**IMDG/IMO**
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Naphthalene | X | X | - | 202-049-5 | - | | 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)**

**SARA 313**

| Component | CAS-No | Weight % | SARA 313 - Threshold Values % |
|---|---|---|---|
| Naphthalene | 91-20-3 | >95 | 0.1 |

**SARA 311/312 Hazard Categories**

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

**CWA (Clean Water Act)**

| Component | CWA - Hazardous Substances | CWA - Reportable Quantities | CWA - Toxic Pollutants | CWA - Priority Pollutants |
|---|---|---|---|---|
| Naphthalene | X | 100 lb | X | X |

**Clean Air Act**

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---|---|---|---|
| Naphthalene | X | | - |

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

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Naphthalene | 100 lb 1 lb | - |

**California Proposition 65** This product contains the following proposition 65 chemicals

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|
| Naphthalene | 91-20-3 | Carcinogen | 5.8 µg/day | Carcinogen |

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

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Naphthalene | 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** Moderate risk, Grade 2

**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**
B3 Combustible liquid
D1B Toxic materials
D2A Very toxic materials



## 16. Other information

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

**Creation Date** 27-Sep-2010
**Revision Date** 12-Oct-2015
**Print Date** 12-Oct-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 4.7
Revision Date 12/28/2015
Print Date 05/01/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Nickel

Product Number : 268259
Brand : Aldrich
Index-No. : 028-002-00-7

CAS-No. : 7440-02-0

### 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 # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), H372
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)
H317 May cause an allergic skin reaction.
H351 Suspected of causing cancer.
H372 Causes damage to organs through prolonged or repeated exposure if inhaled.
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. |
| P260 | Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. |
| P264 | Wash skin thoroughly after handling. |
| P270 | Do not eat, drink or smoke when using this product. |
| P272 | Contaminated work clothing should not be allowed out of the workplace. |
| P273 | Avoid release to the environment. |
| P280 | Wear protective gloves/ protective clothing/ eye protection/ face protection. |
| P302 + P352 | IF ON SKIN: Wash with plenty of soap and water. |
| P308 + P313 | IF exposed or concerned: Get medical advice/ attention. |
| P333 + P313 | If skin irritation or rash occurs: Get medical advice/ attention. |
| P363 | Wash contaminated clothing before reuse. |
| 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 | : | Ni |
| Molecular weight | : | 58.69 g/mol |
| CAS-No. | : | 7440-02-0 |
| EC-No. | : | 231-111-4 |
| Index-No. | : | 028-002-00-7 |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Nickel** | | |
| | Skin Sens. 1; Carc. 2; STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; H317, H351, H372, 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. 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**
Nickel/nickel oxides

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**
No data available

## 6. ACCIDENTAL RELEASE MEASURES

**6.1 Personal precautions, protective equipment and emergency procedures**
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

**6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

**6.4 Reference to other sections**
For disposal see section 13.

## 7. HANDLING AND STORAGE

**7.1 Precautions for safe handling**
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.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.
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 |
|---|---|---|---|---|
| Nickel | 7440-02-0 | TWA | 1.500000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Dermatitis<br>Pneumoconiosis<br>Not suspected as a human carcinogen | | |
| | | TWA | 1.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 0.015000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |

| | | | | |
|---|---|---|---|---|
| | | TWA | 1.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 0.015000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |
| | | TWA | 1.5 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Dermatitis<br>Pneumoconiosis<br>Not suspected as a human carcinogen | | |
| | | TWA | 1 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 0.015 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |

## 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.

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: Foil<br>Colour: white, silver, metallic |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 1,453 °C (2,647 °F) - lit. |
| f) | Initial boiling point and boiling range | 2,732 °C (4,950 °F) - lit. |
| g) | Flash point | Not applicable |
| 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 | 1 hPa (1 mmHg) at 1,810 °C (3,290 °F) |
| l) | Vapour density | No data available |
| m) | Relative density | 8.9 g/mL 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
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**
acids, Oxidizing agents, Sulphur compounds, Hydrogen gas, Oxygen, Methanol, organic solvents, Aluminium, Fluorine, Ammonia

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

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects**

**Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

No data available

**Skin corrosion/irritation**
No data available

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

**Respiratory or skin sensitisation**
May cause sensitisation by skin contact.

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

Limited evidence of carcinogenicity in animal studies

| | |
|---|---|
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Nickel) |
| | 1 - Group 1: Carcinogenic to humans (Nickel) |
| | 2B - Group 2B: Possibly carcinogenic to humans (Nickel) |
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Nickel) |
| | 1 - Group 1: Carcinogenic to humans (Nickel) |
| | 2B - Group 2B: Possibly carcinogenic to humans (Nickel) |
| NTP: | Reasonably anticipated to be a human carcinogen (Nickel) |
| | Reasonably anticipated to be a human carcinogen (Nickel) |
| 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**
Inhalation - Causes damage to organs through prolonged or repeated exposure.

**Aspiration hazard**
No data available

**Additional Information**
RTECS: QR5950000

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | LC50 - Cyprinus carpio (Carp) - 1.3 mg/l - 96 h |
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 1 mg/l - 48 h |

### 12.2 Persistence and degradability
Not applicable

### 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.
Harmful 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**
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 |
|---|---|---|
| Nickel | 7440-02-0 | 2007-07-01 |

**SARA 311/312 Hazards**
Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Nickel | 7440-02-0 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Nickel | 7440-02-0 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Nickel | 7440-02-0 | 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 |
|---|---|---|
| Nickel | 7440-02-0 | 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 |
| H317 | May cause an allergic skin reaction. |
| H351 | Suspected of causing cancer. |
| H372 | Causes damage to organs through prolonged or repeated exposure if inhaled. |
| H402 | Harmful to aquatic life. |
| H412 | Harmful to aquatic life with long lasting effects. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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**Preparation Information**

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

Version: 4.7 Revision Date: 12/28/2015 Print Date: 05/01/2016

# SAFETY DATA SHEET

**Creation Date** 10-Dec-2009 **Revision Date** 26-May-2017 **Revision Number** 4

## 1. Identification

**Product Name** **Tetrachloroethylene**

**Cat No. :** **AC445690000; ACR445690010; AC445690025; AC445691000**

**Synonyms** Perchloroethylene

**Recommended Use** Laboratory chemicals.
**Uses advised against** Not for food, drug, pesticide or biocidal product use

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

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

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**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 Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Skin Sensitization | Category 1 |
| Carcinogenicity | Category 1B |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Central nervous system (CNS). | |
| Specific target organ toxicity - (repeated exposure) | Category 2 |
| Target Organs - Kidney, Liver, Blood. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause 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
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
**Response**
IF exposed or concerned: Get medical attention/advice
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
**Skin**
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention
**Eyes**
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 advice/attention
**Storage**
Store locked up
Store in a well-ventilated place. Keep container tightly closed
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
Toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Tetrachloroethylene | 127-18-4 | >95 |

## 4. First-aid measures

**General Advice** If symptoms persist, call a physician.

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

**Inhalation** Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

**Ingestion** Clean mouth with water and drink afterwards plenty of water.

**Most important symptoms/effects** None reasonably foreseeable. May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: 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

**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

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

**Unsuitable Extinguishing Media** No information available

**Flash Point** No information available
**Method -** No information available

**Autoignition Temperature** No information available
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

**Hazardous Combustion Products**
Chlorine Hydrogen chloride gas Phosgene
**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**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 0 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Use personal protective equipment. Ensure adequate ventilation.
**Environmental Precautions** Do not flush into surface water or sanitary sewer system.

**Methods for Containment and Clean Up** Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

## 7. Handling and storage

**Handling** Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Ensure adequate ventilation. Avoid ingestion and inhalation.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH | Mexico OEL (TWA) |
|---|---|---|---|---|
| Tetrachloroethylene | TWA: 25 ppm<br>STEL: 100 ppm | (Vacated) TWA: 25 ppm<br>(Vacated) TWA: 170 mg/m$^3$<br>Ceiling: 200 ppm<br>TWA: 100 ppm | IDLH: 150 ppm | TWA: 100 ppm<br>TWA: 670 mg/m$^3$<br>TWA: 200 ppm<br>TWA: 1250 mg/m$^3$<br>STEL: 200 ppm<br>STEL: 1340 mg/m$^3$ |

*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 adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

**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** 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** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Liquid |
| **Appearance** | Colorless |
| **Odor** | Characteristic, sweet |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | -22 °C / -7.6 °F |
| **Boiling Point/Range** | 120 - 122 °C / 248 - 251.6 °F @ 760 mmHg |
| **Flash Point** | No information available |
| **Evaporation Rate** | 6.0 (Ether = 1.0) |
| **Flammability (solid,gas)** | Not applicable |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | 18 mbar @ 20 °C |
| **Vapor Density** | No information available |
| **Density** | 1.619 |
| **Specific Gravity** | 1.625 |
| **Solubility** | 0.15 g/L water (20°C) |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | No information available |
| **Decomposition Temperature** | > 150°C |
| **Viscosity** | 0.89 mPa s at 20 °C |
| **Molecular Formula** | C2 Cl4 |
| **Molecular Weight** | 165.83 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products. Excess heat. Exposure to moist air or water.

**Incompatible Materials** Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines, Aluminium

**Hazardous Decomposition Products** Chlorine, Hydrogen chloride gas, Phosgene

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Tetrachloroethylene | LD50 = 2629 mg/kg ( Rat ) | LD50 > 10000 mg/kg (Rat) | LC50 = 27.8 mg/L ( Rat ) 4 h |

**Toxicologically Synergistic Products** No information available

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

**Irritation** Irritating to eyes and skin

**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 |
|---|---|---|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | Group 2A | Reasonably Anticipated | A3 | X | A3 |

*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)*

*NTP: (National Toxicity Program)*
*Known - Known Carcinogen*
*Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*

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

*A1 - Known Human Carcinogen*
*A2 - Suspected Human Carcinogen*
*A3 - Animal Carcinogen*
*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** Central nervous system (CNS)
**STOT - repeated exposure** Kidney Liver Blood

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: 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

**Endocrine Disruptor Information**

| Component | EU - Endocrine Disrupters Candidate List | EU - Endocrine Disruptors - Evaluated Substances | Japan - Endocrine Disruptor Information |
|---|---|---|---|
| Tetrachloroethylene | Group II Chemical | Not applicable | Not applicable |

**Other Adverse Effects** Tumorigenic effects have been reported in experimental animals.

## 12. Ecological information

**Ecotoxicity**

Toxic 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 |
|---|---|---|---|---|
| Tetrachloroethylene | EC50: > 500 mg/L, 96h (Pseudokirchneriella subcapitata) | LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhynchus mykiss)<br>LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus)<br>LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas)<br>LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas) | EC50 = 100 mg/L 24 h<br>EC50 = 112 mg/L 24 h<br>EC50 = 120.0 mg/L 30 min | EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna) |

**Persistence and Degradability** Insoluble in water Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation** No information available.

**Mobility** . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

| Component | log Pow |
|---|---|
| Tetrachloroethylene | 2.88 |

## 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 |
|---|---|---|
| Tetrachloroethylene - 127-18-4 | U210 | - |

## 14. Transport information

**DOT**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Packing Group** III

**TDG**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Packing Group** III

**IATA**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1

**Packing Group** III

**IMDG/IMO**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Subsidiary Hazard Class** P
**Packing Group** III

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloroethylene | X | X | - | 204-825-9 | - | | 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 % |
|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | >95 | 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 |
|---|---|---|---|---|
| Tetrachloroethylene | - | - | X | X |

**Clean Air Act**

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---|---|---|---|
| Tetrachloroethylene | X | | - |

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

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive

Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Tetrachloroethylene | 100 lb 1 lb | - |

**California Proposition 65** This product contains the following proposition 65 chemicals

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | Carcinogen | 14 µg/day | Carcinogen |

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

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Tetrachloroethylene | X | X | X | X | X |

**U.S. Department of Transportation**

Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
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

## 16. Other information

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

**Creation Date** 10-Dec-2009
**Revision Date** 26-May-2017
**Print Date** 26-May-2017
**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**

# SAFETY DATA SHEET

## Section 1. Identification

**CHS Inc.**
**P.O. Box 64089**
**Mail station 525**
**St. Paul, MN 55164-0089**

**Transportation Emergency (CHEMTREC)** : **1-800-424-9300**
**Technical Information** : **1-651-355-8443**
**SDS Information** : **1-651-355-8445**

| | | | | | |
|---|---|---|---|---|---|
| **Product name** | : | Regular, Midgrade & Premium Unleaded Gasoline | **SDS no.** | : | 0147- M6A0 |
| **Common name** | : | Unleaded Gasoline, Premium Unleaded Gasoline | **Revision date** | : | 11/15/2013 |
| **Chemical name** | : | Light Petroleum Distillate | **Chemical formula** | : | Mixture |
| **Chemical family** | : | Mixed Petroleum Hydrocarbon | | | |

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

Not available.

## Section 2. Hazards identification

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture** :
FLAMMABLE LIQUIDS - Category 1
SKIN CORROSION/IRRITATION - Category 2
GERM CELL MUTAGENICITY - Category 1B
CARCINOGENICITY - Category 1A
TOXIC TO REPRODUCTION (Fertility) - Category 2
TOXIC TO REPRODUCTION (Unborn child) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1
ASPIRATION HAZARD - Category 1
AQUATIC HAZARD (ACUTE) - Category 3
AQUATIC HAZARD (LONG-TERM) - Category 3

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Danger

**Hazard statements** :
Extremely flammable liquid and vapor.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
Suspected of damaging fertility or the unborn child.
May be fatal if swallowed and enters airways.
May cause drowsiness and dizziness.
Causes damage to organs through prolonged or repeated exposure.
Harmful to aquatic life with long lasting effects.

**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.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hazardous Material Information System (U.S.A.)** | **Health :** | 2 * | **Flammability :** | 4 | **Physical hazards :** | 0 |
| **National Fire Protection Association (U.S.A.)** | **Health :** | 2 | **Flammability :** | 4 | **Instability :** | 0 |

## Section 3. Composition/information on ingredients

**Substance/mixture** : Mixture

**Chemical name** : Light Petroleum Distillate

**Other means of identification** : Unleaded Gasoline, Premium Unleaded Gasoline

| Ingredient name | % | CAS number |
|---|---|---|
| Toluene | 10 - 30 | 108-88-3 |
| Xylene | 10 - 30 | 1330-20-7 |
| Tert-butyl methyl ether | 10 - 30 | 1634-04-4 |
| Benzene | 1 - 5 | 71-43-2 |
| 1,2,4-Trimethylbenzene | 1 - 5 | 95-63-6 |
| Ethylbenzene | 1 - 5 | 100-41-4 |
| n-Hexane | 1 - 5 | 110-54-3 |
| Butyl ethyl ether | 0.1 - 1 | 628-81-9 |
| Naphthalene | 0.1 - 1 | 91-20-3 |

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**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**

**Eye contact** : If material comes in contact with the eyes, immediately wash the eyes with large amounts of water for 15 minutes, occasionally lifting the lower and upper lids. Get medical attention.

**Inhalation** : If person breathes in large amounts of material, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the person warm and at rest. Get medical attention as soon as possible.

**Skin contact** : If the material comes in contact with the skin, wash the contaminated skin with soap and water promptly. If the material penetrates through clothing, remove the clothing and wash the skin with soap and water promptly. If irritation persists after washing, get medical attention immediately.

**Ingestion** : If material has been swallowed, do not induce vomiting. Get medical attention immediately.

**Most important symptoms/effects, acute and delayed**

**Potential acute health effects**

**Eye contact** : Causes serious eye irritation.

**Inhalation** : Can cause central nervous system (CNS) depression. May cause drowsiness and dizziness.

**Skin contact** : Causes skin irritation.

**Ingestion** : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways. Irritating to mouth, throat and stomach.

**Over-exposure signs/symptoms**

**Eye contact** : Adverse symptoms may include the following: pain or irritation, watering, redness.

**Inhalation** : Adverse symptoms may include the following: respiratory tract irritation, coughing.

**Skin contact** : Adverse symptoms may include the following: irritation, redness.

**Ingestion** : No known significant effects or critical hazards.

**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, $CO_2$, water spray (fog) or foam.

**Unsuitable extinguishing media** : Do not use water jet or water-based fire extinguishers.

**Specific hazards arising from the chemical** : Highly volatile material. Flowing gasoline can be ignited by self-generated static electricity; containers should be bonded and grounded. Vapors may travel along the ground to a source of ignition (pilot light, heater, electric motor) some distance away. Containers, drums (even empty) can explode when heat (welding, cutting, etc.) is applied.

**Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

**Special protective actions for fire-fighters** : Water may be ineffective on flames, but should be used to keep fire-exposed containers cool. Large fires, such as tank fires, should be fought with caution. If possible, pump the contents from the tank and keep adjoining structures cool and protect personnel. Avoid spreading burning liquid with water used for cooling purposes. Do not flush down public sewers. The use of a self-contained breathing apparatus and protective clothing is recommended for fire fighters. Avoid inhalation of vapors.

**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** : Keep unnecessary and unprotected personnel from entering. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

**Methods and materials for containment and cleaning up**

**Spill** : Contain with dikes or absorbent to prevent migration to sewers/streams. Take up small spill with dry chemical absorbent; large spills may require pump or vacuum prior to absorbent. May require excavation of severely contaminated soil.

## Section 7. Handling and storage

**Precautions for safe handling**

**Protective measures** : Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate.

**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.

**Conditions for safe storage, including any incompatibilities** : Do not store above the following temperature: 113°C (235.4°F). Odorous and toxic fumes may form from the decomposition of this product if stored at excessive temperatures for extended periods of time. Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Use appropriate containment to avoid environmental contamination.

## Section 8. Exposure controls/personal protection

**Control parameters**

**Occupational exposure limits**

| Ingredient name | Exposure limits |
|---|---|
| Toluene | **NIOSH REL (United States, 6/2009).**<br>STEL: 560 mg/m³ 15 minutes.<br>STEL: 150 ppm 15 minutes.<br>TWA: 375 mg/m³ 10 hours.<br>TWA: 100 ppm 10 hours.<br>**OSHA PEL Z2 (United States, 11/2006).**<br>AMP: 500 ppm 10 minutes.<br>CEIL: 300 ppm<br>TWA: 200 ppm 8 hours.<br>**ACGIH TLV (United States, 3/2012).**<br>TWA: 20 ppm 8 hours. |
| Xylene | **ACGIH TLV (United States, 3/2012).**<br>STEL: 651 mg/m³ 15 minutes.<br>STEL: 150 ppm 15 minutes.<br>TWA: 434 mg/m³ 8 hours.<br>TWA: 100 ppm 8 hours.<br>**OSHA PEL (United States, 6/2010).**<br>TWA: 100 ppm 8 hours. |

| | |
|---|---|
| | TWA: 435 mg/m³ 8 hours. |
| Tert-butyl methyl ether | **ACGIH TLV (United States, 1/2005).**<br>TWA: 50 ppm 8 hours. Form: All forms.<br>**ACGIH TLV (United States, 2/2010).**<br>TWA: 50 ppm 8 hours. |
| Benzene | **ACGIH TLV (United States, 3/2012). Absorbed through skin.**<br>STEL: 8 mg/m³ 15 minutes.<br>STEL: 2.5 ppm 15 minutes.<br>TWA: 1.6 mg/m³ 8 hours.<br>TWA: 0.5 ppm 8 hours.<br>**NIOSH REL (United States, 6/2009).**<br>STEL: 1 ppm 15 minutes.<br>TWA: 0.1 ppm 10 hours.<br>**OSHA PEL (United States, 6/2010).**<br>STEL: 5 ppm 15 minutes.<br>TWA: 1 ppm 8 hours.<br>**OSHA PEL Z2 (United States, 11/2006).**<br>AMP: 50 ppm 10 minutes.<br>CEIL: 25 ppm<br>TWA: 10 ppm 8 hours. |
| 1,2,4-Trimethylbenzene | **ACGIH TLV (United States, 3/2012).**<br>TWA: 123 mg/m³ 8 hours.<br>TWA: 25 ppm 8 hours.<br>**NIOSH REL (United States, 1/2013).**<br>TWA: 125 mg/m³ 10 hours.<br>TWA: 25 ppm 10 hours.<br>**OSHA PEL 1989 (United States, 3/1989).**<br>TWA: 25 ppm 8 hours.<br>TWA: 125 mg/m³ 8 hours. |
| Ethylbenzene | **ACGIH TLV (United States, 3/2012).**<br>TWA: 20 ppm 8 hours.<br>**NIOSH REL (United States, 6/2009).**<br>STEL: 545 mg/m³ 15 minutes.<br>STEL: 125 ppm 15 minutes.<br>TWA: 435 mg/m³ 10 hours.<br>TWA: 100 ppm 10 hours.<br>**OSHA PEL (United States, 6/2010).**<br>TWA: 435 mg/m³ 8 hours.<br>TWA: 100 ppm 8 hours. |
| n-Hexane | **ACGIH TLV (United States, 3/2012). Absorbed through skin.**<br>TWA: 50 ppm 8 hours.<br>**NIOSH REL (United States, 6/2009).**<br>TWA: 180 mg/m³ 10 hours.<br>TWA: 50 ppm 10 hours.<br>**OSHA PEL (United States, 6/2010).**<br>TWA: 1800 mg/m³ 8 hours.<br>TWA: 500 ppm 8 hours. |
| Naphthalene | **ACGIH TLV (United States, 3/2012). Absorbed through skin.**<br>STEL: 79 mg/m³ 15 minutes.<br>STEL: 15 ppm 15 minutes.<br>TWA: 52 mg/m³ 8 hours.<br>TWA: 10 ppm 8 hours.<br>**NIOSH REL (United States, 1/2013).**<br>STEL: 75 mg/m³ 15 minutes.<br>STEL: 15 ppm 15 minutes.<br>TWA: 50 mg/m³ 10 hours.<br>TWA: 10 ppm 10 hours.<br>**OSHA PEL (United States, 6/2010).**<br>TWA: 50 mg/m³ 8 hours.<br>TWA: 10 ppm 8 hours. |

**Appropriate engineering controls** : Use only with adequate ventilation.

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

**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. Ensure that eyewash stations and safety showers are close to the workstation location.

**Eye/face protection** : Recommended: Splash goggles and a face shield, where splash hazard exists.

**Skin protection**

**Hand protection** : 4 - 8 hours (breakthrough time): Nitrile gloves.

**Body protection** : Recommended: Long sleeved coveralls.

**Other skin protection** : Recommended: Impervious boots.

**Respiratory protection** : If ventilation is inadequate, use a NIOSH-certified respirator with an organic vapor cartridge and P95 particulate filter.

## Section 9. Physical and chemical properties

**Appearance**

**Physical state** : Liquid.

**Color** : Reddish golden brown.

**Odor** : Gasoline

**Odor threshold** : 10 ppm

**pH** : Not available.

**Melting point** : Not available.

**Boiling point** : 26.66°C (80°F)

**Flash point** : Closed cup: -40°C (-40°F) [Pensky-Martens.]

**Flammability** : Not available.

**Lower and upper explosive (flammable) limits** : Lower: 1.4%
Upper: 7.6%

**Relative density** : 0.72

**Evaporation rate** : Slower.

**Solubility** : Insoluble in the following materials: cold water and hot water.

**Solubility in water** : Negligible.

**Partition coefficient: n-octanol/water** : Not available.

**Auto-ignition temperature** : 257.22 to 454.44°C (495 to 850°F)

**Decomposition temperature** : Not available.

**SADT** : Not available.

**Viscosity** : Not available.

**Vapor pressure** : 53.3 kPa (400 mm Hg) (68°F)

**Vapor density** : 4 [Air = 1]

## 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.

**Incompatible materials** : Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis.

**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

## Section 11. Toxicological information

**Information on toxicological effects**

**Acute toxicity**

| Product/ingredient name | Result | Species | Dose | Exposure |
|---|---|---|---|---|
| Toluene | LC50 Inhalation Vapor | Rat | 49 g/m³ | 4 hours |
| | LD50 Oral | Rat | 636 mg/kg | - |
| Xylene | LC50 Inhalation Gas. | Rat | 5000 ppm | 4 hours |
| | LD50 Oral | Rat | 4300 mg/kg | - |
| Tert-butyl methyl ether | LC50 Inhalation Gas. | Rat | 23576 ppm | 4 hours |
| | LC50 Inhalation Vapor | Rat | 41000 mg/m³ | 4 hours |
| | LD50 Oral | Rat | >4 g/kg | - |
| Benzene | LD50 Oral | Rat | 930 mg/kg | - |
| 1,2,4-Trimethylbenzene | LC50 Inhalation Vapor | Rat | 18000 mg/m³ | 4 hours |
| | LD50 Oral | Rat | 5 g/kg | - |
| Ethylbenzene | LD50 Dermal | Rabbit | >5000 mg/kg | - |
| | LD50 Oral | Rat | 3500 mg/kg | - |
| n-Hexane | LC50 Inhalation Gas. | Rat | 48000 ppm | 4 hours |
| | LD50 Oral | Rat | 15840 mg/kg | - |
| Butyl ethyl ether | LD50 Oral | Rat | 1870 mg/kg | - |
| Naphthalene | LD50 Dermal | Rabbit | >20 g/kg | - |
| | LD50 Oral | Rat | 490 mg/kg | - |

**Irritation/Corrosion**

| Product/ingredient name | Result | Species | Score | Exposure | Observation |
|---|---|---|---|---|---|
| Toluene | Eyes - Mild irritant | Rabbit | - | 0.5 minutes 100 mg | - |
| | Skin - Moderate irritant | Rabbit | - | 24 hours 20 mg | - |
| | Eyes - Mild irritant | Rabbit | - | 870 µg | - |
| | Eyes - Severe irritant | Rabbit | - | 24 hours 2 mg | - |
| | Skin - Mild irritant | Pig | - | 24 hours 250 µL | - |
| | Skin - Mild irritant | Rabbit | - | 435 mg | - |
| | Skin - Moderate irritant | Rabbit | - | 500 mg | - |
| Xylene | Eyes - Mild irritant | Rabbit | - | 87 mg | - |
| | Eyes - Severe irritant | Rabbit | - | 24 hours 5 mg | - |
| | Skin - Mild irritant | Rat | - | 8 hours 60 µL | - |
| | Skin - Moderate irritant | Rabbit | - | 24 hours 500 mg | - |
| | Skin - Moderate irritant | Rabbit | - | 100% | - |
| Benzene | Eyes - Moderate irritant | Rabbit | - | 88 mg | - |
| | Skin - Moderate irritant | Rabbit | - | 24 hours 20 mg | - |
| | Eyes - Severe irritant | Rabbit | - | 24 hours 2 mg | - |
| | Skin - Mild irritant | Rat | - | 8 hours 60 µL | - |
| | Skin - Mild irritant | Rabbit | - | 24 hours 15 mg | - |
| Ethylbenzene | Eyes - Severe irritant | Rabbit | - | 500 mg | - |
| | Skin - Mild irritant | Rabbit | - | 24 hours 15 mg | - |
| n-Hexane | Eyes - Mild irritant | Rabbit | - | 10 mg | - |
| Naphthalene | Skin - Mild irritant | Rabbit | - | 495 mg | - |
| | Skin - Severe irritant | Rabbit | - | 24 hours 0.05 mL | - |

**Sensitization**

**Skin** : There is no data available.

**Respiratory** : There is no data available.

**Mutagenicity**

There is no data available.

**Carcinogenicity**

There is no data available.

**Classification**

| Product/ingredient name | OSHA | IARC | NTP |
|---|---|---|---|
| Toluene | - | 3 | - |
| Xylene | - | 3 | - |
| Tert-butyl methyl ether | - | 3 | - |
| Benzene | + | 1 | Known to be a human carcinogen. |
| Ethylbenzene | - | 2B | - |
| Naphthalene | - | 2B | Reasonably anticipated to be a human carcinogen. |

**Reproductive toxicity**

There is no data available.

**Teratogenicity**

There is no data available.

**Specific target organ toxicity (single exposure)**

| Name | Category | Route of exposure | Target organs |
|---|---|---|---|
| Toluene | Category 3 | Not applicable. | Narcotic effects |
| 1,2,4-Trimethylbenzene | Category 3 | Not applicable. | Respiratory tract irritation |
| n-Hexane | Category 3 | Not applicable. | Narcotic effects |

**Specific target organ toxicity (repeated exposure)**

| Name | Category | Route of exposure | Target organs |
|---|---|---|---|
| Toluene | Category 2 | Not determined | Not determined |
| Benzene | Category 1 | Not determined | Not determined |
| n-Hexane | Category 2 | Not determined | Not determined |

**Aspiration hazard**

| Name | Result |
|---|---|
| Toluene | ASPIRATION HAZARD - Category 1 |
| Benzene | ASPIRATION HAZARD - Category 1 |
| n-Hexane | ASPIRATION HAZARD - Category 1 |

**Information on the likely routes of exposure** : Dermal contact. Eye contact. Inhalation. Ingestion.

## Section 12. Ecological information

**Toxicity**

| Product/ingredient name | Result | Species | Exposure |
|---|---|---|---|
| Toluene | Acute EC50 433 ppm Marine water | Algae - Skeletonema costatum | 96 hours |
| | Acute EC50 12500 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 72 hours |
| | Acute EC50 11600 µg/l Fresh water | Crustaceans - Gammarus pseudolimnaeus - Adult | 48 hours |
| | Acute EC50 6000 µg/l Fresh water | Daphnia - Daphnia magna - Juvenile (Fledgling, Hatchling, Weanling) | 48 hours |
| | Acute LC50 5500 µg/l Fresh water | Fish - Oncorhynchus kisutch - Fry | 96 hours |
| | Chronic NOEC 500000 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 96 hours |
| | Chronic NOEC 1000 µg/l Fresh water | Daphnia - Daphnia magna | 21 days |
| Xylene | Acute IC50 10 mg/L | Algae | 72 hours |
| | Acute LC50 8500 µg/l Marine water | Crustaceans - Palaemonetes pugio | 48 hours |
| | Acute LC50 13400 µg/l Fresh water | Fish - Pimephales promelas | 96 hours |
| Tert-butyl methyl ether | Acute LC50 672000 µg/l Fresh water | Fish - Pimephales promelas | 96 hours |
| Benzene | Acute EC50 29000 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 72 hours |
| | Acute EC50 1360000 µg/l Fresh water | Algae - Scenedesmus abundans | 96 hours |
| | Acute EC50 9230 µg/l Fresh water | Daphnia - Daphnia magna - Neonate | 48 hours |
| | Acute LC50 21000 µg/l Marine water | Crustaceans - Artemia salina - Nauplii | 48 hours |
| | Acute LC50 5.28 ul/L Fresh water | Fish - Oncorhynchus gorbuscha - Fry | 96 hours |
| | Chronic NOEC 1.5 to 5.4 ul/L Marine water | Fish - Morone saxatilis - Juvenile (Fledgling, Hatchling, Weanling) | 4 weeks |
| 1,2,4-Trimethylbenzene | Acute LC50 4910 µg/l Marine water | Crustaceans - Elasmopus pectenicrus - Adult | 48 hours |
| | Acute LC50 22.4 mg/L Fresh water | Fish - Tilapia zillii | 96 hours |
| Ethylbenzene | Acute EC50 4600 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 72 hours |
| | Acute EC50 3600 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 96 hours |
| | Acute EC50 2970 µg/l Fresh water | Daphnia - Daphnia magna - Neonate | 48 hours |
| | Acute LC50 5200 µg/l Marine water | Crustaceans - Americamysis bahia | 48 hours |
| | Acute LC50 4200 µg/l Fresh water | Fish - Oncorhynchus mykiss | 96 hours |
| | Chronic NOEC 1000 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 96 hours |
| n-Hexane | Acute LC50 113000 µg/l Fresh water | Fish - Oreochromis mossambicus | 96 hours |
| Naphthalene | Acute EC50 1600 µg/l Fresh water | Daphnia - Daphnia magna - Neonate | 48 hours |
| | Acute LC50 2350 µg/l Marine water | Crustaceans - Palaemonetes pugio | 48 hours |
| | Acute LC50 213 µg/l Fresh water | Fish - Melanotaenia fluviatilis - Larvae | 96 hours |

**Persistence and degradability**

There is no data available.

**Bioaccumulative potential**

| Product/ingredient name | $LogP_{ow}$ | BCF | Potential |
|---|---|---|---|
| Toluene | 2.73 | 90 | low |
| Xylene | 3.12 | 8.1 to 25.9 | low |
| Tert-butyl methyl ether | 1.04 | 1.5 | low |
| Benzene | 2.13 | 11 | low |
| 1,2,4-Trimethylbenzene | 3.63 | 243 | low |
| Ethylbenzene | 3.6 | - | low |
| n-Hexane | 4 | 501.187 | high |
| Butyl ethyl ether | 2.03 | - | low |
| Naphthalene | 3.4 | 36.5 to 168 | low |

**Mobility in soil**

**Soil/water partition coefficient ($K_{OC}$)** : There is no data available.

**Other adverse effects** : No known significant effects or critical hazards.

## Section 13. Disposal considerations

**Disposal methods** : Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

## Section 14. Transport information

**DOT IDENTIFICATION NUMBER** UN1203 **DOT proper shipping name** GASOLINE (Toluene, Xylene) RQ (Benzene, Xylene)

**DOT Hazard Class(es)** 3 **PG** I **DOT EMER. RESPONSE GUIDE NO.** 128

## Section 15. Regulatory information

**U.S. Federal regulations** : **TSCA 8(a) PAIR**: Naphthalene
**TSCA 8(a) CDR Exempt/Partial exemption**: Not determined
**United States inventory (TSCA 8b)**: All components are listed or exempted.
**Clean Water Act (CWA) 307**: Toluene; Benzene; Ethylbenzene; Naphthalene
**Clean Water Act (CWA) 311**: Toluene; Xylene; Benzene; Ethylbenzene; Naphthalene

**Clean Air Act Section 602 Class I Substances** : Not listed
**Clean Air Act Section 602 Class II Substances** : Not listed
**Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs)** : Listed

**DEA List I Chemicals (Precursor Chemicals)** : Not listed
**DEA List II Chemicals (Essential Chemicals)** : 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
Delayed (chronic) health hazard

**Composition/information on ingredients**

| Name | % | Fire hazard | Sudden release of pressure | Reactive | Immediate (acute) health hazard | Delayed (chronic) health hazard |
|---|---|---|---|---|---|---|
| Toluene | 10 - 30 | Yes. | No. | No. | Yes. | Yes. |
| Xylene | 10 - 30 | Yes. | No. | No. | Yes. | No. |
| Tert-butyl methyl ether | 10 - 30 | Yes. | No. | No. | Yes. | No. |
| Benzene | 1 - 5 | Yes. | No. | No. | Yes. | Yes. |
| 1,2,4-Trimethylbenzene | 1 - 5 | Yes. | No. | No. | Yes. | No. |
| Ethylbenzene | 1 - 5 | Yes. | No. | No. | Yes. | Yes. |
| n-Hexane | 1 - 5 | Yes. | No. | No. | Yes. | Yes. |
| Butyl ethyl ether | 0.1 - 1 | Yes. | No. | No. | Yes. | No. |
| Naphthalene | 0.1 - 1 | No. | No. | No. | Yes. | Yes. |

**SARA 313** : This product (does/not) contain toxic chemicals subject to the reporting requirements of SARA Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372.

| Product name | CAS number | % |
|---|---|---|
| Toluene | 108-88-3 | Up to 18.1 |
| Xylene | 1330-20-7 | Up to 15.3 |
| Benzene | 71-43-2 | Up to 5.3 |
| 1,2,4-Trimethylbenzene | 95-63-6 | Up to 4.8 |
| Ethylbenzene | 100-41-4 | Up to 2.6 |
| n-Hexane | 110-54-3 | Up to 4 |
| Naphthalene | 91-20-3 | Up to 1 |

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** : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2,4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether

**New York** : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; Ethylbenzene; n-Hexane; Naphthalene

**New Jersey** : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2,4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether; Naphthalene

**Pennsylvania** : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2,4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether; Naphthalene

**California Prop. 65** : **WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

| Ingredient name | Cancer | Reproductive | No significant risk level | Maximum acceptable dosage level |
|---|---|---|---|---|
| Toluene | No. | Yes. | No. | 7000 µg/day (ingestion)<br>13000 µg/day (inhalation) |
| Benzene | Yes. | Yes. | 6.4 µg/day (ingestion)<br>13 µg/day (inhalation) | 24 µg/day (ingestion)<br>49 µg/day (inhalation) |
| Ethylbenzene | Yes. | No. | 41 µg/day (ingestion)<br>54 µg/day (inhalation) | No. |
| Naphthalene | Yes. | No. | Yes. | No. |

## Section 16. Other information

**Revision date** : 11/15/2013 **Supersedes** : 01/23/2013

**Revised Section(s)** : 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16. **Prepared by** : KMK Regulatory Services Inc.

Notice to reader
THE INFORMATION CONTAINED IN THIS SDS RELATES ONLY TO THE SPECIFIC MATERIAL IDENTIFIED. IT DOES NOT COVER USE OF THAT MATERIAL IN COMBINATION WITH ANY OTHER MATERIAL OR IN ANY PARTICULAR PROCESS. IN COMPLIANCE WITH 29 C.F.R. 1910.1200(g), CHS HAS PREPARED THIS SDS IN SEGMENTS, WITH THE INTENT THAT THOSE SEGMENTS BE READ TOGETHER AS A WHOLE WITHOUT TEXTUAL OMISSIONS OR ALTERATIONS. CHS BELIEVES THE INFORMATION CONTAINED HEREIN TO BE ACCURATE, BUT MAKES NO REPRESENTATION, GUARANTEE, OR WARRANTY, EXPRESS OR IMPLIED, ABOUT THE ACCURACY, RELIABILITY, OR COMPLETENESS OF THE INFORMATION OR ABOUT THE FITNESS OF CONTENTS HEREIN FOR EITHER GENERAL OR PARTICULAR PURPOSES. PERSONS REVIEWING THIS SDS SHOULD MAKE THEIR OWN DETERMINATION AS TO THE MATERIAL'S SUITABILITY AND COMPLETENESS FOR USE IN THEIR PARTICULAR APPLICATIONS.






**RegenOx® – Part A (Oxidizer Complex)**

**Material Safety Data Sheet (MSDS)**

**Last Revised:** June 24, 2010

## Section 1 – Supplier Information and Material Identification

**Supplier:**




1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

| | |
|---|---|
| Chemical Description: | A mixture of sodium percarbonate [$2Na_2CO_3 \cdot 3H_2O_2$], sodium carbonate [$Na_2CO_3$], sodium silicate and silica gel. |
| Chemical Family: | Inorganic Chemicals |
| Trade Name: | RegenOx® – Part A (Oxidizer Complex) |
| Product Use: | Used to remediate contaminated soil and groundwater (environmental applications) |

## Section 2 – Chemical Information/Other Designations

| CAS No. | Chemical | Percentage |
|---|---|---|
| 15630-89-4 | Sodium Percarbonate | 60 -100 % |
| 5968-11-6 | Sodium Carbonate Monohydrate | 10 – 30 % |
| 7699-11-6 | Silicic Acid | < 1 % |
| 63231-67-4 | Silica Gel | < 1 % |

## Section 3 – Physical Data

| | |
|---|---|
| **Form:** | Powder |
| **Color:** | White |
| **Odor:** | Odorless |
| **Melting Point:** | NA |
| **Boiling Point:** | NA |

| Section 3 – Physical Data (cont) | |
|---|---|
| **Flammability/Flash Point:** | NA |
| **Vapor Pressure:** | NA |
| **Bulk Density:** | 0.9 – 1.2 g/cm$^3$ |
| **Solubility:** | Min 14.5g/100g water @ 20 ºC |
| **Viscosity:** | NA |
| **pH (3% solution):** | ≈ 10.5 |
| **Decomposition Temperature:** | Self-accelerating decomposition with oxygen release starts at 50 ºC. |

| Section 4 – Reactivity Data | |
|---|---|
| **Stability:** | Stable under normal conditions |
| **Conditions to Avoid/Incompatibility:** | Acids, bases, salts of heavy metals, reducing agents, and flammable substances |
| **Hazardous Decomposition Products:** | Oxygen. Contamination with many substances will cause decomposition. The rate of decomposition increases with increasing temperature and may be very vigorous with rapid generation of oxygen and steam. |

| Section 5 – Regulations | |
|---|---|
| **TSCA Inventory Listed:** | Yes |
| **CERCLA Hazardous Substance (40 CFR Part 302)** | |
| **Listed Substance:** | *No* |
| **Unlisted Substance:** | *Yes* |
| **SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know** | |
| **Extremely Hazardous Substance:** | No |
| **WHMIS Classification:** | C, D2B |
| **Canadian Domestic Substance List:** | Appears |

## Section 6 – Protective Measures, Storage and Handling

**Technical Protective Measures**

| | |
|---|---|
| **Storage:** | Oxidizer. Store in a cool, well ventilated area away from all sources of ignition and out of the direct sunlight. Store in a dry location away from heat and in temperatures less than 40 °C.<br><br>Keep away from incompatible materials and keep lids tightly closed. Do not store in improperly labeled containers.<br><br>Protect from moisture. Do not store near combustible materials. Keep containers well sealed.<br><br>Store separately from reducing materials. Avoid contamination which may lead to decomposition. |
| **Handling:** | Avoid contact with eyes, skin and clothing. Use with adequate ventilation.<br><br>Do not swallow. Avoid breathing vapors, mists or dust. Do not eat, drink or smoke in the work area.<br><br>Label containers and keep them tightly closed when not in use.<br><br>Wash hands thoroughly after handling. |

**Personal Protective Equipment (PPE)**

| | |
|---|---|
| **Engineering Controls:** | General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Avoid creating dust or mists. Maintain adequate ventilation at all times. Do not use in confined areas. Keep levels below recommended exposure limits. To determine actual exposure limits, monitoring should be performed on a routine basis. |
| **Respiratory Protection:** | For many conditions, no respiratory protection is necessary; however, in dusty or unknown conditions or when exposures exceed limit values a NIOSH approved respirator should be used. |
| **Hand Protection:** | Wear chemical resistant gloves (neoprene, rubber, or PVC). |

## Section 6 – Protective Measures, Storage and Handling (cont)

| | |
|---|---|
| **Eye Protection:** | Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles. |
| **Skin Protection:** | Try to avoid skin contact with this product. Chemical resistant gloves (neoprene, PVC or rubber) and protective clothing should be worn during use. |
| **Other:** | Eye wash station. |
| **Protection Against Fire & Explosion:** | Product is non-explosive. In case of fire, evacuate all non-essential personnel, wear protective clothing and a self-contained breathing apparatus, stay upwind of fire, and use water to spray cool fire-exposed containers. |

## Section 7 – Hazards Identification

**Potential Health Effects**

| | |
|---|---|
| **Inhalation:** | Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat. |
| **Eye Contact:** | Causes irritation, redness and pain. |
| **Skin Contact:** | Causes slight irritation. |
| **Ingestion:** | May be harmful if swallowed (vomiting and diarrhea). |

## Section 8 – Measures in Case of Accidents and Fire

| | |
|---|---|
| **After Spillage/Leakage:** | Eliminate all ignition sources. Evacuate unprotected personnel and never exceed any occupational exposure limit. Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory. |
| **Extinguishing Media:** | Water |

**First Aid**

| | |
|---|---|
| **Eye Contact:** | Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist. |
| **Inhalation:** | Remove affected person to fresh air. Seek medical attention if the effects persist. |
| **Ingestion:** | If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **Do Not** induce vomiting. |

## Section 8 – Measures in Case of Accidents and Fire (cont)

| | |
|---|---|
| **Skin Contact:** | Wash affected areas with soap and a mild detergent and large amounts of water. |

## Section 9 – Accidental Release Measures

| | |
|---|---|
| **Precautions:** | |
| **Cleanup Methods:** | Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory. |

## Section 10 – Information on Toxicology

| | |
|---|---|
| **Toxicity Data** | |
| **LD50 Oral (rat):** | 2,400 mg/kg |
| **LD50 Dermal (rabbit):** | Min 2,000 mg/kg |
| **LD50 Inhalation (rat):** | Min 4,580 mg/kg |

## Section 11 – Information on Ecology

| | |
|---|---|
| **Ecology Data** | |
| **Ecotoxicological Information:** | NA |

## Section 12 – Disposal Considerations

| | |
|---|---|
| **Waste Disposal Method** | |
| **Waste Treatment:** | Dispose of in an approved waste facility operated by an authorized contactor in compliance with local regulations. |
| **Package (Pail) Treatment:** | The empty and clean containers are to be recycled or disposed of in conformity with local regulations. |

## Section 13 – Shipping/Transport Information

| | |
|---|---|
| **D.O.T. Shipping Name:** | Oxidizing Solid, N.O.S. [A mixture of sodium percarbonate [$2Na_2CO_3 \cdot 3H2O_2$], sodium carbonate [$Na_2CO_3$], sodium silicate and silica gel.] |
| **UN Number:** | 1479 |
| **Hazard Class:** | 5.1 |
| **Labels:** | 5.1 (Oxidizer) |
| **Packaging Group:** | III |

## Section 14 – Other Information

| | | |
|---|---|---|
| **HMIS® Rating** | Health – 1 (slight) | Reactivity – 1 (slight) |
| | Flammability – 0 (none) | Lab PPE – goggles, gloves, and lab coat |

HMIS® is a registered trademark of the National Painting and Coating Association.

## Section 15 – Further Information

**The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.**

**RegenOx® – Part B (Activator Complex)**

**Material Safety Data Sheet (MSDS)**

**Last Revised:** June 4, 2010

## Section 1 – Supplier Information and Material Identification

**Supplier:**

REGENESIS
1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

| | |
|---|---|
| Chemical Description: | A mixture of sodium silicate solution, silica gel and ferrous sulfate |
| Chemical Family: | Inorganic Chemicals |
| Trade Name: | RegenOx® – Part B (Activator Complex) |
| Product Use: | Used for environmental remediation of contaminated soils and groundwater |

## Section 2 – Chemical Information/Other Designations

| CAS No. | Chemical |
|---|---|
| 1344-09-8 | Silicic Acid, Sodium Salt, Sodium Silicate |
| 63231-67-4 | Silica Gel |
| 7720-78-7 | Ferrous Sulfate |
| 7732-18-5 | Water |

## Section 3 – Physical Data

| | |
|---|---|
| **Form:** | Liquid |
| **Color:** | Blue/Green |
| **Odor:** | Odorless |
| **Melting Point:** | NA |
| **Boiling Point:** | NA |
| **Flammability/Flash Point:** | NA |
| **Vapor Pressure:** | NA |

| Section 3 – Physical Data ( cont) | |
|---|---|
| **Specific Gravity** | 1.39 g/cm$^3$ |
| **Solubility:** | Miscible |
| **Viscosity:** | NA |
| **pH (3% solution):** | 11 |
| **Hazardous Decomposition Products:** | Oxides of carbon and silicon may be formed when heated to decomposition. |

| Section 4 – Reactivity Data | |
|---|---|
| **Stability:** | Stable under normal conditions. |
| **Conditions to Avoid:** | None. |
| **Incompatibility:** | Avoid hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, oxidizers, aluminum, fiberglass, copper, brass, zinc, and galvanized containers. |

| Section 5 – Regulations | |
|---|---|
| **TSCA Inventory Listed:** | Yes |
| **CERCLA Hazardous Substance (40 CFR Part 302)** | |
| **Listed Substance:** | *No* |
| **Unlisted Substance:** | *Yes* |
| **SARA, Title III, Sections 302/303 (40 CFR Part 355) – Emergency Planning and Notification** | |
| **Extremely Hazardous Substance:** | No |
| **SARA, Title III, Sections 311/312 (40 CFR Part 370) – Hazardous Chemical Reporting: Community Right-To-Know** | |
| **Hazard Category:** | Acute |
| **SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know** | |
| **Extremely Hazardous Substance:** | No |

## Section 6 – Protective Measures, Storage and Handling

**Technical Protective Measures**

| | |
|---|---|
| **Storage:** | Keep in a tightly closed container (steel or plastic) and store in a cool, well ventilated area away from all incompatible materials (acids, reactive metals, and ammonium salts). Store in a dry location away from heat above 60 degrees C and colder than 10 degrees C. Do not store in aluminum, fiberglass, copper, brass, zinc or galvanized containers. |
| **Handling:** | Avoid contact with eyes, skin and clothing. Avoid breathing spray mist. Use with adequate ventilation.<br>Do not use product if it is brownish-yellow in color. |

**Personal Protective Equipment (PPE)**

| | |
|---|---|
| **Engineering Controls:** | General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Safety shower and eyewash station should be within direct access. |
| **Respiratory Protection:** | Use NIOSH-approved dust and mist respirator where spray mist exists. Respirators should be used in accordance with 29 CFR 1910.134. |
| **Hand Protection:** | Wear chemical resistant gloves. |
| **Eye Protection:** | Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles. |
| **Skin Protection:** | Try to avoid skin contact with this product. Gloves and protective clothing should be worn during use. |
| **Other:** | |
| **Protection Against Fire & Explosion:** | Product is non-explosive and non-combustible. |

## Section 7 – Hazards Identification

**Potential Health Effects**

| | |
|---|---|
| **Inhalation:** | Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat. |
| **Eye Contact:** | Causes irritation, redness and pain. |
| **Skin Contact:** | Causes irritation. Symptoms include redness, itching and pain. |
| **Ingestion:** | May cause irritation to mouth, esophagus, and stomach. |

## Section 8 – Measures in Case of Accidents and Fire

| | |
|---|---|
| **After Spillage/Leakage (small):** | Mop up and neutralize liquid, then discharge to sewer in accordance with local, state and federal regulations. |
| **After Spillage/Leakage (large):** | Keep unnecessary personnel away; isolate hazard area and do not allow entrance into the affected area. Do not touch or walk through spilled material. Stop leak if possible without risking injury. Prevent runoff from entering into storm sewers and ditches that lead to natural waterways. Isolate the material if at all possible. Sand or earth may be used to contain the spill. If containment is not possible, neutralize the contaminated area and flush with large quantities of water. |
| **Extinguishing Media:** | Material is compatible with all extinguishing media. |
| **Further Information:** | |

**First Aid**

| | |
|---|---|
| **Eye Contact:** | Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist. |
| **Inhalation:** | Remove affected person to fresh air. Give artificial respiration if individual is not breathing. If breathing is difficult, give oxygen. Seek medical attention if the effects persist. |
| **Ingestion:** | If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **DO NOT** induce vomiting. |
| **Skin Contact:** | Wash affected areas with soap and a mild detergent and large amounts of water. Remove contaminated clothing and shoes. |

## Section 9 – Accidental Release Measures

**Precautions:**

| | |
|---|---|
| **PPE:** | Wear chemical goggles, body-covering protective clothing, chemical resistant gloves, and rubber boots (see Section 6). |
| **Environmental Hazards:** | Sinks and mixes with water. High pH of this material may be harmful to aquatic life. Only water will evaporate from a spill of this material. |
| **Cleanup Methods:** | Pick-up and place in an appropriate container for reclamation or disposal. US regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. |

## Section 10 – Information on Toxicology

**Toxicity Data**

| | |
|---|---|
| **Sodium Silicate:** | When tested for primary eye irritation potential according to OECD Guidelines, Section 405, a similar sodium silicate solution produced corneal, iridal and conjunctival irritation. Some eye irritation was still present 14 days after treatment, although the average primary irritation score has declined from 29.7 after 1 day to 4.0 after 14 days. When tested for primary skin irritation potential, a similar sodium silicate solution produced irritation with a primary irritation index of 3 to abraded skin and 0 to intact skin. Human experience confirms that irritation occurs when sodium silicates get on clothes at the collar, cuffs, or other areas where abrasion may exist.<br><br>The acute oral toxicity of this product has not been tested. |
| **Ferrous Sulfate:** | LD50 Oral (rat): 319 mg/kg not a suspected carcinogen. |

## Section 11 – Information on Ecology

**Ecology Data**

| | |
|---|---|
| **Ecotoxicological Information:** | Based on 100% solid sodium silicate, a 96 hour median tolerance for fish of 2,320 mg/l; a 96 hour median tolerance for water fleas of 247 mg/L; a 96 hour median tolerance for snail eggs of 632 mg/L; and a 96 hour median tolerance for Amphipoda of 160 mg/L. |

## Section 12 – Disposal Considerations

**Waste Disposal Method**

| | |
|---|---|
| **Waste Treatment:** | Neutralize and landfill solids in an approved waste facility operated by an authorized contactor in compliance with local regulations. |
| **Package (Pail) Treatment:** | The empty and clean containers are to be recycled or disposed of in conformity with local regulations. |

## Section 13 – Shipping/Transport Information

| | |
|---|---|
| **D.O.T.** | This product is not regulated as a hazardous material so there are no restrictions. |

## Section 14 – Other Information

| | | |
|---|---|---|
| **HMIS® Rating** | Health – 2 (moderate) | Reactivity – 0 (none) |
| | Flammability – 0 (none) | Lab PPE – goggles, gloves, and lab coat |
| | Contact – 1 (slight) | |

HMIS® is a registered trademark of the National Painting and Coating Association.

## Section 15 – Further Information

**The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.**

# SAFETY DATA SHEET

**SILVER**

## Section 1. Identification

| | | |
|---|---|---|
| **GHS product identifier** | : | SILVER |
| **Chemical name** | : | Mixture |
| **CAS number** | : | Mixture |
| **Other means of identification** | : | CC01054908 |
| **Product type** | : | liquid |

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

| | | |
|---|---|---|
| **Product use** | : | Industrial applications. Plastics. |
| **Supplier's details** | : | **POLYONE CORPORATION**<br>ColorMatrix Group Inc.<br>680 North Rocky River Drive, Berea, Ohio, 44017-1628, USA<br><br>+1 216 622 0100 |
| **Emergency telephone number (with hours of operation)** | : | **CHEMTREC 1-800-424-9300 (24hrs for spill, leak, fire, exposure or accident).** |

## Section 2. Hazards identification

This mixture has not been evaluated as a whole for health effects. Information provided on health effects of this product is based on the individual components. However, some vapors or contaminants may be released upon heating and the end-user (fabricator) must take the necessary precautions (mechanical ventilation, respiratory protection, etc.) to protect employees from exposure. See sections 8 and 11 for special precautions. After handling, always wash hands thoroughly with soap and water.

| | | |
|---|---|---|
| **OSHA/HCS status** | : | This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). |
| **Classification of the substance or mixture** | : | SKIN CORROSION/IRRITATION - Category 2 |

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Warning
**Hazard statements** : Causes skin irritation.

**Precautionary statements**

**General** : Not applicable.
**Prevention** : Wear protective gloves. Wash hands thoroughly after handling.
**Response** : IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention.
**Storage** : Not applicable.
**Disposal** : Not applicable.
**Supplemental label elements** : None known.
**Hazards not otherwise classified** : None known.

## Section 3. Composition/information on ingredients

**Substance/mixture** : Mixture
**Chemical name** : Mixture
**Other means of identification** : CC01054908

**CAS number/other identifiers**

| Ingredient name | % | CAS number |
|---|---|---|
| Miscellaneous Compounds Distillates, petroleum, hydrotreated middle | 10 - 30 | Not available. |
| Titanium dioxide | 10 - 30 | 13463-67-7 |

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**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**

| | | |
|---|---|---|
| **Eye contact** | : | 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. |
| **Inhalation** | : | Remove victim to fresh air and keep at rest in a position comfortable for breathing. 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 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. |
| **Skin contact** | : | Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse. |
| **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** | : | No known significant effects or critical hazards. |
| **Skin contact** | : | Causes skin irritation. |
| **Ingestion** | : | Irritating to mouth, throat and stomach. |

**Over-exposure signs/symptoms**

| | | |
|---|---|---|
| **Eye contact** | : | Adverse symptoms may include the following:<br>pain or irritation |

watering
redness

| | | |
|---|---|---|
| **Inhalation** | : | No specific data. |
| **Skin contact** | : | Adverse symptoms may include the following:<br>irritation<br>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. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. |

**See toxicological information (Section 11)**

# Section 5. Fire-fighting measures

**Extinguishing media**

| | | |
|---|---|---|
| **Suitable extinguishing media** | : | In case of fire, use water spray (fog), foam, dry chemical or $CO_2$. |
| **Unsuitable extinguishing media** | : | None known. |
| **Specific hazards arising from the chemical** | : | In a fire or if heated, a pressure increase will occur and the container may burst. |
| **Hazardous thermal decomposition products** | : | Decomposition products may include the following materials:<br>carbon dioxide<br>carbon monoxide<br>metal oxide/oxides |
| **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. |
| **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. 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. 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. 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. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. 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 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. 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 |
|---|---|
| Titanium dioxide | **OSHA PEL 1989 (1989-03-01)**<br>PEL: Permissible Exposure Level 10 mg/m3 Form: Total dust<br>**OSHA PEL (1993-06-30)**<br>PEL: Permissible Exposure Level 15 mg/m3 Form: Total dust<br>**ACGIH TLV (1996-05-18)**<br>TLV-TWA: Threshold Limit Value - Time weighted average PEL: Permissible Exposure Level 10 mg/m3 |

| | | |
|---|---|---|
| **Appropriate engineering controls** | : | Good general ventilation should be sufficient to control worker exposure to airborne contaminants. |
| **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. |

**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.

**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 [liquid]
**Color** : SILVER
**Odor** : Faint odor.
**Odor threshold** : Not available.
**pH** : Not available.
**Melting point** : Not available.
**Boiling point** : Not available.
**Flash point** : Not available.
**Burning time** : Not available.

| | | |
|---|---|---|
| **Burning rate** | : | Not available. |
| **Evaporation rate** | : | Not available. |
| **Flammability (solid, gas)** | : | Not available. |
| **Lower and upper explosive (flammable) limits** | : | **Lower:** Not available.<br>**Upper:** Not available. |
| **Vapor pressure** | : | Not available. |
| **Vapor density** | : | Not available. |
| **Relative density** | : | Not available. |
| **Solubility** | : | Not available. |
| **Solubility in water** | : | insoluble in water. |
| **Partition coefficient: n-octanol/water** | : | Not available. |
| **Auto-ignition temperature** | : | Not available. |
| **Decomposition temperature** | : | Not available. |
| **SADT** | : | Not available. |
| **Viscosity** | : | **Dynamic:** Not available.<br>**Kinematic:** Not available. |

## Section 10. Stability and reactivity

| | | |
|---|---|---|
| **Reactivity** | : | No specific test data related to reactivity available for this product or its ingredients. |
| **Chemical stability** | : | Stable under recommended storage and handling conditions (see Section 7). |
| **Possibility of hazardous reactions** | : | Under normal conditions of storage and use, hazardous reactions will not occur. |
| **Conditions to avoid** | : | Keep away from extreme heat and oxidizing agents. |
| **Incompatible materials** | : | Keep away from strong acids.<br>Oxidizer. |
| **Hazardous decomposition products** | : | Under normal conditions of storage and use, hazardous decomposition products should not be produced. |

## Section 11. Toxicological information

This mixture has not been evaluated as a whole for health effects. Exposure effects listed are based on existing health data for the individual components which comprise the mixture.

**Information on toxicological effects**

**Acute toxicity**

| Product/ingredient name | Result | Species | Dose | Exposure |
|---|---|---|---|---|
| Titanium dioxide | | | | |

| | | | | |
|---|---|---|---|---|
| | LC50 Inhalation | Rat - Male | 6.82 Mg/l | 4 h |
| | LD50 Dermal | Rabbit | > 5,000 mg/kg | - |

**Conclusion/Summary** : Mixture.Not fully tested.

**Irritation/Corrosion**

**Conclusion/Summary**
**Skin** : Mixture.Not fully tested.
**Eyes** : Mixture.Not fully tested.
**Respiratory** : Mixture.Not fully tested.

**Sensitization**

**Conclusion/Summary**
**Skin** : Mixture.Not fully tested.
**Respiratory** : Mixture.Not fully tested.

**Mutagenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Carcinogenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Classification**

| Product/ingredient name | OSHA | IARC | NTP |
|---|---|---|---|
| Titanium dioxide | | 2B | |

**Reproductive toxicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Teratogenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Specific target organ toxicity (single exposure)**
Not available.

**Specific target organ toxicity (repeated exposure)**
Not available.

**Aspiration hazard**

| Product/ingredient name | Result |
|---|---|

| | |
|---|---|
| Miscellaneous Compounds Distillates, petroleum, hydrotreated middle | ASPIRATION HAZARD - Category 1 |

**Information on the likely routes of exposure** : Not available.

**Potential acute health effects**

**Eye contact** : Causes serious eye irritation.
**Inhalation** : No known significant effects or critical hazards.
**Skin contact** : 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**

**Potential immediate effects** : Not available.
**Potential delayed effects** : Not available.

**Potential chronic health effects**

**Conclusion/Summary** : Mixture.Not fully tested.

**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**

| Route | ATE value |
|---|---|
| Inhalation (dusts and mists) | 8.073 mg/l |

# Section 12. Ecological information

**Toxicity**

| Product/ingredient name | Result | Species | Exposure |
|---|---|---|---|
| Titanium dioxide | | | |
| | Acute LC50 > 1,000,000 µg/l Marine water | Fish - Mummichog | 96 h |
| | Acute LC50 > 1,000 mg/l Fresh water | Fish - Fathead minnow | 96 h |
| | Acute LC50 13 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute LC50 6.5 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 19.3 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 27.8 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 35.306 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |

**Conclusion/Summary** : Not available.

**Persistence and degradability**

**Conclusion/Summary** : Not available.

**Bioaccumulative potential**

| Product/ingredient name | LogPow | BCF | Potential |
|---|---|---|---|
| Titanium dioxide | | 352.00 | low |

**Mobility in soil**

| | | |
|---|---|---|
| **Soil/water partition coefficient (KOC)** | : | 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. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

**United States - RCRA Acute hazardous waste "P" List:** Not listed

**United States - RCRA Toxic hazardous waste "U" List:** Not listed

## Section 14. Transport information

| | | |
|---|---|---|
| U.S. DOT Classification | : | Not regulated for transportation. |
| ICAO/IATA | : | Not classified as dangerous good under transport regulations. |
| IMO/IMDG (maritime) | : | Not classified as dangerous good under transport regulations. |

## Section 15. Regulatory information

**U.S. Federal regulations** : **United States - TSCA 12(b) - Chemical export notification:** None of the components are listed.
**United States - TSCA 4(a) - Final Test Rules:** Not listed
**United States - TSCA 4(a) - ITC Priority list:** Not listed
**United States - TSCA 4(a) - Proposed test rules:** Not listed

**United States - TSCA 4(f) - Priority risk review:** Not listed
**United States - TSCA 5(a)2 - Final significant new use rules:** Not listed
**United States - TSCA 5(a)2 - Proposed significant new use rules:** Not listed
**United States - TSCA 5(e) - Substances consent order:** Not listed
**United States - TSCA 6 - Final risk management:** Not listed
**United States - TSCA 6 - Proposed risk management:** Not listed
**United States - TSCA 8(a) - Chemical risk rules:** Not listed
**United States - TSCA 8(a) - Dioxin/Furane precusor:** Not listed
**United States - TSCA 8(a) - Chemical Data Reporting (CDR):** Not determined
**United States - TSCA 8(a) - Preliminary assessment report (PAIR):** Not listed
**United States - TSCA 8(c) - Significant adverse reaction (SAR):** Not listed
**United States - TSCA 8(d) - Health and safety studies:** Not listed
**United States - EPA Clean water act (CWA) section 307 - Priority pollutants:** Listed **Chromium (III) oxide**

**United States - EPA Clean water act (CWA) section 311 - Hazardous substances:** Not listed
**United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Flammable substances:** Not listed
**United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Toxic substances:** Not listed
**United States - Department of commerce - Precursor chemical:** Not listed

| | | |
|---|---|---|
| **Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs)** | : | Not 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 |

**US. EPA CERCLA Hazardous Substances (40 CFR 302)**

not applicable

**SARA 311/312**

**Classification** : Immediate (acute) health hazard

**Composition/information on ingredients**

| Name | % | Classification |
|---|---|---|
| **Miscellaneous Compounds Distillates, petroleum, hydrotreated middle** | 10 - 30 | AH |
| **Titanium dioxide** | 10 - 30 | CH |

**SARA 313**

| | Product name | CAS number | % |
|---|---|---|---|
| **Form R - Reporting requirements** | Aluminum | 7429-90-5 | 1 - 5 |
| **Supplier notification** | Aluminum | 7429-90-5 | 1 - 5 |

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** : The following components are listed:
Mica
Titanium dioxide
Aluminum

**New York** : None of the components are listed.

**New Jersey** : The following components are listed:
Mica
Titanium dioxide
Aluminum

**Pennsylvania** : The following components are listed:
Titanium dioxide
Aluminum

**California Prop. 65**

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

**United States inventory (TSCA 8b)** : All components are listed or exempted.

**Canada inventory** : All components are listed or exempted.

**International regulations**

| | | |
|---|---|---|
| **International lists** | : | **Australia inventory (AICS):** Not determined.<br>**Taiwan inventory (CSNN):** Not determined.<br>**Malaysia Inventory (EHS Register):** Not determined.<br>**EINECS:** All components are listed or exempted.<br>**Japan inventory:** Not determined.<br>**China inventory (IECSC):** All components are listed or exempted.<br>**Korea inventory:** All components are listed or exempted.<br>**New Zealand Inventory of Chemicals (NZIoC):** Not determined.<br>**Philippines inventory (PICCS):** All components are listed or exempted. |
| **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 |

## Section 16. Other information

**History**

| | | |
|---|---|---|
| **Date of printing** | : | 06/04/2015 |
| **Date of issue/Date of revision** | : | 06/03/2015 |
| **Date of previous issue** | : | 11/20/2014 |
| **Version** | : | 1.1 |
| **Key to abbreviations** | : | ATE = Acute Toxicity Estimate<br>BCF = Bioconcentration Factor<br>GHS = Globally Harmonized System of Classification and Labelling of Chemicals<br>IATA = International Air Transport Association<br>IBC = Intermediate Bulk Container<br>IMDG = International Maritime Dangerous Goods<br>LogPow = logarithm of the octanol/water partition coefficient<br>MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)<br>UN = United Nations |
| **References** | : | Not available. |

**Notice to reader**

**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. Particularly this information may not be valid for such material used in conjunction with any other materials or in any process, unless specified in the text.**

# SAFETY DATA SHEET

## 1. Identification

**Product identifier:** Trichloroethylene

**Other means of identification**
**Product No.:** 9464, 8600, 9458, 9454

**Recommended use and restriction on use**

**Recommended use:** Not available.
**Restrictions on use:** Not known.

**Manufacturer/Importer/Supplier/Distributor Information**

**Manufacturer**

| | |
|---|---|
| Company Name: | Avantor Performance Materials, Inc. |
| Address: | 3477 Corporate Parkway, Suite 200<br>Center Valley, PA 18034 |
| Telephone: | |
| | Customer Service: 855-282-6867 |
| Fax: | |
| Contact Person: | Environmental Health & Safety |
| e-mail: | info@avantormaterials.com |

**Emergency telephone number:**
24 Hour Emergency: 908-859-2151

Chemtrec: 800-424-9300

## 2. Hazard(s) identification

**Hazard Classification**

**Health Hazards**

| | |
|---|---|
| Skin Corrosion/Irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2A |
| Germ Cell Mutagenicity | Category 2 |
| Carcinogenicity | Category 1B |
| Specific Target Organ Toxicity - Single Exposure | Category 3 |

**Environmental Hazards**

| | |
|---|---|
| Chronic hazards to the aquatic environment | Category 3 |

**Label Elements**

**Hazard Symbol:**



**Signal Word:** Danger

**Hazard Statement:** May cause cancer.
Suspected of causing genetic defects.
Causes serious eye irritation.
Causes skin irritation.
Harmful to aquatic life with long lasting effects.

**Precautionary Statement**

**Prevention:** Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection/face protection. Wash hands thoroughly after handling. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid release to the environment.

**Response:** 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 advice/attention. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash before reuse. Call a POISON CENTER or doctor/physician if you feel unwell. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

**Storage:** Store locked up. Store in a well-ventilated place. Keep container tightly closed.

**Disposal:** 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.

**Other hazards which do not result in GHS classification:** None.

## 3. Composition/information on ingredients

**Substances**

| Chemical Identity | Common name and synonyms | CAS number | Content in percent (%)* |
|---|---|---|---|
| TRICHLOROETHYLENE | | 79-01-6 | 99 - 100% |

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

## 4. First-aid measures

**General information:** Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

**Ingestion:** Rinse mouth. Get medical attention if symptoms occur. 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.

**Inhalation:** Move to fresh air. Get medical attention if symptoms persist. If breathing stops, provide artificial respiration.

**Skin Contact:** Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention if irritation persists after washing. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

**Eye contact:** Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention if irritation persists after washing.

**Most important symptoms/effects, acute and delayed**

**Symptoms:** Irritating to eyes, respiratory system and skin.

**Indication of immediate medical attention and special treatment needed**

**Treatment:** Treat symptomatically. Symptoms may be delayed.

## 5. Fire-fighting measures

**General Fire Hazards:** In case of fire and/or explosion do not breathe fumes.

**Suitable (and unsuitable) extinguishing media**

**Suitable extinguishing media:** Use fire-extinguishing media appropriate for surrounding materials.

**Unsuitable extinguishing media:** Do not use water jet as an extinguisher, as this will spread the fire.

**Specific hazards arising from the chemical:** Contact with metals may evolve flammable hydrogen gas. Fire may produce irritating, corrosive and/or toxic gases.

**Special protective equipment and precautions for firefighters**

**Special fire fighting procedures:** Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out.

**Special protective equipment for fire-fighters:** Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

## 6. Accidental release measures

**Personal precautions, protective equipment and emergency procedures:** Keep unauthorized personnel away. Use personal protective equipment. See Section 8 of the MSDS for Personal Protective Equipment. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

**Methods and material for containment and cleaning up:** Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

**Notification Procedures:** Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk. Inform authorities if large amounts are involved.

**Environmental Precautions:** Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

## 7. Handling and storage

**Precautions for safe handling:** Use personal protective equipment as required. Do not breathe mist or vapor. Do not taste or swallow. Do not eat, drink or smoke when using the product. Use only with adequate ventilation. Wash hands thoroughly after handling. See Section 8 of the MSDS for Personal Protective Equipment. Avoid contact with eyes. Avoid contact with skin. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection/face protection. Avoid breathing dust/fume/gas/mist/vapors/spray. Wash contaminated clothing before reuse.

**Conditions for safe storage, including any incompatibilities:** Store locked up. Keep in a cool, well-ventilated place. Store in a dry place.

## 8. Exposure controls/personal protection

### Control Parameters

#### Occupational Exposure Limits

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| TRICHLOROETHYLENE | TWA | 10 ppm | US. ACGIH Threshold Limit Values (2011) |
| | STEL | 25 ppm | US. ACGIH Threshold Limit Values (2011) |
| | REL | 25 ppm | US. NIOSH: Pocket Guide to Chemical Hazards (2010) |
| | TWA | 50 ppm 270 mg/m3 | US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989) |
| | STEL | 200 ppm 1,080 mg/m3 | US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989) |
| | TWA | 100 ppm | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |
| | Ceiling | 200 ppm | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |
| | MAX. CONC | 300 ppm | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |
| | AN ESL | 54 µg/m3 | US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (12 2010) |

#### Biological Limit Values

| Chemical Identity | Exposure Limit Values | Source |
|---|---|---|
| TRICHLOROETHYLENE (Trichloroacetic acid: Sampling time: End of shift at end of work week.) | 15 mg/l (Urine) | ACGIH BEL (03 2013) |
| TRICHLOROETHYLENE (Trichloroethanol, without hydrolysis: Sampling time: End of shift at end of work week.) | 0.5 mg/l (Blood) | ACGIH BEL (03 2013) |

**Appropriate Engineering Controls** No data available.

**Individual protection measures, such as personal protective equipment**

**General information:** 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. An eye wash and safety shower must be available in the immediate work area.

**Eye/face protection:** Wear safety glasses with side shields (or goggles) and a face shield.

**Skin Protection**

**Hand Protection:** Chemical resistant gloves

**Other:** Wear suitable protective clothing.

**Respiratory Protection:** In case of inadequate ventilation use suitable respirator.

**Hygiene measures:** Provide eyewash station and safety shower. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not eat, drink or smoke when using the product. Wash contaminated clothing before reuse.

## 9. Physical and chemical properties

**Appearance**

| | |
|---|---|
| **Physical state:** | Liquid |
| **Form:** | Liquid |
| **Color:** | Colorless |
| **Odor:** | Ether-like odor |
| **Odor threshold:** | No data available. |
| **pH:** | No data available. |
| **Melting point/freezing point:** | -84.7 °C |
| **Initial boiling point and boiling range:** | 87.2 °C |
| **Flash Point:** | Not applicable |
| **Evaporation rate:** | No data available. |
| **Flammability (solid, gas):** | No data available. |
| **Upper/lower limit on flammability or explosive limits** | |
| **Flammability limit - upper (%):** | 10.5 %(V)<br>90 %(V) |
| **Flammability limit - lower (%):** | 8 %(V)<br>12.5 %(V) |
| **Explosive limit - upper (%):** | No data available. |
| **Explosive limit - lower (%):** | No data available. |
| **Vapor pressure:** | 9.2 kPa (25 °C) |
| **Vapor density:** | 4.53 AIR=1 |
| **Relative density:** | 1.47 (20 °C) |
| **Solubility(ies)** | |
| **Solubility in water:** | 1 g/l (20 °C) |
| **Solubility (other):** | acetone: Soluble<br>ethanol: Soluble |
| **Partition coefficient (n-octanol/water):** | 2.61 |
| **Auto-ignition temperature:** | 420 °C |
| **Decomposition temperature:** | No data available. |
| **Viscosity:** | No data available. |

**Other information**

| | |
|---|---|
| **Molecular weight:** | 131.39 g/mol ($C_2HCl_3$) |

## 10. Stability and reactivity

**Reactivity:** No dangerous reaction known under conditions of normal use.

| | |
|---|---|
| **Chemical Stability:** | Material is stable under normal conditions. |
| **Possibility of Hazardous Reactions:** | Hazardous polymerization does not occur. |
| **Conditions to Avoid:** | Heat, sparks, flames. Light. Moisture. Contact with incompatible materials. |
| **Incompatible Materials:** | Strong oxidizing agents. Alkalies. Caustics. Chemically active metals. |
| **Hazardous Decomposition Products:** | By heating and fire, toxic vapors/gases may be formed. Oxides of Carbon. Phosgene. |

## 11. Toxicological information

**Information on likely routes of exposure**

| | |
|---|---|
| **Ingestion:** | May be harmful if swallowed. |
| **Inhalation:** | May be harmful if inhaled. |
| **Skin Contact:** | Causes skin irritation. |
| **Eye contact:** | Causes serious eye irritation. |

**Information on toxicological effects**

**Acute toxicity (list all possible routes of exposure)**

**Oral**
**Product:** LD 50 (Rat): 4,920 mg/kg

**Dermal**
**Product:** No data available.

**Inhalation**
**Product:** LC 50 (Rat, 4 h): 12000 ppm

**Repeated Dose Toxicity**
**Product:** No data available.

**Skin Corrosion/Irritation**
**Product:** Causes skin irritation.

**Serious Eye Damage/Eye Irritation**
**Product:** Causes serious eye irritation.

**Respiratory or Skin Sensitization**
**Product:** Not a skin sensitizer.

**Carcinogenicity**
**Product:** May cause cancer.

**IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:**

| | |
|---|---|
| TRICHLOROETHYLENE | Overall evaluation: 1. Carcinogenic to humans. |

**US. National Toxicology Program (NTP) Report on Carcinogens:**

| | |
|---|---|
| TRICHLOROETHYLENE | Reasonably Anticipated to be a Human Carcinogen. |

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):**
No carcinogenic components identified

**Germ Cell Mutagenicity**

**In vitro**
**Product:** Suspected of causing genetic defects.

**In vivo**
**Product:** Suspected of causing genetic defects.

**Reproductive Toxicity**
**Product:** No components toxic to reproduction

**Specific Target Organ Toxicity - Single Exposure**
**Product:** May cause respiratory irritation. May cause drowsiness or dizziness.

**Specific Target Organ Toxicity - Repeated Exposure**
**Product:** No data available.

**Aspiration Hazard**
**Product:** Not classified

**Other Effects:** None known.

## 12. Ecological information

**Ecotoxicity:**

**Acute hazards to the aquatic environment:**

**Fish**
**Product:** No data available.

**Specified substance(s):**
TRICHLOROETHYLENE — LC 50 (Fathead minnow (Pimephales promelas), 96 h): 31.4 - 71.8 mg/l Mortality
LC 50 (Bluegill (Lepomis macrochirus), 96 h): 39 - 54 mg/l Mortality
EC 50 (Fathead minnow (Pimephales promelas), 96 h): 18.4 - 28.5 mg/l Intoxication

**Aquatic Invertebrates**
**Product:** No data available.

**Specified substance(s):**
TRICHLOROETHYLENE — LC 50 (Water flea (Daphnia magna), 48 h): 12 - 26 mg/l Mortality

**Chronic hazards to the aquatic environment:**

**Fish**
**Product:** No data available.

**Aquatic Invertebrates**
**Product:** No data available.

**Toxicity to Aquatic Plants**
**Product:** No data available.

**Persistence and Degradability**

**Biodegradation**
**Product:** There are no data on the degradability of this product.

**BOD/COD Ratio**
**Product:** No data available.

**Bioaccumulative Potential**
**Bioconcentration Factor (BCF)**
**Product:** No data available on bioaccumulation.

**Partition Coefficient n-octanol / water (log Kow)**
**Product:** Log Kow: 2.61

**Mobility in Soil:** The product is water soluble and may spread in water systems.

**Other Adverse Effects:** Harmful to aquatic life with long lasting effects.

## 13. Disposal considerations

**Disposal instructions:** Discharge, treatment, or disposal may be subject to national, state, or local laws.

**Contaminated Packaging:** Since emptied containers retain product residue, follow label warnings even after container is emptied.

## 14. Transport information

**DOT**

| | |
|---|---|
| UN Number: | UN 1710 |
| UN Proper Shipping Name: | Trichloroethylene |
| Transport Hazard Class(es) | |
| Class(es): | 6.1 |
| Label(s): | 6.1 |
| Packing Group: | III |
| Marine Pollutant: | No |

**IMDG**

| | |
|---|---|
| UN Number: | UN 1710 |
| UN Proper Shipping Name: | TRICHLOROETHYLENE |
| Transport Hazard Class(es) | |
| Class(es): | 6.1 |
| Label(s): | 6.1 |
| EmS No.: | F-A, S-A |
| Packing Group: | III |
| Marine Pollutant: | No |

**IATA**

| | |
|---|---|
| UN Number: | UN 1710 |
| Proper Shipping Name: | Trichloroethylene |
| Transport Hazard Class(es): | |
| Class(es): | 6.1 |
| Label(s): | 6.1 |
| Marine Pollutant: | No |
| Packing Group: | III |

## 15. Regulatory information

**US Federal Regulations**

**TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**
None present or none present in regulated quantities.

**CERCLA Hazardous Substance List (40 CFR 302.4):**
TRICHLOROETHYLENE Reportable quantity: 100 lbs.

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

**Hazard categories**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| X | Acute (Immediate) | X | Chronic (Delayed) | | Fire | | Reactive | | Pressure Generating |

**SARA 302 Extremely Hazardous Substance**
None present or none present in regulated quantities.

**SARA 304 Emergency Release Notification**

| Chemical Identity | RQ |
|---|---|
| TRICHLOROETHYLENE | 100 lbs. |

**SARA 311/312 Hazardous Chemical**

| Chemical Identity | Threshold Planning Quantity |
|---|---|
| TRICHLOROETHYLENE | 500 lbs |

**SARA 313 (TRI Reporting)**

| Chemical Identity | Reporting threshold for other users | Reporting threshold for manufacturing and processing |
|---|---|---|
| TRICHLOROETHYLENE | 10000 lbs | 25000 lbs. |

**Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)**
TRICHLOROETHYLENE Reportable quantity: 100 lbs.

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):**
None present or none present in regulated quantities.

**US State Regulations**

**US. California Proposition 65**
TRICHLOROETHYLENE Carcinogenic.
TRICHLOROETHYLENE Male reproductive toxin.
TRICHLOROETHYLENE Developmental toxin.

**US. New Jersey Worker and Community Right-to-Know Act**
TRICHLOROETHYLENE Listed

**US. Massachusetts RTK - Substance List**
TRICHLOROETHYLENE Listed

**US. Pennsylvania RTK - Hazardous Substances**
TRICHLOROETHYLENE Listed

**US. Rhode Island RTK**
TRICHLOROETHYLENE Listed

**Inventory Status:**

| | |
|---|---|
| Australia AICS: | On or in compliance with the inventory |
| Canada DSL Inventory List: | On or in compliance with the inventory |
| EINECS, ELINCS or NLP: | On or in compliance with the inventory |
| Japan (ENCS) List: | On or in compliance with the inventory |
| China Inv. Existing Chemical Substances: | Not in compliance with the inventory. |
| Korea Existing Chemicals Inv. (KECI): | On or in compliance with the inventory |
| Canada NDSL Inventory: | Not in compliance with the inventory. |
| Philippines PICCS: | On or in compliance with the inventory |
| US TSCA Inventory: | On or in compliance with the inventory |
| New Zealand Inventory of Chemicals: | On or in compliance with the inventory |
| Japan ISHL Listing: | On or in compliance with the inventory |
| Japan Pharmacopoeia Listing: | Not in compliance with the inventory. |

## 16.Other information, including date of preparation or last revision

**NFPA Hazard ID**




Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

| | |
|---|---|
| **Issue Date:** | 01-08-2015 |
| **Revision Date:** | No data available. |
| **Version #:** | 1.1 |
| **Further Information:** | No data available. |

**Disclaimer:**

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# SAFETY DATA SHEET

**Creation Date** 10-Dec-2009 **Revision Date** 06-Nov-2015 **Revision Number** 2

## 1. Identification

**Product Name** **Tetrachloroethylene**

**Cat No. :** **AC167890000; AC167890010; AC167890025; AC167890100; AC167891000; AC167895000**

**Synonyms** Perchloroethylene

**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

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**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 Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Skin Sensitization | Category 1 |
| Carcinogenicity | Category 1B |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system, Central nervous system (CNS). | |
| Specific target organ toxicity - (repeated exposure) | Category 2 |
| Target Organs - Kidney, Liver, Blood. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause 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
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
**Response**
IF exposed or concerned: Get medical attention/advice
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
**Skin**
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention
**Eyes**
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 advice/attention
**Storage**
Store locked up
Store in a well-ventilated place. Keep container tightly closed
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
Toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Tetrachloroethylene | 127-18-4 | >95 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. 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. Obtain medical attention.

**Ingestion** Do not induce vomiting. Obtain medical attention.

**Most important symptoms/effects** Breathing difficulties. . May cause allergic skin reaction. Inhalation of high vapor

concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: 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

**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

**Unsuitable Extinguishing Media** No information available

**Flash Point** No information available
**Method -** No information available

**Autoignition Temperature** No information available
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

**Hazardous Combustion Products**
Chlorine Hydrogen chloride gas Phosgene
**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**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 0 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

**Environmental Precautions** Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

**Methods for Containment and Clean Up** 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 breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| Tetrachloroethylene | TWA: 25 ppm<br>STEL: 100 ppm | (Vacated) TWA: 25 ppm<br>(Vacated) TWA: 170 mg/m$^3$<br>Ceiling: 200 ppm<br>TWA: 100 ppm | IDLH: 150 ppm |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Tetrachloroethylene | TWA: 25 ppm<br>TWA: 170 mg/m³<br>STEL: 100 ppm<br>STEL: 685 mg/m³ | TWA: 100 ppm<br>TWA: 670 mg/m³<br>TWA: 200 ppm<br>TWA: 1250 mg/m³<br>STEL: 200 ppm<br>STEL: 1340 mg/m³ | TWA: 25 ppm<br>STEL: 100 ppm |

*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 adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

**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

| | |
|---|---|
| **Physical State** | Liquid |
| **Appearance** | Colorless |
| **Odor** | Characteristic, sweet |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | -22 °C / -7.6 °F |
| **Boiling Point/Range** | 120 - 122 °C / 248 - 251.6 °F @ 760 mmHg |
| **Flash Point** | No information available |
| **Evaporation Rate** | 6.0 (Ether = 1.0) |
| **Flammability (solid,gas)** | Not applicable |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | 18 mbar @ 20 °C |
| **Vapor Density** | No information available |
| **Specific Gravity** | 1.625 |
| **Solubility** | 0.15 g/L water (20°C) |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | No information available |
| **Decomposition Temperature** | > 150°C |
| **Viscosity** | 0.89 mPa s at 20 °C |
| **Molecular Formula** | C2 Cl4 |
| **Molecular Weight** | 165.83 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products. Excess heat. Exposure to moist air or water.

**Incompatible Materials** Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines

**Hazardous Decomposition Products** Chlorine, Hydrogen chloride gas, Phosgene

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Tetrachloroethylene | LD50 = 2629 mg/kg ( Rat ) | LD50 > 10000 mg/kg (Rat) | LC50 = 27.8 mg/L ( Rat ) 4 h |

**Toxicologically Synergistic Products** No information available

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

**Irritation** Irritating to eyes and skin

**Sensitization** May cause sensitization by skin contact

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | Group 2A | Reasonably Anticipated | A3 | X | A3 |

*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)*

*NTP: (National Toxicity Program)*
*Known - Known Carcinogen*
*Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*

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

*A1 - Known Human Carcinogen*
*A2 - Suspected Human Carcinogen*
*A3 - Animal Carcinogen*
*ACGIH: (American Conference of Governmental Industrial Hygienists)*

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** Respiratory system Central nervous system (CNS)

**STOT - repeated exposure** Kidney Liver Blood

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: 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

**Endocrine Disruptor Information**

| Component | EU - Endocrine Disrupters Candidate List | EU - Endocrine Disruptors - Evaluated Substances | Japan - Endocrine Disruptor Information |
|---|---|---|---|
| Tetrachloroethylene | Group II Chemical | Not applicable | Not applicable |

**Other Adverse Effects** Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information.

## 12. Ecological information

**Ecotoxicity**

Toxic 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 |
|---|---|---|---|---|
| Tetrachloroethylene | EC50: > 500 mg/L, 96h (Pseudokirchneriella subcapitata) | LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhynchus mykiss)<br>LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus)<br>LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas)<br>LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas) | EC50 = 100 mg/L 24 h<br>EC50 = 112 mg/L 24 h<br>EC50 = 120.0 mg/L 30 min | EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna) |

**Persistence and Degradability** Insoluble in water Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation** No information available.

**Mobility** . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

| Component | log Pow |
|---|---|
| Tetrachloroethylene | 2.88 |

## 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 |
|---|---|---|
| Tetrachloroethylene - 127-18-4 | U210 | - |

## 14. Transport information

**DOT**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Packing Group** III

**TDG**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Packing Group** III

**IATA**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Packing Group** III

**IMDG/IMO**

| | |
|---|---|
| **UN-No** | UN1897 |
| **Proper Shipping Name** | TETRACHLOROETHYLENE |
| **Hazard Class** | 6.1 |
| **Packing Group** | III |

## 15. Regulatory information

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloroethylene | X | X | - | 204-825-9 | - | | 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 % |
|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | >95 | 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 |
|---|---|---|---|---|
| Tetrachloroethylene | - | - | X | X |

**Clean Air Act**

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---|---|---|---|
| Tetrachloroethylene | X | | - |

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

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Tetrachloroethylene | 100 lb 1 lb | - |

**California Proposition 65** This product contains the following proposition 65 chemicals

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | Carcinogen | 14 µg/day | Carcinogen |

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

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Tetrachloroethylene | X | X | X | X | X |

**U.S. Department of Transportation**

Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
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** D1B Toxic materials
D2A Very toxic materials



## 16. Other information

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

**Creation Date** 10-Dec-2009
**Revision Date** 06-Nov-2015
**Print Date** 06-Nov-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**

# SAFETY DATA SHEET

## 1. Identification

**Product identifier:** TOLUENE

**Other means of identification**
**Product No.:** 9457, 4483, V560, 8604, 9476, 9466, 9460, 9456, 9364, 9351, 9336, 8608

**Recommended use and restriction on use**

**Recommended use:** Not available.
**Restrictions on use:** Not known.

**Manufacturer/Importer/Supplier/Distributor information**

**Manufacturer**

| | |
|---|---|
| Company Name: | Avantor Performance Materials, Inc. |
| Address: | 3477 Corporate Parkway, Suite 200<br>Center Valley, PA 18034 |
| Telephone: | Customer Service: 855-282-6867 |
| Fax: | |
| Contact Person: | Environmental Health & Safety |
| e-mail: | info@avantormaterials.com |

**Emergency telephone number:**
24 Hour Emergency: 908-859-2151

Chemtrec: 800-424-9300

## 2. Hazard(s) identification

**Hazard classification**

**Physical hazards**

| | |
|---|---|
| Flammable liquids | Category 2 |

**Health hazards**

| | |
|---|---|
| Acute toxicity (Oral) | Category 4 |
| Acute toxicity (Inhalation - vapor) | Category 4 |
| Skin corrosion/irritation | Category 2 |
| Serious eye damage/eye irritation | Category 2A |
| Toxic to reproduction | Category 2 |
| Specific target organ toxicity - single exposure | Category 3 |
| Specific target organ toxicity - repeated exposure | Category 2 |
| Aspiration hazard | Category 1 |

**Environmental hazards**

| | |
|---|---|
| Acute hazards to the aquatic environment | Category 2 |

**Label elements**

**Hazard symbol:**



**Signal word:** Danger

**Hazard statement:**
Highly flammable liquid and vapor.
Harmful if swallowed or if inhaled.
Causes skin irritation.
Causes serious eye irritation.
Suspected of damaging fertility or the unborn child.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May be fatal if swallowed and enters airways.
May cause damage to organs through prolonged or repeated exposure.
Toxic to aquatic life.

**Precautionary statement**

**Prevention:** Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. 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. Use only outdoors or in a well-ventilated area. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment.

**Response:** In case of fire: Use water spray, foam, dry powder or carbon dioxide for extinction. IF exposed or concerned: Get medical advice/attention. 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. IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. 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 advice/attention. IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting.

**Storage:** Store locked up. Store in a well-ventilated place. Keep cool. Keep container tightly closed.

**Disposal:** 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.

**Other hazards which do not result in GHS classification:** Static accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor. May cause flash fire or explosion.

## 3. Composition/information on ingredients

**Substances**

| Chemical identity | Common name and synonyms | CAS number | Content in percent (%)* |
|---|---|---|---|
| TOLUENE | | 108-88-3 | 99 - 100% |

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

## 4. First-aid measures

**General information:** Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

**Ingestion:** Call a physician or poison control center immediately. Do NOT induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

**Inhalation:** Move to fresh air. Get medical attention immediately.

**Skin contact:** Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

**Eye contact:** Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention.

**Most important symptoms/effects, acute and delayed**

**Symptoms:** Harmful if swallowed. May be fatal if swallowed. Harmful if inhaled. Irritating to eyes, respiratory system and skin.

**Indication of immediate medical attention and special treatment needed**

**Treatment:** Treat symptomatically. Symptoms may be delayed.

## 5. Fire-fighting measures

**General fire hazards:** In case of fire and/or explosion do not breathe fumes.

**Suitable (and unsuitable) extinguishing media**

**Suitable extinguishing media:** Water spray, foam, dry powder or carbon dioxide.

**Unsuitable extinguishing media:** Avoid water in straight hose stream; will scatter and spread fire.

**Specific hazards arising from the chemical:** Vapors may cause a flash fire or ignite explosively. Vapors may travel considerable distance to a source of ignition and flash back. Prevent buildup of vapors or gases to explosive concentrations.

**Special protective equipment and precautions for firefighters**

**Special fire fighting procedures:** Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out. Water may be ineffective in fighting the fire. Fight fire from a protected location. Move containers from fire area if you can do so without risk.

| | |
|---|---|
| **Special protective equipment for fire-fighters:** | Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. |

## 6. Accidental release measures

| | |
|---|---|
| **Personal precautions, protective equipment and emergency procedures:** | ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unauthorized personnel away. Keep upwind. Use personal protective equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. See Section 8 of the MSDS for Personal Protective Equipment. |
| **Methods and material for containment and cleaning up:** | Eliminate all ignition sources if safe to do so. Take precautionary measures against static discharges. Stop leak if possible without any risk. Use only non-sparking tools. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal. |
| **Notification Procedures:** | Prevent entry into waterways, sewer, basements or confined areas. Inform authorities if large amounts are involved. |
| **Environmental precautions:** | Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. |

## 7. Handling and storage

| | |
|---|---|
| **Precautions for safe handling:** | DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Wear protective gloves/protective clothing/eye protection/face protection. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Wash hands thoroughly after handling. |
| **Conditions for safe storage, including any incompatibilities:** | Keep away from food, drink and animal feeding stuffs. Keep container tightly closed in a cool, well-ventilated place. Ground container and transfer equipment to eliminate static electric sparks. Comply with all national, state, and local codes pertaining to the storage, handling, dispensing, and disposal of flammable liquids. |

## 8. Exposure controls/personal protection

### Control parameters

#### Occupational exposure limits

| Chemical identity | Type | Exposure Limit values | | Source |
|---|---|---|---|---|
| TOLUENE | TWA | 20 ppm | | US. ACGIH Threshold Limit Values (2011) |
| | STEL | 150 ppm | 560 mg/m3 | US. NIOSH: Pocket Guide to Chemical Hazards (2010) |
| | REL | 100 ppm | 375 mg/m3 | US. NIOSH: Pocket Guide to Chemical Hazards (2010) |
| | TWA | 100 ppm | 375 mg/m3 | US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989) |
| | STEL | 150 ppm | 560 mg/m3 | US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989) |
| | TWA | 200 ppm | | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |
| | Ceiling | 300 ppm | | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |
| | MAX. CONC | 500 ppm | | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |

#### Biological limit values

| Chemical identity | Exposure Limit values | Source |
|---|---|---|
| TOLUENE (o-Cresol, with hydrolysis: Sampling time: End of shift.) | 0.3 mg/g (Creatinine in urine) | ACGIH BEL (2011) |
| TOLUENE (toluene: Sampling time: Prior to last shift of work week.) | 0.02 mg/l (Blood) | ACGIH BEL (2011) |
| TOLUENE (toluene: Sampling time: End of shift.) | 0.03 mg/l (Urine) | ACGIH BEL (2011) |

**Appropriate engineering controls** No data available.

### Individual protection measures, such as personal protective equipment

**General information:** 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. An eye wash and safety shower must be available in the immediate work area. Use explosion-proof ventilation equipment.

**Eye/face protection:** Wear safety glasses with side shields (or goggles) and a face shield.

**Skin protection**

**Hand protection:** Chemical resistant gloves

**Other:** Wear suitable protective clothing.

**Respiratory protection:** In case of inadequate ventilation use suitable respirator.

**Hygiene measures:** Provide eyewash station and safety shower. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

## 9. Physical and chemical properties

**Appearance**

| | |
|---|---|
| **Physical state:** | Liquid |
| **Form:** | Liquid |
| **Color:** | Colorless |
| **Odor:** | Sweet aromatic odor |
| **Odor threshold:** | No data available. |
| **pH:** | No data available. |
| **Melting point/freezing point:** | -94.9 °C |
| **Initial boiling point and boiling range:** | 110 °C |
| **Flash Point:** | 4 °C (Closed Cup) |
| **Evaporation rate:** | 2.24 (butyl acetate=1) |
| **Flammability (solid, gas):** | No data available. |
| **Upper/lower limit on flammability or explosive limits** | |
| **Flammability limit - upper (%):** | 7.1 %(V) |
| **Flammability limit - lower (%):** | 1.1 %(V) |
| **Explosive limit - upper (%):** | No data available. |
| **Explosive limit - lower (%):** | No data available. |
| **Vapor pressure:** | 3.8 kPa (25 °C) |
| **Vapor density:** | 3.1 AIR=1 |
| **Relative density:** | 0.86 (20 °C) |
| **Solubility(ies)** | |
| **Solubility in water:** | 0.7 g/l (23.3 °C) |
| **Solubility (other):** | No data available. |
| **Partition coefficient (n-octanol/water):** | 2.73 |
| **Auto-ignition temperature:** | 480 °C |
| **Decomposition temperature:** | No data available. |
| **Viscosity:** | No data available. |

**Other information**

| | |
|---|---|
| **Molecular weight:** | 92.14 g/mol (C7H8) |

## 10. Stability and reactivity

| | |
|---|---|
| **Reactivity:** | No dangerous reaction known under conditions of normal use. |
| **Chemical stability:** | Material is stable under normal conditions. |
| **Possibility of hazardous reactions:** | Hazardous polymerization does not occur. |
| **Conditions to avoid:** | Heat, sparks, flames. |
| **Incompatible materials:** | Strong oxidizing agents. Chlorine. |
| **Hazardous decomposition products:** | Thermal decomposition may release oxides of carbon. |

## 11. Toxicological information

**Information on likely routes of exposure**

| | |
|---|---|
| **Ingestion:** | Harmful if swallowed. |
| **Inhalation:** | Harmful if inhaled. May cause irritation to the mucous membranes and upper respiratory tract. |

**Skin contact:** Causes skin irritation.

**Eye contact:** Causes serious eye irritation.

**Information on toxicological effects**

**Acute toxicity (list all possible routes of exposure)**

**Oral**
**Product:** LD 50 (Rat): 636 mg/kg

**Dermal**
**Product:** LD 50 (Rabbit): 12,124 mg/kg

**Inhalation**
**Product:** LC 50 (Mouse, 24 h): 400 mg/l
LC 50 (Rat, 4 h): 8,000 mg/l

**Repeated dose toxicity**
**Product:** No data available.

**Skin corrosion/irritation**
**Product:** Causes skin irritation.

**Serious eye damage/eye irritation**
**Product:** Causes serious eye irritation.

**Respiratory or skin sensitization**
**Product:** Not a skin sensitizer.

**Carcinogenicity**
**Product:** This substance has no evidence of carcinogenic properties.

**IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:**
No carcinogenic components identified

**US. National Toxicology Program (NTP) Report on Carcinogens:**
No carcinogenic components identified

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):**
No carcinogenic components identified

**Germ cell mutagenicity**

**In vitro**
**Product:** No mutagenic components identified

**In vivo**
**Product:** No mutagenic components identified

**Reproductive toxicity**
**Product:** May damage fertility or the unborn child.

**Specific target organ toxicity - single exposure**
**Product:** Narcotic effect. Respiratory tract irritation.

**Specific target organ toxicity - repeated exposure**
**Product:** Peripheral nervous system Central nervous system. Kidneys. auditory organs

**Aspiration hazard**
**Product:** May be fatal if swallowed and enters airways.

**Other effects:** No data available.

## 12. Ecological information

**Ecotoxicity:**

**Acute hazards to the aquatic environment:**

**Fish**

**Product:** No data available.

**Specified substance(s):**

TOLUENE — LC 50 (Fathead minnow (Pimephales promelas), 96 h): 12.6 mg/l Mortality
LC 50 (Coho salmon,silver salmon (Oncorhynchus kisutch), 96 h): 5.5 mg/l Mortality

**Aquatic invertebrates**

**Product:** No data available.

**Specified substance(s):**

TOLUENE — EC 50 (Brine shrimp (Artemia sp.), 24 h): 22.1 - 54.1 mg/l Intoxication
EC 50 (Water flea (Daphnia magna), 48 h): 5.46 - 9.83 mg/l Intoxication

**Chronic hazards to the aquatic environment:**

**Fish**

**Product:** No data available.

**Aquatic invertebrates**

**Product:** No data available.

**Toxicity to Aquatic Plants**

**Product:** No data available.

**Persistence and degradability**

**Biodegradation**

**Product:** Expected to be readily biodegradable.

**BOD/COD ratio**

**Product:** No data available.

**Bioaccumulative potential**

**Bioconcentration factor (BCF)**

**Product:** Bioaccumulation is unlikely to be significant because of the low water solubility of this product.

**Partition coefficient n-octanol / water (log Kow)**

**Product:** Log Kow: 2.73

**Mobility in soil:** The product is insoluble in water and will spread on the water surface.

**Other adverse effects:** Toxic to aquatic organisms.

## 13. Disposal considerations

**Disposal instructions:** Discharge, treatment, or disposal may be subject to national, state, or local laws. Residual vapors may explode on ignition; do not cut, drill, grind, or weld on or near this container.

**Contaminated packaging:** Since emptied containers retain product residue, follow label warnings even after container is emptied.

## 14. Transport information

**DOT**

| | |
|---|---|
| UN number: | UN 1294 |
| UN proper shipping name: | Toluene |
| Transport hazard class(es) | |
| Class(es): | 3 |
| Label(s): | 3 |
| Packing group: | II |
| Marine Pollutant: | No |

**IMDG**

| | |
|---|---|
| UN number: | UN 1294 |
| UN proper shipping name: | TOLUENE |
| Transport hazard class(es) | |
| Class(es): | 3 |
| Label(s): | 3 |
| EmS No.: | F-E, S-D |
| Packing group: | II |
| Marine Pollutant: | No |

**IATA**

| | |
|---|---|
| UN number: | UN 1294 |
| Proper Shipping Name: | Toluene |
| Transport hazard class(es): | |
| Class(es): | 3 |
| Label(s): | 3 |
| Marine Pollutant: | No |
| Packing group: | II |

## 15. Regulatory information

**US federal regulations**

**TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

None present or none present in regulated quantities.

**CERCLA Hazardous Substance List (40 CFR 302.4):**

TOLUENE Reportable quantity: 1000 lbs.

**Superfund amendments and reauthorization act of 1986 (SARA)**

**Hazard categories**

[X] Acute (Immediate) [X] Chronic (Delayed) [X] Fire [ ] Reactive [ ] Pressure Generating

**SARA 302 Extremely hazardous substance**

None present or none present in regulated quantities.

**SARA 304 Emergency release notification**

| Chemical identity | RQ |
|---|---|
| TOLUENE | 1000 lbs. |

**SARA 311/312 Hazardous chemical**

| Chemical identity | Threshold Planning Quantity |
|---|---|
| TOLUENE | 500 lbs |

**SARA 313 (TRI reporting)**

| Chemical identity | Reporting threshold for other users | Reporting threshold for manufacturing and processing |
|---|---|---|
| TOLUENE | 10000 lbs | 25000 lbs. |

**Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)**

TOLUENE Reportable quantity: 1000 lbs.

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):**

None present or none present in regulated quantities.

**US state regulations**

**US. California Proposition 65**

TOLUENE Developmental toxin.
TOLUENE Female reproductive toxin.

**US. New Jersey Worker and Community Right-to-Know Act**

TOLUENE Listed

**US. Massachusetts RTK - Substance List**

TOLUENE Listed

**US. Pennsylvania RTK - Hazardous Substances**

TOLUENE Listed

**US. Rhode Island RTK**

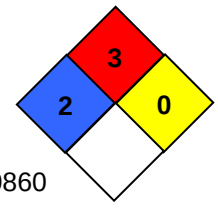
TOLUENE Listed

**Inventory Status:**

| | |
|---|---|
| Australia AICS: | On or in compliance with the inventory |
| Canada DSL Inventory List: | On or in compliance with the inventory |
| EU EINECS List: | On or in compliance with the inventory |
| EU ELINCS List: | Not in compliance with the inventory. |
| Japan (ENCS) List: | On or in compliance with the inventory |
| EU No Longer Polymers List: | Not in compliance with the inventory. |
| China Inv. Existing Chemical Substances: | On or in compliance with the inventory |
| Korea Existing Chemicals Inv. (KECI): | On or in compliance with the inventory |
| Canada NDSL Inventory: | Not in compliance with the inventory. |
| Philippines PICCS: | On or in compliance with the inventory |
| US TSCA Inventory: | On or in compliance with the inventory |
| New Zealand Inventory of Chemicals: | On or in compliance with the inventory |
| Switzerland Consolidated Inventory: | Not in compliance with the inventory. |
| Japan ISHL Listing: | On or in compliance with the inventory |
| Japan Pharmacopoeia Listing: | Not in compliance with the inventory. |

## 16.Other information, including date of preparation or last revision

**NFPA Hazard ID**




Flammability
Health

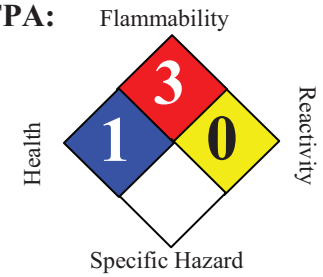



Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

| | |
|---|---|
| **Issue date:** | 06-12-2014 |
| **Revision date:** | No data available. |
| **Version #:** | 1.0 |
| **Further information:** | No data available. |
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# Safety Data Sheet
# Gasoline, Unleaded

**NFPA:**




## SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

| | | | | | |
|---|---|---|---|---|---|
| **Product name** | : | Gasoline, Unleaded | | | |
| **Synonyms** | : | Blend of Highly Flammable Petroleum Distillates, Regular, Mid-Grade, Premium, 888100008809 | | | |
| **SDS Number** | : | 888100008809 | **Version** | : | 1.1 |
| **Product Use Description** | : | Fuel | | | |
| **Company** | : | For: Tesoro Refining & Marketing Co.<br>19100 Ridgewood Parkway, San Antonio, TX 78259 | | | |
| **Tesoro Call Center** | : | (877) 783-7676 | **Chemtrec (Emergency Contact)** | : | (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, CO2, 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

**Inhalation** : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Seek medical attention immediately.

**Skin contact** : 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.

**Eye contact** : 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.

**Ingestion** : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Obtain medical attention.

**Notes to physician** : 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

**Suitable extinguishing media** : SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, 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.

**Specific hazards during fire fighting** : Extremely flammable liquid and vapor. This material is combustible/flammable and is sensitive to fire, heat, and static discharge.

**Special protective equipment for fire-fighters** : 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

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|---|---|---|
| **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-initated 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 gasoline or naphtha).

(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated 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 |

**Engineering measures** : 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.

**Eye protection** : 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.

**Hand protection** : Gloves constructed of nitrile or neoprene are recommended. Consult manufacturer specifications for further information.

**Skin and body protection** : 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.

**Respiratory protection** : 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.

**Work / Hygiene practices** : 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

**Appearance** : Clear to straw colored liquid

**Odor** : Characteristic hydrocarbon-like

**Odor threshold** 0.5 - 1.1 ppm

**pH** : Not applicable

**Melting point/freezing point** About -101°C (-150°F)

**Initial boiling point & range** Boiling point varies: 30 – 200°C (85 – 392°F)

**Flash point** < -21°C (-5.8°F)

**Evaporation rate** : Higher initially and declining as lighter components evaporate

**Flammability (solid, gas)** : 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 mm²/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

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|---|---|
| **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 nitrocresols 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

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|---|---|
| **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<br>Dose: 18.8 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 20.7 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br><br>Eye irritation: Classification: Irritating to eyes.<br>Result: Moderate eye irritation |
| **Toluene** | 108-88-3 | Acute oral toxicity: LD50 rat<br>Dose: 636 mg/kg<br><br>Acute dermal toxicity: LD50 rabbit<br>Dose: 12,124 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 49 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br>Prolonged skin contact may defat the skin and produce dermatitis.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation |
| **Xylene** | 1330-20-7 | Acute oral toxicity: LD50 rat<br>Dose: 2,840 mg/kg<br><br>Acute dermal toxicity: LD50 rabbit<br>Dose: ca. 4,500 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 6,350 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation |

| | | |
|---|---|---|
| | | Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation |
| **Ethanol; Ethyl alcohol** | 64-17-5 | Acute oral toxicity: LD50 rat<br>Dose: 6,200 mg/kg<br><br>Acute dermal toxicity: LD50 rabbit<br>Dose: 19,999 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 8,001 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br>Prolonged skin contact may cause skin irritation and/or dermatitis.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation<br>Mild eye irritation |
| **Naphthalene** | 91-20-3 | Acute oral toxicity: LD50 rat<br>Dose: 2,001 mg/kg<br><br>Acute dermal toxicity: LD50 rat<br>Dose: 2,501 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 101 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br><br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation<br><br>Carcinogenicity: N11.00422130 |
| **Benzene** | 71-43-2 | Acute oral toxicity: LD50 rat<br>Dose: 930 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 44 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br>Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Risk of serious damage to eyes. |
| **Pentane** | 109-66-0 | Acute oral toxicity: LD50 rat<br>Dose: 2,001 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 364 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation |
| **Cyclohexane** | 110-82-7 | Acute dermal toxicity: LD50 rabbit<br>Dose: 2,001 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 14 mg/l<br>Exposure time: 4 h |

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|---|---|---|
| | | Skin irritation: Classification: Irritating to skin.<br>Result: Skin irritation<br><br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation |
| **Ethylbenzene** | 100-41-4 | Acute oral toxicity: LD50 rat<br>Dose: 3,500 mg/kg<br><br>Acute dermal toxicity: LD50 rabbit<br>Dose: 15,500 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 18 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br><br>Eye irritation: Classification: Irritating to eyes.<br>Result: Risk of serious damage to eyes. |
| **Heptane [and isomers]** | 142-82-5 | Acute oral toxicity: LD50 rat<br>Dose: 15,001 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 103 g/m3<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Skin irritation<br>Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation |
| **N-hexane** | 110-54-3 | Acute oral toxicity: LD50 rat<br>Dose: 25,000 mg/kg<br><br>Acute dermal toxicity: LD50 rabbit<br>Dose: 2,001 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 171.6 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Skin irritation<br><br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation<br><br>Teratogenicity: N11.00418960 |

**Carcinogenicity**

| | | |
|---|---|---|
| **NTP** | : | Naphthalene (CAS-No.: 91-20-3)<br>Benzene (CAS-No.: 71-43-2) |
| **IARC** | : | Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9)<br>Naphthalene (CAS-No.: 91-20-3)<br>Benzene (CAS-No.: 71-43-2)<br>Ethylbenzene (CAS-No.: 100-41-4) |
| **OSHA** | : | Benzene (CAS-No.: 71-43-2) |
| **CA Prop 65** | : | WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.<br>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:**

| | | |
|---|---|---|
| **Toluene** | 108-88-3 | Toxicity to fish:<br>LC50<br>Species: Carassius auratus (goldfish)<br>Dose: 13 mg/l<br>Exposure time: 96 h<br><br>Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 11.5 mg/l<br>Exposure time: 48 h<br><br>Toxicity to algae:<br>IC50<br>Species: Selenastrum capricornutum (green algae)<br>Dose: 12 mg/l<br>Exposure time: 72 h |
| **Ethanol; Ethyl alcohol** | 64-17-5 | Toxicity to fish:<br>LC50<br>Species: Leuciscus idus (Golden orfe)<br>Dose: 8,140 mg/l<br>Exposure time: 48 h<br><br>Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 9,268 - 14,221 mg/l<br>Exposure time: 48 h |
| **Isopentane; 2-Methylbutane** | 78-78-4 | Toxicity to fish:<br>LC50<br>Species: Oncorhynchus mykiss (rainbow trout)<br>Dose: 3.1 mg/l<br>Exposure time: 96 h<br><br>Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 2.3 mg/l<br>Exposure time: 96 h |
| **Naphthalene** | 91-20-3 | Toxicity to algae:<br>EC50<br>Species:<br>Dose: 33 mg/l<br>Exposure time: 24 h |
| **Pentane** | 109-66-0 | Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 9.74 mg/l<br>Exposure time: 48 h |
| **Cyclohexane** | 110-82-7 | Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 3.78 mg/l<br>Exposure time: 48 h |

| | | |
|---|---|---|
| **Heptane [and isomers]** | 142-82-5 | Toxicity to fish:<br>LC50<br>Species: Carassius auratus (goldfish)<br>Dose: 4 mg/l<br>Exposure time: 24 h<br><br>Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 1.5 mg/l<br>Exposure time: 48 h |
| **N-hexane** | 110-54-3 | Toxicity to fish:<br>LC50<br>Species: Pimephales promelas (fathead minnow)<br>Dose: 2.5 mg/l<br>Exposure time: 96 h<br><br>Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 2.1 mg/l<br>Exposure time: 48 h |

## 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 ENVIROMENT)**
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

# SAFETY DATA SHEET

**Creation Date** 13-Feb-2015 **Revision Date** 21-Feb-2014 **Revision Number** 3

## SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

### 1.1. Product identification

**Product Description:** Xylene
**Cat No. :** **6601, 6615, 6655, 9900-5, 9900-55, 6601E**
**Synonyms** Dimethylbenzene; Methyltoluene
**Molecular Formula** C8H10

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

**Recommended Use** Laboratory chemicals.
**Uses advised against** No Information available

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

**Company**
Richard Allan Scientific
A Subsidiary of Thermo Fisher Scientific
4481 Campus Drive
Kalamazoo, MI 49008
Tel: (800) 522-7270
**E-mail address** begel.sdsdesk@thermofisher.com

### 1.4. Emergency telephone number

Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

## SECTION 2: HAZARDS IDENTIFICATION

### 2.1. Classification of the substance or mixture

**CLP Classification - Regulation (EC) No 1272/2008**

**Physical hazards**

| | |
|---|---|
| Flammable liquids | Category 3 |

**Health hazards**

| | |
|---|---|
| Aspiration Toxicity | Category 1 |
| Acute dermal toxicity | Category 4 |
| Acute Inhalation Toxicity - Vapors | Category 4 |
| Skin Corrosion/irritation | Category 2 |
| Specific target organ toxicity - (repeated exposure) | Category 2 |

**Environmental hazards**
Based on available data, the classification criteria are not met

**Classification according to EU Directives 67/548/EEC or 1999/45/EC**

**Symbol(s)** Xn - Harmful
**R-phrase(s)** R10 - Flammable
R38 - Irritating to skin
R20/21 - Harmful by inhalation and in contact with skin

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

### 2.2. Label elements



**Signal Word** **Danger**

**Hazard Statements**

H226 - Flammable liquid and vapor
H312 - Harmful in contact with skin
H332 - Harmful if inhaled
H315 - Causes skin irritation
H304 - May be fatal if swallowed and enters airways
H373 - May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements**

P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P280 - Wear protective gloves/ protective clothing
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P312 - Call a POISON CENTER or doctor/ physician if you feel unwell
P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician
P331 - Do NOT induce vomiting
P362 - Take off contaminated clothing and wash before reuse
P260 - Do not breathe dust/fume/gas/mist/vapors/spray

### 2.3. Other hazards

No information available

## SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

| Component | CAS-No | EC-No. | Weight % | CLP Classification - Regulation (EC) No 1272/2008 | DSD Classification - 67/548/EEC |
|---|---|---|---|---|---|
| Ethylbenzene | 100-41-4 | EEC No. 202-849-4 | 10 - 15 | Flam. Liq. 2 (H225)<br>Acute Tox. 4 (H332)<br>Asp. Tox. 1 (H304)<br>STOT RE 2 (H373)<br>Aquatic Chronic 3 (H412) | F; R11<br>Xn; R20-48/20<br>R65 |
| Xylenes (o-, m-, p- isomers) | 1330-20-7 | EEC No. 215-535-7 | 85 | Acute Tox. 4 (H312)<br>Acute Tox. 4 (H332)<br>Skin Irrit. 2 (H315)<br>Flam. Liq. 3 (H226) | R10<br>Xn; R20/21<br>Xi; R38 |
| Toluene | 108-88-3 | EEC No. 203-625-9 | 0 - 0.5 | Skin Irrit. 2 (H315)<br>Repr. 2 (H361d)<br>STOT SE 3 (H336)<br>STOT RE 2 (H373)<br>Asp. Tox. 1 (H304)<br>Flam. Liq. 2 (H225) | F; R11<br>Xi; R38<br>Xn; R48/20-65<br>Repr.Cat.3; R63<br>R67 |
| Benzene | 71-43-2 | EEC No. 200-753-7 | 0 - 0.01 | Skin Irrit. 2 (H315)<br>Eye Irrit. 2 (H319)<br>Muta. 1B (H340)<br>Carc. 1A (H350)<br>STOT RE 1 (H372) | F; R11<br>Xi; R36/38<br>Carc.Cat.1; R45<br>Muta.Cat.2; R46<br>T; R48/23/24/25 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Asp. Tox. 1 (H304)<br>Flam. Liq. 2 (H225) | Xn; R65 |

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

## SECTION 4: FIRST AID MEASURES

### 4.1. Description of first aid measures

**General Advice** If symptoms persist, call a physician. 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. Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. If symptoms persist, call a physician.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required. Call a physician immediately. SPEEDY ACTION IS CRITICAL, GET MEDICAL AID IMMEDIATELY. If symptoms persist, call a physician. If skin irritation persists, call a physician. Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes.

**Ingestion** Do not induce vomiting. Call a physician or Poison Control Center immediately. Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Consult a physician.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required. Immediate medical attention is not required. Move to fresh air in case of accidental inhalation of vapors. If symptoms persist, call a physician.

**Protection of First-aiders** Use personal protective equipment.

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

Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

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

**Notes to Physician** Treat symptomatically.

## SECTION 5: FIREFIGHTING MEASURES

### 5.1. Extinguishing media

**Suitable Extinguishing Media**
$CO_2$, dry chemical, dry sand, alcohol-resistant foam. Cool closed containers exposed to fire with water spray.

**Extinguishing media which must not be used for safety reasons**
No information available.

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

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Keep product and empty container away from heat and sources of ignition.

**Hazardous Combustion Products**

Carbon monoxide (CO), Carbon dioxide ($CO_2$), Hydrocarbons, Aldehydes.

**5.3. Advice for firefighters**

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

## SECTION 6: ACCIDENTAL RELEASE MEASURES

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Do not get in eyes, on skin, or on clothing. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.

**6.2. Environmental precautions**

Should not be released into the environment. See Section 12 for additional ecological information. Do not flush into surface water or sanitary sewer system. Prevent further leakage or spillage if safe to do so. Prevent product from entering drains.

**6.3. Methods and material for containment and cleaning up**

Remove all sources of ignition. Soak up with inert absorbent material. Take precautionary measures against static discharges. Keep in suitable, closed containers for disposal.

**6.4. Reference to other sections**

Refer to protective measures listed in Sections 8 and 13.

## SECTION 7: HANDLING AND STORAGE

**7.1. Precautions for safe handling**

Use only under a chemical fume hood. Wear personal protective equipment. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Do not ingest. Pay attention to flashback. No information available. Do not take internally.

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

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area. Keep containers tightly closed in a cool, well-ventilated place. Keep in properly labeled containers.

**7.3. Specific end use(s)**

Use in laboratories

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

**8.1. Control parameters**

**Exposure limits**

| Component | European Union | The United Kingdom | France | Belgium | Spain |
|---|---|---|---|---|---|
| Ethylbenzene | TWA: 100 ppm 8 hr<br>TWA: 442 mg/m³ 8 hr<br>STEL: 200 ppm 15 min<br>STEL: 884 mg/m³ 15 min<br>Possibility of significant uptake through the skin | STEL: 125 ppm 15 min<br>STEL: 552 mg/m³ 15 min<br>TWA: 100 ppm 8 hr<br>TWA: 441 mg/m³ 8 hr<br>Skin | TWA / VME: 20 ppm (8 heures). restrictive limit<br>TWA / VME: 88.4 mg/m³ (8 heures). restrictive limit<br>TWA / VME: 1000 mg/m³ (8 heures).<br>STEL / VLCT: 100 ppm. restrictive limit<br>STEL / VLCT: 442 | TWA: 100 ppm 8 uren<br>TWA: 442 mg/m³ 8 uren<br>STEL: 125 ppm 15 minuten<br>STEL: 551 mg/m³ 15 minuten<br>Huid | STEL / VLA-EC: 200 ppm (15 minutos).<br>STEL / VLA-EC: 884 mg/m³ (15 minutos).<br>TWA / VLA-ED: 100 ppm (8 horas)<br>TWA / VLA-ED: 441 mg/m³ (8 horas)<br>Piel |

| | | | | | |
|---|---|---|---|---|---|
| | | | mg/m³. restrictive limit<br>STEL / VLCT: 1500 mg/m³.<br>Peau | | |
| Xylenes (o-, m-, p-isomers) | TWA: 50 ppm 8 hr<br>TWA: 221 mg/m³ 8 hr<br>STEL: 100 ppm 15 min<br>STEL: 442 mg/m³ 15 min<br>Possibility of significant uptake through the skin | STEL: 100 ppm 15 min<br>STEL: 441 mg/m³ 15 min<br>TWA: 50 ppm 8 hr<br>TWA: 220 mg/m³ 8 hr<br>Skin | TWA / VME: 50 ppm (8 heures). restrictive limit<br>TWA / VME: 221 mg/m³ (8 heures). restrictive limit<br>TWA / VME: 1000 mg/m³ (8 heures).<br>STEL / VLCT: 100 ppm. restrictive limit<br>STEL / VLCT: 442 mg/m³. restrictive limit<br>STEL / VLCT: 1500 mg/m³.<br>Peau | TWA: 50 ppm 8 uren<br>TWA: 221 mg/m³ 8 uren<br>STEL: 100 ppm 15 minuten<br>STEL: 442 mg/m³ 15 minuten<br>Huid | STEL / VLA-EC: 100 ppm (15 minutos).<br>STEL / VLA-EC: 442 mg/m³ (15 minutos).<br>TWA / VLA-ED: 50 ppm (8 horas)<br>TWA / VLA-ED: 221 mg/m³ (8 horas)<br>Piel |
| Toluene | TWA: 50 ppm 8 hr<br>TWA: 192 mg/m³ 8 hr<br>STEL: 100 ppm 15 min<br>STEL: 384 mg/m³ 15 min<br>Skin | STEL: 100 ppm 15 min<br>STEL: 384 mg/m³ 15 min<br>TWA: 50 ppm 8 hr<br>TWA: 191 mg/m³ 8 hr<br>Skin | TWA / VME: 20 ppm (8 heures). restrictive limit<br>TWA / VME: 76.8 mg/m³ (8 heures). restrictive limit<br>TWA / VME: 1000 mg/m³ (8 heures).<br>STEL / VLCT: 100 ppm. restrictive limit<br>STEL / VLCT: 384 mg/m³. restrictive limit<br>STEL / VLCT: 1500 mg/m³.<br>Peau | TWA: 20 ppm 8 uren<br>TWA: 77 mg/m³ 8 uren<br>STEL: 100 ppm 15 minuten<br>STEL: 384 mg/m³ 15 minuten<br>Huid | STEL / VLA-EC: 100 ppm (15 minutos).<br>STEL / VLA-EC: 384 mg/m³ (15 minutos).<br>TWA / VLA-ED: 50 ppm (8 horas)<br>TWA / VLA-ED: 192 mg/m³ (8 horas)<br>Piel |
| Benzene | TWA: 1 ppm 8 hr measured or calculated in relation to a reference period of eight hours<br>TWA: 3.25 mg/m³ 8 hr measured or calculated in relation to a reference period of eight hours<br>Substantial contribution to the total body burden via dermal exposure possible | STEL: 3 ppm 15 min<br>STEL: 9.75 mg/m³ 15 min<br>TWA: 1 ppm 8 hr<br>TWA: 3.25 mg/m³ 8 hr<br>Carc.<br>Skin | TWA / VME: 1 ppm (8 heures). restrictive limit<br>TWA / VME: 3.25 mg/m³ (8 heures). restrictive limit<br>TWA / VME: 1000 mg/m³ (8 heures).<br>STEL / VLCT: 1500 mg/m³.<br>Peau | TWA: 1 ppm 8 uren<br>TWA: 3.25 mg/m³ 8 uren<br>Huid | TWA / VLA-ED: 1 ppm (8 horas)<br>TWA / VLA-ED: 3.25 mg/m³ (8 horas)<br>Piel |

| Component | Italy | Germany | Portugal | The Netherlands | Finland |
|---|---|---|---|---|---|
| Ethylbenzene | TWA: 100 ppm 8 ore.<br>TWA: 442 mg/m³ 8 ore.<br>STEL: 200 ppm 15 minuti. Breve termine<br>STEL: 884 mg/m³ 15 minuti. Breve termine<br>Pelle | TWA: 20 ppm (8 Stunden). AGW - exposure factor 2<br>TWA: 88 mg/m³ (8 Stunden). AGW - exposure factor 2<br>TWA: 20 ppm (8 Stunden). MAK<br>TWA: 88 mg/m³ (8 Stunden). MAK<br>Höhepunkt: 40 ppm<br>Höhepunkt: 176 mg/m³<br>Haut | STEL: 200 ppm 15 minutos<br>STEL: 884 mg/m³ 15 minutos<br>TWA: 100 ppm 8 horas<br>TWA: 442 mg/m³ 8 horas<br>Pele | huid<br>STEL: 430 mg/m³ 15 minuten<br>TWA: 215 mg/m³ 8 uren | TWA: 50 ppm 8 tunteina<br>TWA: 220 mg/m³ 8 tunteina<br>STEL: 200 ppm 15 minuutteina<br>STEL: 880 mg/m³ 15 minuutteina<br>Iho |
| Xylenes (o-, m-, p-isomers) | TWA: 50 ppm 8 ore. pure<br>TWA: 221 mg/m³ 8 ore. pure<br>STEL: 100 ppm 15 minuti. Breve termine pure<br>STEL: 442 mg/m³ 15 minuti. Breve termine pure<br>Pelle | TWA: 100 ppm (8 Stunden). AGW - exposure factor 2<br>TWA: 440 mg/m³ (8 Stunden). AGW - exposure factor 2<br>TWA: 100 ppm (8 Stunden). MAK all isomers<br>TWA: 440 mg/m³ (8 Stunden). MAK all isomers | STEL: 100 ppm 15 minutos<br>STEL: 442 mg/m³ 15 minutos<br>TWA: 50 ppm 8 horas<br>TWA: 221 mg/m³ 8 horas<br>Pele | huid<br>STEL: 442 mg/m³ 15 minuten<br>TWA: 210 mg/m³ 8 uren | TWA: 50 ppm 8 tunteina<br>TWA: 220 mg/m³ 8 tunteina<br>STEL: 100 ppm 15 minuutteina<br>STEL: 440 mg/m³ 15 minuutteina<br>Iho |

| | | | | | |
|---|---|---|---|---|---|
| | | Höhepunkt: 200 ppm<br>Höhepunkt: 880 mg/m³<br>Haut<br>Haut all isomers | | | |
| Toluene | TWA: 50 ppm 8 ore.<br>TWA: 192 mg/m³ 8 ore.<br>Pelle | TWA: 50 ppm (8 Stunden). AGW - exposure factor 4<br>TWA: 190 mg/m³ (8 Stunden). AGW - exposure factor 4<br>TWA: 50 ppm (8 Stunden). MAK<br>TWA: 190 mg/m³ (8 Stunden). MAK<br>Höhepunkt: 200 ppm<br>Höhepunkt: 760 mg/m³<br>Haut | STEL: 100 ppm 15 minutos<br>STEL: 384 mg/m³ 15 minutos<br>TWA: 50 ppm 8 horas<br>TWA: 192 mg/m³ 8 horas<br>Pele | STEL: 384 mg/m³ 15 minuten<br>TWA: 150 mg/m³ 8 uren | TWA: 25 ppm 8 tunteina<br>TWA: 81 mg/m³ 8 tunteina<br>STEL: 100 ppm 15 minuutteina<br>STEL: 380 mg/m³ 15 minuutteina<br>Iho |
| Benzene | TWA: 1 ppm 8 ore.<br>TWA: 3.25 mg/m³ 8 ore.<br>Pelle | Haut | STEL: 2.5 ppm 15 minutos<br>TWA: 0.5 ppm 8 horas<br>Pele | huid<br>TWA: 3.25 mg/m³ 8 uren | TWA: 1 ppm 8 tunteina<br>TWA: 3.25 mg/m³ 8 tunteina<br>Iho |

| Component | Austria | Denmark | Switzerland | Poland | Norway |
|---|---|---|---|---|---|
| Ethylbenzene | Haut<br>MAK-KZW: 200 ppm 15 Minuten<br>MAK-KZW: 880 mg/m³ 15 Minuten<br>MAK-TMW: 100 ppm 8 Stunden<br>MAK-TMW: 440 mg/m³ 8 Stunden | TWA: 50 ppm 8 timer<br>TWA: 217 mg/m³ 8 timer<br>Hud | Haut/Peau<br>STEL: 50 ppm 15 Minuten<br>STEL: 220 mg/m³ 15 Minuten<br>TWA: 50 ppm 8 Stunden<br>TWA: 220 mg/m³ 8 Stunden | STEL: 400 mg/m³ 15 minutach<br>TWA: 200 mg/m³ 8 godzinach | TWA: 5 ppm 8 timer<br>TWA: 20 mg/m³ 8 timer<br>STEL: 10 ppm 15 minutter.<br>STEL: 30 mg/m³ 15 minutter.<br>Hud |
| Xylenes (o-, m-, p-isomers) | Haut<br>MAK-KZW: 100 ppm 15 Minuten<br>MAK-KZW: 442 mg/m³ 15 Minuten<br>MAK-TMW: 50 ppm 8 Stunden<br>MAK-TMW: 221 mg/m³ 8 Stunden | TWA: 25 ppm 8 timer<br>TWA: 109 mg/m³ 8 timer<br>Hud | Haut/Peau<br>STEL: 200 ppm 15 Minuten<br>STEL: 870 mg/m³ 15 Minuten<br>TWA: 100 ppm 8 Stunden<br>TWA: 435 mg/m³ 8 Stunden | TWA: 100 mg/m³ 8 godzinach | TWA: 25 ppm 8 timer<br>TWA: 108 mg/m³ 8 timer<br>STEL: 37.5 ppm 15 minutter.<br>STEL: 135 mg/m³ 15 minutter.<br>Hud |
| Toluene | Haut<br>MAK-KZW: 100 ppm 15 Minuten<br>MAK-KZW: 380 mg/m³ 15 Minuten<br>MAK-TMW: 50 ppm 8 Stunden<br>MAK-TMW: 190 mg/m³ 8 Stunden | TWA: 25 ppm 8 timer<br>TWA: 94 mg/m³ 8 timer<br>Hud | Haut/Peau<br>STEL: 200 ppm 15 Minuten<br>STEL: 760 mg/m³ 15 Minuten<br>TWA: 50 ppm 8 Stunden<br>TWA: 190 mg/m³ 8 Stunden | STEL: 200 mg/m³ 15 minutach<br>TWA: 100 mg/m³ 8 godzinach | TWA: 25 ppm 8 timer<br>TWA: 94 mg/m³ 8 timer<br>STEL: 37.5 ppm 15 minutter.<br>STEL: 141 mg/m³ 15 minutter.<br>Hud |
| Benzene | TRK-KZW: 4 ppm 15 Minuten<br>TRK-KZW: 12.8 mg/m³ 15 Minuten<br>Haut<br>TRK-TMW: 1 ppm<br>TRK-TMW: 3.2 mg/m³ | TWA: 0.5 ppm 8 timer<br>TWA: 1.6 mg/m³ 8 timer<br>Hud | Haut/Peau<br>TWA: 0.5 ppm 8 Stunden<br>TWA: 1.6 mg/m³ 8 Stunden | TWA: 1.6 mg/m³ 8 godzinach | TWA: 1 ppm 8 timer<br>TWA: 3 mg/m³ 8 timer<br>STEL: 3 ppm 15 minutter.<br>STEL: 6 mg/m³ 15 minutter. |

| Component | Bulgaria | Croatia | Ireland | Cyprus | Czech Republic |
|---|---|---|---|---|---|
| Ethylbenzene | TWA: 435 mg/m³<br>STEL : 545 mg/m³<br>Skin notation | kože<br>TWA-GVI: 100 ppm 8 satima.<br>TWA-GVI: 442 mg/m³ 8 satima.<br>STEL-KGVI: 200 ppm 15 minutama.<br>STEL-KGVI: 884 mg/m³ 15 minutama. | TWA: 100 ppm 8 hr.<br>TWA: 442 mg/m³ 8 hr.<br>STEL: 200 ppm 15 min<br>STEL: 884 mg/m³ 15 min<br>Skin | Skin-potential for cutaneous absorption<br>STEL: 200 ppm<br>STEL: 884 mg/m³<br>TWA: 100 ppm<br>TWA: 442 mg/m³ | TWA: 200 mg/m³ 8 hodinách.<br>Potential for cutaneous absorption<br>Ceiling: 500 mg/m³ |
| Xylenes (o-, m-, p- | TWA: 50 ppm | kože | TWA: 50 ppm 8 hr. | Skin-potential for | TWA: 200 mg/m³ 8 |

| | | | | | |
|---|---|---|---|---|---|
| isomers) | TWA: 221.0 mg/m³<br>STEL : 100 ppm<br>STEL : 442 mg/m³<br>Skin notation | TWA-GVI: 50 ppm 8 satima.<br>TWA-GVI: 221 mg/m³ 8 satima.<br>STEL-KGVI: 100 ppm 15 minutama.<br>STEL-KGVI: 442 mg/m³ 15 minutama. | TWA: 221 mg/m³ 8 hr.<br>STEL: 100 ppm 15 min<br>STEL: 442 mg/m³ 15 min<br>Skin | cutaneous absorption<br>STEL: 100 ppm<br>STEL: 442 mg/m³<br>TWA: 50 ppm<br>TWA: 221 mg/m³ | hodinách.<br>Potential for cutaneous absorption<br>Ceiling: 400 mg/m³ |
| Toluene | TWA: 50 ppm<br>TWA: 192.0 mg/m³<br>STEL : 100 ppm<br>STEL : 384.0 mg/m³<br>Skin notation | kože<br>TWA-GVI: 50 ppm 8 satima.<br>TWA-GVI: 192 mg/m³ 8 satima.<br>STEL-KGVI: 100 ppm 15 minutama.<br>STEL-KGVI: 384 mg/m³ 15 minutama. | TWA: 50 ppm 8 hr.<br>TWA: 192 mg/m³ 8 hr.<br>STEL: 384 mg/m³ 15 min<br>STEL: 100 ppm 15 min<br>Skin | Skin-potential for cutaneous absorption<br>STEL: 100 ppm<br>STEL: 384 mg/m³<br>TWA: 50 ppm<br>TWA: 192 mg/m³ | TWA: 200 mg/m³ 8 hodinách.<br>Potential for cutaneous absorption<br>Ceiling: 500 mg/m³ |
| Benzene | TWA: 3.25 mg/m³<br>Skin notation | kože<br>TWA-GVI: 1 ppm 8 satima.<br>TWA-GVI: 3.25 mg/m³ 8 satima. | TWA: 1 ppm 8 hr.<br>TWA: 3 mg/m³ 8 hr.<br>STEL: 3 ppm 15 min<br>STEL: 9 mg/m³ 15 min<br>Skin | Skin-potential for cutaneous absorption<br>TWA: 1 ppm<br>TWA: 3.25 mg/m³ | TWA: 3 mg/m³ 8 hodinách.<br>Potential for cutaneous absorption<br>Ceiling: 10 mg/m³ |

| Component | Estonia | Gibraltar | Greece | Hungary | Iceland |
|---|---|---|---|---|---|
| Ethylbenzene | Nahk<br>TWA: 100 ppm 8 tundides.<br>TWA: 442 mg/m³ 8 tundides.<br>STEL: 200 ppm 15 minutites.<br>STEL: 884 mg/m³ 15 minutites.<br>Ceiling: 0.01 ppm 5 min | Skin notation<br>TWA: 100 ppm 8 hr<br>TWA: 442 mg/m³ 8 hr<br>STEL: 200 ppm 15 min<br>STEL: 884 mg/m³ 15 min | STEL: 125 ppm<br>STEL: 545 mg/m³<br>TWA: 100 ppm<br>TWA: 435 mg/m³ | STEL: 884 mg/m³ 15 percekben. CK<br>TWA: 442 mg/m³ 8 órában. AK<br>lehetséges borön keresztüli felszívódás | STEL: 200 ppm<br>STEL: 884 mg/m³<br>TWA: 50 ppm 8 klukkustundum.<br>TWA: 200 mg/m³ 8 klukkustundum.<br>Skin notation<br>Ceiling: 100 ppm<br>Ceiling: 400 mg/m³ |
| Xylenes (o-, m-, p-isomers) | Nahk<br>TWA: 50 ppm 8 tundides.<br>TWA: 221 mg/m³ 8 tundides.<br>STEL: 100 ppm 15 minutites.<br>STEL: 442 mg/m³ 15 minutites. | Skin notation<br>TWA: 50 ppm 8 hr pure<br>TWA: 221 mg/m³ 8 hr pure<br>STEL: 100 ppm 15 min pure<br>STEL: 442 mg/m³ 15 min pure | skin - potential for cutaneous absorption<br>STEL: 150 ppm<br>STEL: 650 mg/m³<br>TWA: 100 ppm<br>TWA: 435 mg/m³ | STEL: 442 mg/m³ 15 percekben. CK<br>TWA: 221 mg/m³ 8 órában. AK<br>lehetséges borön keresztüli felszívódás | STEL: 100 ppm<br>STEL: 442 mg/m³<br>TWA: 25 ppm 8 klukkustundum.<br>TWA: 109 mg/m³ 8 klukkustundum.<br>Skin notation<br>Ceiling: 50 ppm<br>Ceiling: 218 mg/m³ |
| Toluene | Nahk<br>TWA: 50 ppm 8 tundides.<br>TWA: 192 mg/m³ 8 tundides.<br>STEL: 100 ppm 15 minutites.<br>STEL: 384 mg/m³ 15 minutites. | Skin notation<br>TWA: 50 ppm 8 hr<br>TWA: 192 mg/m³ 8 hr<br>STEL: 100 ppm 15 min<br>STEL: 384 mg/m³ 15 min | skin - potential for cutaneous absorption<br>STEL: 100 ppm<br>STEL: 384 mg/m³<br>TWA: 50 ppm<br>TWA: 192 mg/m³ | STEL: 380 mg/m³ 15 percekben. CK<br>TWA: 190 mg/m³ 8 órában. AK<br>lehetséges borön keresztüli felszívódás | STEL: 50 ppm<br>STEL: 188 mg/m³<br>TWA: 25 ppm 8 klukkustundum.<br>TWA: 94 mg/m³ 8 klukkustundum.<br>Skin notation<br>Ceiling: 50 ppm<br>Ceiling: 188 mg/m³ |
| Benzene | Nahk<br>TWA: 0.5 ppm 8 tundides.<br>TWA: 1.5 mg/m³ 8 tundides.<br>STEL: 3 ppm 15 minutites.<br>STEL: 9 mg/m³ 15 minutites. | | skin - potential for cutaneous absorption<br>TWA: 1.0 ppm<br>TWA: 3.19 mg/m³ | lehetséges borön keresztüli felszívódás<br>Ceiling: 3 mg/m³ MK | TWA: 0.5 ppm 8 klukkustundum.<br>TWA: 1.6 mg/m³ 8 klukkustundum.<br>Skin notation<br>Ceiling: 1 ppm<br>Ceiling: 3.2 mg/m³ |

| Component | Latvia | Lithuania | Luxembourg | Malta | Romania |
|---|---|---|---|---|---|
| Ethylbenzene | skin - potential for cutaneous exposure<br>STEL: 200 ppm<br>STEL: 884 mg/m³<br>TWA: 100 ppm | TWA: 100 ppm IPRD<br>TWA: 442 mg/m³ IPRD<br>Oda<br>STEL: 200 ppm<br>STEL: 884 mg/m³ | Possibility of significant uptake through the skin<br>TWA: 100 ppm 8 Stunden<br>TWA: 442 mg/m³ 8 | possibility of significant uptake through the skin<br>TWA: 100 ppm<br>TWA: 442 mg/m³<br>STEL: 200 ppm 15 | Skin notation<br>TWA: 100 ppm 8 ore<br>TWA: 442 mg/m³ 8 ore<br>STEL: 200 ppm 15 minute |

| | | | | | |
|---|---|---|---|---|---|
| | TWA: 442 mg/m³ | | Stunden<br>STEL: 200 ppm 15 Minuten<br>STEL: 884 mg/m³ 15 Minuten | minuti<br>STEL: 884 mg/m³ 15 minuti | STEL: 884 mg/m³ 15 minute |
| Xylenes (o-, m-, p-isomers) | skin - potential for cutaneous exposure<br>STEL: 100 ppm<br>STEL: 442 mg/m³<br>TWA: 50 ppm<br>TWA: 221 mg/m³ | TWA: 50 ppm IPRD<br>TWA: 200 mg/m³ IPRD Oda<br>STEL: 100 ppm<br>STEL: 450 mg/m³ | TWA: 50 ppm 8 Stunden<br>TWA: 221 mg/m³ 8 Stunden<br>STEL: 100 ppm 15 Minuten<br>STEL: 442 mg/m³ 15 Minuten | possibility of significant uptake through the skin<br>TWA: 50 ppm<br>TWA: 221 mg/m³<br>STEL: 100 ppm 15 minuti<br>STEL: 442 mg/m³ 15 minuti | Skin notation<br>TWA: 50 ppm 8 ore<br>TWA: 221 mg/m³ 8 ore<br>STEL: 100 ppm 15 minute<br>STEL: 442 mg/m³ 15 minute |
| Toluene | skin - potential for cutaneous exposure<br>STEL: 40 ppm<br>STEL: 150 mg/m³<br>TWA: 14 ppm<br>TWA: 50 mg/m³ | TWA: 50 ppm IPRD<br>TWA: 192 mg/m³ IPRD Oda<br>STEL: 100 ppm<br>STEL: 384 mg/m³ | Possibility of significant uptake through the skin<br>TWA: 50 ppm 8 Stunden<br>TWA: 192 mg/m³ 8 Stunden<br>STEL: 100 ppm 15 Minuten<br>STEL: 384 mg/m³ 15 Minuten | possibility of significant uptake through the skin<br>TWA: 50 ppm<br>TWA: 192 mg/m³<br>STEL: 100 ppm 15 minuti<br>STEL: 384 mg/m³ 15 minuti | Skin notation<br>TWA: 50 ppm 8 ore<br>TWA: 192 mg/m³ 8 ore<br>STEL: 100 ppm 15 minute<br>STEL: 384 mg/m³ 15 minute |
| Benzene | skin - potential for cutaneous exposure<br>TWA: 1 ppm<br>TWA: 3.25 mg/m³ | TWA: 1 ppm IPRD<br>TWA: 3.25 mg/m³ IPRD Oda<br>STEL: 6 ppm<br>STEL: 19 mg/m³ | TWA: 1 ppm 8 Stunden<br>TWA: 3.25 mg/m³ 8 Stunden | | Skin notation<br>TWA: 1 ppm 8 ore<br>TWA: 3.25 mg/m³ 8 ore |

| Component | Russia | Slovak Republic | Slovenia | Sweden | Turkey |
|---|---|---|---|---|---|
| Ethylbenzene | TWA: 50 mg/m³<br>STEL: 150 mg/m³ vapor | Ceiling: 884 mg/m³<br>Potential for cutaneous absorption<br>TWA: 100 ppm<br>TWA: 442 mg/m³ | TWA: 100 ppm 8 urah<br>TWA: 442 mg/m³ 8 urah<br>Koža<br>STEL: 200 ppm 15 minutah<br>STEL: 884 mg/m³ 15 minutah | STV: 100 ppm 15 minuter<br>STV: 450 mg/m³ 15 minuter<br>LLV: 50 ppm 8 timmar.<br>LLV: 200 mg/m³ 8 timmar. | Deri<br>TWA: 100 ppm 8 saat<br>TWA: 442 mg/m³ 8 saat<br>STEL: 200 ppm 15 dakika<br>STEL: 884 mg/m³ 15 dakika |
| Xylenes (o-, m-, p-isomers) | TWA: 50 mg/m³ 2-,3- and 4- isomers<br>STEL: 150 mg/m³ vapor | Ceiling: 442 mg/m³<br>Potential for cutaneous absorption<br>TWA: 50 ppm<br>TWA: 221 mg/m³ | TWA: 50 ppm 8 urah<br>TWA: 221 mg/m³ 8 urah<br>Koža<br>STEL: 100 ppm 15 minutah<br>STEL: 442 mg/m³ 15 minutah | STV: 100 ppm 15 minuter<br>STV: 442 mg/m³ 15 minuter<br>LLV: 50 ppm 8 timmar.<br>LLV: 221 mg/m³ 8 timmar.<br>Hud | Deri<br>TWA: 50 ppm 8 saat<br>TWA: 221 mg/m³ 8 saat<br>STEL: 100 ppm 15 dakika<br>STEL: 442 mg/m³ 15 dakika |
| Toluene | TWA: 50 mg/m³<br>STEL: 150 mg/m³ vapor | Ceiling: 384 mg/m³<br>Potential for cutaneous absorption<br>TWA: 50 ppm<br>TWA: 192 mg/m³ | TWA: 50 ppm 8 urah<br>TWA: 192 mg/m³ 8 urah<br>Koža<br>STEL: 200 ppm 15 minutah<br>STEL: 384 mg/m³ 15 minutah | STV: 100 ppm 15 minuter<br>STV: 384 mg/m³ 15 minuter<br>LLV: 50 ppm 8 timmar.<br>LLV: 192 mg/m³ 8 timmar.<br>Hud | Deri<br>TWA: 50 ppm 8 saat<br>TWA: 192 mg/m³ 8 saat<br>STEL: 100 ppm 15 dakika<br>STEL: 384 mg/m³ 15 dakika |
| Benzene | TWA: 5 mg/m³<br>Skin notation<br>STEL: 15 mg/m³ vapor | TWA: 1.0 ppm 8 hodinách<br>TWA: 3.25 mg/m³ 8 hodinách<br>Potential for cutaneous absorption<br>STEL: 5.0 ppm 15 minútach<br>STEL: 16.25 mg/m³ 15 minútach | TWA: 1 ppm 8 urah<br>TWA: 3.25 mg/m³ 8 urah<br>Koža<br>STEL: 4 ppm 15 minutah<br>STEL: 13 mg/m³ 15 minutah | STV: 3 ppm 15 minuter<br>STV: 9 mg/m³ 15 minuter<br>LLV: 0.5 ppm 8 timmar.<br>LLV: 1.5 mg/m³ 8 timmar.<br>Hud | |

**Biological limit values**

| Component | European Union | United Kingdom | France | Spain | Germany |
|---|---|---|---|---|---|
| Ethylbenzene | | | Mandelic acid: 1500 | Mandelic acid plus | Mandelic acid plus |

| | | | | | |
|---|---|---|---|---|---|
| | | | mg/g creatinine urine end of shift at end of workweek | Phenylglyoxylic acid: 700 mg/g Creatinine urine end of workweek | Phenylglyoxylic acid: 300 mg/g urine (end of shift ) |
| Xylenes (o-, m-, p-isomers) | | Methyl hippuric acid: 650 mmol/mol creatinine urine Post shift | Methylhippuric acid: 1500 mg/g creatinine urine end of shift | Methylhippuric acids: 1 g/g Creatinine urine end of shift | Xylene: 1.5 mg/L whole blood (end of shift all isomers) Methylhippuric(tolur-)acid: 2000 mg/L urine (end of shift all isomers) |
| Toluene | | | Toluene: 1 mg/L blood end of shift Hippuric acid: 2500 mg/g creatinine urine end of shift | o-Cresol: 0.5 mg/L urine end of shift Hippuric acid: 1.6 g/g Creatinine urine end of shift Toluene: 0.05 mg/L blood start of last shift of workweek | Toluene: 600 µg/L whole blood (end of shift ) o-Cresol: 1.5 mg/L urine (end of several shifts after hydrolysis; for long-term exposures) |
| Benzene | | | Muconic acid: 5 mg/L urine end of shift | S-Phenylmercapturic acid: 0.045 mg/g urine end of exposure or end of shift trans,trans-Muconic acid: 2 mg/L urine end of exposure or end of shift Total benzene: 5 µg/L blood end of exposure or end of shift | |

| Component | Italy | Finland | Denmark | Bulgaria | Romania |
|---|---|---|---|---|---|
| Ethylbenzene | | Mandelic acid: 5.2 mmol/L urine end of shift at end of workweek. | | Mandelic acid and Phenylglyoxylic acid - together: 2000 mg/g Creatinine urine at the end of exposure or end of shift Possible significant absorption through the skin | Mandelic acid: 1.5 g/g Creatinine urine end of work week |
| Xylenes (o-, m-, p-isomers) | | Methylhippuric acid: 5.0 mmol/L urine end of shift. | | | Methylhippuric acid: 3 g/L urine end of shift |
| Toluene | | Toluene concentrated: 500 nmol/L blood prior to shift. | | Hippuric acid: 1.6 mmol/mmol Creatinine urine at the end of exposure or end of shift | Hippuric acid: 2 g/L urine end of shift o-Cresol: 3 mg/L urine end of shift |
| Benzene | | | | Trans, trans-Muconic acid: 2.0 mg/L urine at the end of exposure or end of shift Possible significant absorption through the skin S-Phenyl Mercapturic acid: 0.045 mg/g Creatinine urine at the end of exposure or end of shift Possible significant absorption through the skin | S-Phenylmercapturic acid: 25 µg/g Creatinine urine end of shift total Phenols: 50 mg/L urine end of shift |

| Component | Gibraltar | Latvia | Slovak Republic | Luxembourg | Turkey |
|---|---|---|---|---|---|
| Ethylbenzene | | | 2 and 4-Ethylphenol: 12 mg/L urine end of exposure or work shift also after all work shifts for long-term exposure Mandelic acid and phenylglycolic acid: 1600 mg/L urine end of exposure or work shift | | |

| | | | | | |
|---|---|---|---|---|---|
| | | | also after all work shifts for long-term exposure | | |
| Xylenes (o-, m-, p-isomers) | | | Xylene: 1.5 mg/L blood end of exposure or work shift all isomers Methylhippuric acid: 2000 mg/L urine end of exposure or work shift | | |
| Toluene | | Hippuric acid: 1.6 g/g Creatinine urine end of shift Toluene: 0.05 mg/l blood end of shift | Toluene: 600 µg/L blood end of exposure or work shift o-Cresol: 1.5 mg/L urine after all work shifts for long-term exposure o-Cresol: 1.5 mg/L urine end of exposure or work shift Hippuric acid: 1600 mg/g creatinine end of exposure or work shift | | |
| Benzene | | Phenol: 25 µg/g Creatinine urine end of shift | | | |

**Monitoring methods**
BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.

**Derived No Effect Level (DNEL)** No information available

| Route of exposure | Acute effects (local) | Acute effects (systemic) | Chronic effects (local) | Chronic effects (systemic) |
|---|---|---|---|---|
| **Oral** | | | | |
| **Dermal** | | | | |
| **Inhalation** | | | | |

**Predicted No Effect Concentration (PNEC)** No information available.

**8.2. Exposure controls**

**Engineering Measures**
Use only under a chemical fume hood. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.
Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source

**Personal protective equipment**

**Eye Protection** Safety glasses with side-shields (European standard - EN 166)

**Hand Protection** Protective gloves

| Glove material | Breakthrough time | Glove thickness | EU standard | Glove comments |
|---|---|---|---|---|
| Disposable gloves | See manufacturers recommendations | - | EN 374 | (minimum requirement) |

**Skin and body protection** Long sleeved clothing Apron Impervious gloves

Inspect gloves before use.
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information)
Ensure gloves are suitable for the task: Chemical compatability, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.
Remove gloves with care avoiding skin contamination.

**Respiratory Protection** When workers are facing concentrations above the exposure limit they must use

| | |
|---|---|
| | appropriate certified respirators.<br>To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly |
| **Large scale/emergency use** | In case of insufficient ventilation wear suitable respiratory equipment |
| **Small scale/Laboratory use** | Use a NIOSH/MSHA or European Standard EN 149:2001 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.<br>When RPE is used a face piece Fit Test should be conducted |
| **Hygiene Measures** | When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. |
| **Environmental exposure controls** | No information available. |

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

### 9.1. Information on basic physical and chemical properties

| | | |
|---|---|---|
| **Appearance** | Clear, Colorless | |
| **Physical State** | Liquid | |
| **Odor** | aromatic | |
| **Odor Threshold** | No data available | |
| **pH** | No data available | |
| **Melting Point/Range** | -47.2 °C / -53 °F | |
| **Softening Point** | No data available | |
| **Boiling Point/Range** | 136.7 - 143.3 °C / 278 - 290 °F | |
| **Flash Point** | 27.7 °C / 82 °F | **Method -** No information available |
| **Evaporation Rate** | No information available | |
| **Flammability (solid,gas)** | No information available | |
| **Explosion Limits** | **Lower** 1.1 vol %<br>**Upper** 7.0 vol % | |
| **Vapor Pressure** | 9 mmHg @ 25 °C | |
| **Vapor Density** | 3.66 (Air = 1.0) | (Air = 1.0) |
| **Specific Gravity / Density** | No data available 0.87 | |
| **Bulk Density** | No data available | |
| **Water Solubility** | No information available | |
| **Solubility in other solvents** | No information available | |

**Partition Coefficient (n-octanol/water)**

| **Component** | **log Pow** |
|---|---|
| Ethylbenzene | 3.118 |
| Xylenes (o-, m-, p- isomers) | 3.15 |
| Toluene | 2.65 |
| Benzene | 1.83 |

| | |
|---|---|
| **Autoignition Temperature** | 527 °C / 980.6 °F |
| **Decomposition Temperature** | No data available |
| **Viscosity** | No data available |
| **Explosive Properties** | No information available |
| **Oxidizing Properties** | No information available |

### 9.2. Other information

| | |
|---|---|
| **Molecular Formula** | C8H10 |
| **Molecular Weight** | 106.17 |

## SECTION 10: STABILITY AND REACTIVITY

### 10.1. Reactivity

None known, based on information available

**10.2. Chemical stability**

Stable under normal conditions

**10.3. Possibility of hazardous reactions**

**Hazardous Polymerization** Hazardous polymerization does not occur.
**Hazardous Reactions** No information available.

**10.4. Conditions to avoid**

Incompatible products. Heat, flames and sparks.

**10.5. Incompatible materials**

Strong oxidizing agents. Strong acids.

**10.6. Hazardous decomposition products**

Carbon monoxide (CO). Carbon dioxide ($CO_2$). Hydrocarbons. Aldehydes.

## SECTION 11: TOXICOLOGICAL INFORMATION

**11.1. Information on toxicological effects**

**Product Information** No acute toxicity information is available for this product

**(a) acute toxicity;**
**Oral** No data available
**Dermal** No data available
**Inhalation** No data available

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Ethylbenzene | 3500 mg/kg ( Rat ) | 15400 mg/kg ( Rabbit ) | 17.2 mg/L ( Rat ) 4 h |
| Xylenes (o-, m-, p- isomers) | 3500 mg/kg ( Rat ) | 4350 mg/kg ( Rabbit ) 1700 mg/kg ( Rabbit ) | 29.08 mg/L [MOE Risk Assessment Vol.1, 2002] |
| Toluene | > 5000 mg/kg ( Rat ) | 12000 mg/kg ( Rabbit ) | 26700 ppm ( Rat ) 1 h |
| Benzene | 810 mg/kg ( Rat ) 1800 mg/kg ( Rat ) | 8200 mg/kg ( Rabbit ) | 44.66 mg/L ( Rat ) 4 h |

**(b) skin corrosion/irritation;** No data available

**(c) serious eye damage/irritation;** No data available

**(d) respiratory or skin sensitization;**
**Respiratory** No data available
**Skin** No data available

**(e) germ cell mutagenicity;** No data available

**(f) carcinogenicity;** No data available

The table below indicates whether each agency has listed any ingredient as a carcinogen

| Component | EU | UK | Germany | IARC |
|---|---|---|---|---|
| Ethylbenzene | | | | Group 2B |
| Benzene | Carc Cat. 1A | | Cat. 1 | Group 1 |

**(g) reproductive toxicity;** No data available
**Reproductive Effects** Experiments have shown reproductive toxicity effects on laboratory animals.
**Developmental Effects** Developmental effects have occurred in experimental animals.
**Teratogenicity** Teratogenic effects have occurred in experimental animals.

**(h) STOT-single exposure;** No data available

**(i) STOT-repeated exposure;** No data available

**Target Organs** Eyes, Skin, Central nervous system (CNS), Liver, Kidney, Respiratory system.

**(j) aspiration hazard;** No data available

**Other Adverse Effects** Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information

**Symptoms / effects,both acute and delayed** Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

## SECTION 12: ECOLOGICAL INFORMATION

**12.1. Toxicity**

**Ecotoxicity effects** Do not empty into drains.

| Component | Freshwater Fish | Water Flea | Freshwater Algae | Microtox |
|---|---|---|---|---|
| Ethylbenzene | 9.6 mg/L LC50 96 h 9.1 - 15.6 mg/L LC50 96 h 32 mg/L LC50 96 h 7.55 - 11 mg/L LC50 96 h 4.2 mg/L LC50 96 h 11.0 - 18.0 mg/L LC50 96 h | 1.8 - 2.4 mg/L EC50 48 h | 2.6 - 11.3 mg/L EC50 72 h 438 mg/L EC50 > 96 h 4.6 mg/L EC50 = 72 h 1.7 - 7.6 mg/L EC50 96 h | EC50 = 9.68 mg/L 30 min EC50 = 96 mg/L 24 h |
| Xylenes (o-, m-, p- isomers) | 30.26 - 40.75 mg/L LC50 96 h 780 mg/L LC50 96 h 23.53 - 29.97 mg/L LC50 96 h 7.711 - 9.591 mg/L LC50 96 h 19 mg/L LC50 96 h 13.1 - 16.5 mg/L LC50 96 h 13.5 - 17.3 mg/L LC50 96 h 2.661 - 4.093 mg/L LC50 96 h 13.4 mg/L LC50 96 h | 0.6 mg/L LC50 = 48 h 3.82 mg/L EC50 = 48 h | | EC50 = 0.0084 mg/L 24 h |
| Toluene | 50-70 mg/L LC50 96 h 5-7 mg/L LC50 96 h 15-19 mg/L LC50 96 h 28 mg/L LC50 96 h 12 mg/L LC50 96 h | 11.5 mg/L EC50 = 48 h 5.46 - 9.83 mg/L EC50 48 h | 12.5 mg/L EC50 = 72 h 433 mg/L EC50 > 96 h | EC50 = 19.7 mg/L 30 min |
| Benzene | 70000 - 142000 µg/L LC50 96 h 22330 - 41160 µg/L LC50 96 h 28.6 mg/L LC50 96 h 22.49 mg/L LC50 96 h 5.3 mg/L LC50 96 h 10.7 - 14.7 mg/L LC50 96 h | 10 mg/L EC50 = 48 h 8.76 - 15.6 mg/L EC50 48 h | 29 mg/L EC50 = 72 h | |

**12.2. Persistence and degradability** No information available

| Component | Degradability |
|---|---|
| Toluene 108-88-3 ( 0 - 0.5 ) | 86% (20d) |

**12.3. Bioaccumulative potential** No information available

| Component | log Pow | Bioconcentration factor (BCF) |
|---|---|---|
| Ethylbenzene | 3.118 | 15 |
| Xylenes (o-, m-, p- isomers) | 3.15 | 0.6 - 15 |
| Toluene | 2.65 | 90 |
| Benzene | 1.83 | 3.5 - 4.4 |

**12.4. Mobility in soil** .

**12.5. Results of PBT and vPvB assessment** No data available for assessment.

**12.6. Other adverse effects**

| | |
|---|---|
| **Endocrine Disruptor Information** | This product does not contain any known or suspected endocrine disruptors |
| **Persistent Organic Pollutant** | This product does not contain any known or suspected substance |
| **Ozone Depletion Potential** | This product does not contain any known or suspected substance |

## SECTION 13: DISPOSAL CONSIDERATIONS

**13.1. Waste treatment methods**

| | |
|---|---|
| **Waste from Residues / Unused Products** | 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. |
| **Contaminated Packaging** | Empty remaining contents. Dispose of in accordance with local regulations. Do not re-use empty containers. |
| **European Waste Catalogue (EWC)** | According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. |
| **Other Information** | Waste codes should be assigned by the user based on the application for which the product was used. |

## SECTION 14: TRANSPORT INFORMATION

**IMDG/IMO**

| | |
|---|---|
| **14.1. UN number** | UN1307 |
| **14.2. UN proper shipping name** | XYLENES |
| **14.3. Transport hazard class(es)** | 3 |
| **14.4. Packing group** | III |

**ADR**

| | |
|---|---|
| **14.1. UN number** | UN1307 |
| **14.2. UN proper shipping name** | XYLENES |
| **14.3. Transport hazard class(es)** | 3 |
| **14.4. Packing group** | III |

**IATA**

| | |
|---|---|
| **14.1. UN number** | UN1307 |
| **14.2. UN proper shipping name** | XYLENES |
| **14.3. Transport hazard class(es)** | 3 |
| **14.4. Packing group** | III |

| | |
|---|---|
| **14.5. Environmental hazards** | No hazards identified |
| **14.6. Special precautions for user** | No special precautions required |
| **14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code** | Not applicable, packaged goods |

## SECTION 15: REGULATORY INFORMATION

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

**International Inventories** Australia X = listed China Canada The product is classified and labeled according to EC directives or corresponding national laws The product is classified and labeled in accordance with Directive 1999/45/EC Europe TSCA Korea Philippines Japan

| Component | EINECS | ELINCS | NLP | TSCA | DSL | NDSL | PICCS | ENCS | IECSC | AICS | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ethylbenzene | 202-849-4 | - | | X | X | - | X | X | X | X | X |
| Xylenes (o-, m-, p- isomers) | 215-535-7 | - | | X | X | - | X | X | X | X | X |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Toluene | 203-625-9 | - | | X | X | - | X | X | X | X | X |
| Benzene | 200-753-7 | - | | X | X | - | X | X | X | X | X |

| Component | REACH (1907/2006) - Annex XIV - Substances Subject to Authorization | REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances | REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC) |
|---|---|---|---|
| Toluene | | Use restricted. See item 48. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details) | |
| Benzene | | Use restricted. See item 5. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details) Use restricted. See item 28. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details) Use restricted. See item 29. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details) | |

**National Regulations**

| Component | Germany - Water Classification (VwVwS) | Germany - TA-Luft Class |
|---|---|---|
| Ethylbenzene | WGK 1 | |
| Xylenes (o-, m-, p- isomers) | WGK 2 | |
| Toluene | WGK 2 | |
| Benzene | WGK 3 | Krebserzeugende Stoffe - Class III : 1 mg/m³ (Massenkonzentration) |

| Component | France - INRS (Tables of occupational diseases) |
|---|---|
| Ethylbenzene | Tableaux des maladies professionnelles (TMP) - RG 84 |
| Xylenes (o-, m-, p- isomers) | Tableaux des maladies professionnelles (TMP) - RG 4bis,RG 84 |
| Toluene | Tableaux des maladies professionnelles (TMP) - RG 4bis,RG 84 |
| Benzene | Tableaux des maladies professionnelles (TMP) - RG 4,RG 4bis,RG 84 |

Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment.
Take note of Dir 94/33/EC on the protection of young people at work
Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

**15.2. Chemical safety assessment**

A Chemical Safety Assessment/Report (CSA/CSR) has not been conducted

## SECTION 16: OTHER INFORMATION

**Full text of R-phrases referred to under sections 2 and 3**
R10 - Flammable
R11 - Highly flammable
R20 - Harmful by inhalation
R38 - Irritating to skin
R45 - May cause cancer
R46 - May cause heritable genetic damage
R63 - Possible risk of harm to the unborn child
R65 - Harmful: may cause lung damage if swallowed
R67 - Vapors may cause drowsiness and dizziness

R20/21 - Harmful by inhalation and in contact with skin
R36/38 - Irritating to eyes and skin
R48/20 - Harmful: danger of serious damage to health by prolonged exposure through inhalation
R48/23/24/25 - Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed

**Full text of H-Statements referred to under sections 2 and 3**
H226 - Flammable liquid and vapor
H225 - Highly flammable liquid and vapor
H312 - Harmful in contact with skin
H332 - Harmful if inhaled
H315 - Causes skin irritation
H304 - May be fatal if swallowed and enters airways
H373 - May cause damage to organs through prolonged or repeated exposure

**Legend**

**CAS** - Chemical Abstracts Service
**EINECS/ELINCS** - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
**PICCS** - Philippines Inventory of Chemicals and Chemical Substances
**IECSC** - Chinese Inventory of Existing Chemical Substances
**KECL** - Korean Existing and Evaluated Chemical Substances
**TSCA** - United States Toxic Substances Control Act Section 8(b) Inventory
**DSL/NDSL** - Canadian Domestic Substances List/Non-Domestic Substances List
**ENCS** - Japanese Existing and New Chemical Substances
**AICS** - Australian Inventory of Chemical Substances
**NZIoC** - New Zealand Inventory of Chemicals

**WEL** - Workplace Exposure Limit
**ACGIH** - American Conference of Governmental Industrial Hygienists
**DNEL** - Derived No Effect Level
**RPE** - Respiratory Protective Equipment
**LC50** - Lethal Concentration 50%
**NOEC** - No Observed Effect Concentration
**PBT** - Persistent, Bioaccumulative, Toxic
**TWA** - Time Weighted Average
**IARC** - International Agency for Research on Cancer
**PNEC** - Predicted No Effect Concentration
**LD50** - Lethal Dose 50%
**EC50** - Effective Concentration 50%
**POW** - Partition coefficient Octanol:Water
**vPvB** - very Persistent, very Bioaccumulative

**ADR** - European Agreement Concerning the International Carriage of Dangerous Goods by Road
**IMO/IMDG** - International Maritime Organization/International Maritime Dangerous Goods Code
**OECD** - Organisation for Economic Co-operation and Development
**BCF** - Bioconcentration factor
**ICAO/IATA** - International Civil Aviation Organization/International Air Transport Association
**MARPOL** - International Convention for the Prevention of Pollution from Ships
**ATE** - Acute Toxicity Estimate
**VOC** - Volatile Organic Compounds

**Key literature references and sources for data**
Suppliers safety data sheet, Chemadvisor - LOLI, Merck index, RTECS

**Training Advice**
Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.

| | |
|---|---|
| **Creation Date** | 13-Feb-2015 |
| **Revision Date** | 21-Feb-2014 |
| **Revision Summary** | Not applicable. |

## This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

**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 Safety Data Sheet

# SAFETY DATA SHEET

Version 5.8
Revision Date 10/12/2015
Print Date 05/01/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Zinc

Product Number : 96454
Brand : Sigma-Aldrich

CAS-No. : 7440-66-6

### 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 # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Combustible dust,
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)

May form combustible dust concentrations in air
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P273 Avoid release to the environment.
P391 Collect spillage.
P501 Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.2 Mixtures

Formula : Zn
Molecular weight : 65.39 g/mol

**Hazardous components**

| Component | | Classification | Concentration |
|---|---|---|---|
| **Zinc powder (stabilized)** | | | |
| CAS-No.<br>EC-No.<br>Index-No. | 7440-66-6<br>231-175-3<br>030-001-01-9 | Aquatic Acute 1; Aquatic Chronic 1; H410 | <= 100 % |
| **Zinc oxide** | | | |
| CAS-No.<br>EC-No.<br>Index-No. | 1314-13-2<br>215-222-5<br>030-013-00-7 | Aquatic Acute 1; Aquatic Chronic 1; H410 | >= 5 - < 10 % |

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.

**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**
Special powder against metal fire Dry sandUse water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**Unsuitable extinguishing media**
Water

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

Zinc/zinc 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. Ensure adequate ventilation.
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

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.

Keep in a dry place.
Storage class (TRGS 510): Non Combustible Solids

### 7.3 Specific end use(s)

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

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| Zinc oxide | 1314-13-2 | TWA | 2.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | metal fume fever | | |
| | | STEL | 10.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | metal fume fever | | |

| | | | | |
|---|---|---|---|---|
| | | TWA | 5.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 5.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | ST | 10.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | C | 15.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 15.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |

## 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**
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**
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: powder<br>Colour: grey |
| b) | Odour | odourless |
| c) | Odour Threshold | No data available |
| d) | pH | Not applicable |
| e) | Melting point/freezing point | Melting point/range: 420 °C (788 °F) - lit. |
| f) | Initial boiling point and boiling range | 907 °C (1,665 °F) - lit. |
| g) | Flash point | Not applicable |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | May form combustible dust concentrations in air |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | Not applicable |
| l) | Vapour density | No data available |
| m) | Relative density | 7.133 g/mL at 25 °C (77 °F) |
| n) | Water solubility | insoluble |
| o) | Partition coefficient: n-octanol/water | Not applicable |
| p) | Auto-ignition temperature | does not ignite |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | During processing, dust may form explosive mixture in air. |
| t) | Oxidizing properties | No data available |

### 9.2 Other safety information

| | |
|---|---|
| Bulk density | 1.8 - 3.2 kg/m3 |

## 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
Dust may form explosive mixture in air.

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents, Acids and bases

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

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

**Acute toxicity**
No data available (Zinc powder (stabilized))

Inhalation: No data available (Zinc powder (stabilized))

Dermal: No data available (Zinc powder (stabilized))

No data available (Zinc powder (stabilized))

**Skin corrosion/irritation**
No data available (Zinc powder (stabilized))

**Serious eye damage/eye irritation**
No data available (Zinc powder (stabilized))

**Respiratory or skin sensitisation**
Did not cause sensitisation on laboratory animals. (Zinc powder (stabilized))

**Germ cell mutagenicity**
No data available (Zinc powder (stabilized))

**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 (Zinc powder (stabilized))

No data available (Zinc powder (stabilized))

**Specific target organ toxicity - single exposure**
No data available (Zinc powder (stabilized))

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available (Zinc powder (stabilized))

**Additional Information**
RTECS: ZG8600000

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

Effects due to ingestion may include:, chills, dry throat, sweet taste, Fever, Cough, Nausea, Vomiting, Weakness, Contact with eyes or skin may cause:, Irritation (Zinc powder (stabilized))

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | LC50 - Cyprinus carpio (Carp) - 450 µg/l - 96 h (Zinc powder (stabilized)) |
| Toxicity to daphnia and other aquatic invertebrates | LC50 - Daphnia magna (Water flea) - 0.068 mg/l - 48 h (Zinc powder (stabilized)) |
| | mortality NOEC - Daphnia (water flea) - 0.101 - 0.14 mg/l - 7 d (Zinc powder (stabilized)) |

### 12.2 Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.

### 12.3 Bioaccumulative potential

| | |
|---|---|
| Bioaccumulation | Algae - 7 d<br>at 16 °C - 5 µg/l (Zinc powder (stabilized)) |
| | Bioconcentration factor (BCF): 466 |

### 12.4 Mobility in soil

No data available (Zinc powder (stabilized))

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

No data available

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

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

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

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Zinc powder (stabilized))
Reportable Quantity (RQ): 1020 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc powder (stabilized))
Marine pollutant:yes

**IATA**
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Zinc powder (stabilized))

**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 |
|---|---|---|
| Zinc oxide | 1314-13-2 | 2007-03-01 |
| Zinc powder (stabilized) | 7440-66-6 | 1993-04-24 |

**SARA 311/312 Hazards**
No SARA Hazards

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Zinc powder (stabilized) | 7440-66-6 | 1993-04-24 |
| Zinc oxide | 1314-13-2 | 2007-03-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Zinc powder (stabilized) | 7440-66-6 | 1993-04-24 |
| Zinc oxide | 1314-13-2 | 2007-03-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Zinc powder (stabilized) | 7440-66-6 | 1993-04-24 |
| Zinc oxide | 1314-13-2 | 2007-03-01 |

**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.**

| | |
|---|---|
| | May form combustible dust concentrations in air |
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 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 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: 10/12/2015 Print Date: 05/01/2016

# ATTACHMENT I

# Langan Guidelines

LANGAN

**ATTACHMENT I**

**LANGAN GUIDELINES**

## GENERAL

- No smoking, eating, or drinking in this work zone.
- Upon leaving the work zone, personnel will thoroughly wash their hands and face.
- Minimize contact with contaminated materials through proper planning of work areas and decontamination areas, and by following proper procedures. Do not place equipment on the ground. Do not sit on contaminated materials.
- No open flames in the work zone.
- Only properly trained and equipped personnel are permitted to work in potentially contaminated areas.
- Always use the appropriate level of personal protective equipment (PPE).
- Maintain close contact with your buddy in the work zone
- Contaminated material will be contained in the Exclusion Zone (EZ).
- Report any unusual conditions.
- Work areas will be kept clear and uncluttered. Debris and other slip, trip, and fall hazards will be removed as frequently as possible.
- The number of personnel and equipment in the work zone will be kept to an essential minimum.
- Be alert to the symptoms of fatigue and heat/cold stress, and their effects on the normal caution and judgment of personnel.
- Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved quickly by the site HSO.

## TOOLS AND HEAVY EQUIPMENT

- Do not, under any circumstances, enter or ride in or on any backhoe bucket, materials hoist, or any other device not specifically designed to carrying passengers.
- Loose-fitting clothing or loose long hair is prohibited around moving machinery.
- Ensure that heavy equipment operators and all other personnel in the work zone are using the same hand signals to communicate.
- Drilling/excavating within 10 feet in any direction of overhead power lines is prohibited.
- The locations of all underground utilities must be identified and marked out prior to initiating any subsurface activities.
- Check to insure that the equipment operator has lowered all blades and buckets to the ground before shutting off the vehicle.
- If the equipment has an emergency stop device, have the operator show all personnel its location and how to activate it.
- Help the operator ensure adequate clearances when the equipment must negotiate in tight quarters; serve as a signalman to direct backing as necessary.
- Ensure that all heavy equipment that is used in the Exclusion Zone is kept in that zone until the job is done, and that such equipment is completely decontaminated before moving it into the clean area of the work zone.
- Samplers must not reach into or get near rotating equipment such as the drill rig. If personnel must work near any tools that could rotate, the equipment operator must completely shut down the rig prior to initiating such work. It may be necessary to use a remote sampling device.

# APPENDIX B

# QUALITY ASSURANCE PROJECT PLAN

LANGAN

# QUALITY ASSURANCE PROJECT PLAN

## for

## 28-90 REVIEW AVENUE
## QUEENS, NEW YORK
### NYSDEC BCP No. TBD

***Prepared For:***

**28-90 Review Avenue Owner, LLC**
**c/o Innovo Property Group**
**1370 Avenue of the Americas, 19th Floor**
**New York, New York**

***Prepared By:***

**Langan Engineering, Environmental, Surveying,**
**Landscape Architecture and Geology, D.P.C.**
**300 Kimball Drive**
**Parsippany, New Jersey 07054**

Amanda M. Forsburg

**Amanda Forsburg, CHMM**
**Senior Project Scientist**

**April 2019**
**100652601**

LANGAN

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# 1.0 PROJECT DESCRIPTION

## 1.1 Introduction

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) has prepared this Quality Assurance Project Plan (QAPP) on behalf of 28-90 Review Avenue Owner, LLC (Requestor) for the property located at 28-90 Review Avenue in the Long Island City neighborhood of Queens, New York. The Requestor intends to enroll into the New York State Brownfield Cleanup Program (BCP) as a volunteer and will implement a Supplemental Remedial Investigation Workplan (SRIWP) pursuant to a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC). The approximately 192,792-square foot site is identified as Block 294 and Lot 106 on the New York City Tax Map.

This QAPP specifies analytical methods to be used to ensure that data collected during implementation of the SRIWP are precise, accurate, representative, comparable, complete, and meet the sensitivity requirements of the project.

## 1.2 Project Objectives

The SRIWP involves the installation of soil borings and groundwater monitoring wells for the collection of soil, groundwater, and light non-aqueous phase liquid (LNAPL) samples. The Supplemental Remedial Investigation (SRI) sampling was requested by NYSDEC during a BCP pre-Application meeting on 14 February 2019 to delineate contamination identified at the site during the November 2018 Remedial Investigation. In addition to delineation sampling, soil, groundwater, and LNAPL samples will be collected from within the areas of concern (AOCs) to assess remedial options and aid in design of a selected remedy to be implemented at the site. This QAPP addresses sampling and analytical methods that will be necessary in support of Supplemental Remedial Investigation (SRI) activities. These objectives have been established in order to meet standards that will protect public health and the environment for the site.

## 1.3 Scope of Work

The specific scope of work covered in this QAPP includes any sampling that will occur during implementation of the SRIWP. The SRIWP requires collection of soil and groundwater samples to delineate previously identified petroleum impacts at

the site, and collection of soil samples, groundwater, and LNAPL samples from within the AOCs to aid in the evaluation, selection, and design of remedial options.

## 2.0 DATA QUALITY OBJECTIVES AND PROCESS

Data Quality Objectives (DQOs) are qualitative and quantitative statements to help ensure that data of known and appropriate quality are obtained during the project. The overall objectives are:

- To evaluate the quality of soil for delineation purposes through the collection of soil samples;
- To evaluate the quality of groundwater for delineation purposes through the collection of groundwater samples; and,
- To evaluate the quality of soil for potential remediation options through collection of soil samples from within the delineated area(s) of the site.

DQOs for sampling activities are determined by evaluating five factors:

- Data needs and uses: The types of data required and how the data will be used after it is obtained.
- Parameters of Interest: The types of chemical or physical parameters required for the intended use.
- Level of Concern: Levels of constituents, which may require remedial actions or further investigations.
- Required Analytical Level: The level of data quality, data precision, and quality assurance/quality control (QA/QC) documentation required for chemical analysis.
- Required Detection Limits: The detection limits necessary based on the above information.

The quality assurance and quality control objectives for all measurement data include:'

- Precision – an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Field sampling precision will be determined by analyzing coded duplicate samples and analytical precision will be determined by analyzing internal QC duplicates and/or matrix spike duplicates.
- Accuracy – a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. For soil samples, accuracy will be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy will be

assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), internal standards, laboratory method blanks, instrument calibration, and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks.

- Representativeness – expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is dependent upon the adequate design of the sampling program and will be satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is accomplished by following all applicable methods, laboratory-issued standard operating procedures (SOPs), the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.
- Completeness – the percentage of measurements made which are judged to be valid. Completeness will be assessed through data validation. The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested.
- Comparability – expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured using several procedures, including standard methods for sampling and analysis as documented in the QAPP, using standard reporting units and reporting formats, and data validation.
- Sensitivity – the ability of the instrument or method to detect target analytes at the levels of interest. The project manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection.

## 3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Implementation of the SRIWP will be overseen by Langan for 28-90 Review Avenue Owner, LLC. The environmental consultant will also arrange data analysis and reporting tasks. The analytical services will be performed by an Environmental Laboratory Approval Program (ELAP)-certified laboratory. Data validation services will be performed by approved data validation contractor(s).

For the required sampling as stated in the SRIWP, sampling will be conducted by Langan, the analytical services will be performed by York Analytical Laboratories, Inc. of Stratford, Conn. (New York State Department of Health [NYSDOH] ELAP certification number 10854). Data validation services will be performed by Emily Strake; résumé attached (Attachment A).

Key contacts for this project are as follows:

| | |
|---|---|
| 28-90 Review Avenue Owner, LLC | Andrew Chung<br>Telephone: (212) 218-3150 |
| Langan Project Manager: | Christopher McMahon<br>Telephone: (973) 560-4900 |
| Langan Quality Assurance Officer (QAO): | Steve Ciambruschini<br>Telephone: (973) 560-4900 |
| Langan Remedial Engineer: | Satyajit Vaidya<br>Telephone: (973) 560-4900 |
| Program Quality Assurance Monitor: | Amanda Forsburg<br>Telephone: (973) 560-4900 |
| Data Validator: | Emily Strake<br>Telephone: (215) 491-6500 |
| Laboratory Representative: | York Analytical Laboratories, Inc.<br>Phil Murphy<br>Telephone: (203) 598-1371 |

## 4.0 QUALITY ASSURANCE OBJECTIVES FOR COLLECTION OF DATA

The overall quality assurance objective is to develop and implement procedures for sampling, laboratory analysis, field measurements, and reporting that will provide data of sufficient quality to evaluate soil impacts at the site. The sample set, chemical analysis results, and interpretations must be based on data that meet or exceed quality assurance objectives established for the site. Quality assurance objectives are usually expressed in

terms of accuracy or bias, sensitivity, completeness, representativeness, comparability, and sensitivity of analysis. Variances from the quality assurance objectives at any stage of the investigation will result in the implementation of appropriate corrective measures and an assessment of the impact of corrective measures on the usability of the data.

***Precision***

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is assessed through the collection and measurement of field duplicates. Laboratory precision and sample heterogeneity also contribute to the uncertainty of field duplicate measurements. This uncertainty is taken into account during the data assessment process. For field duplicates, results less than 2x the reporting limit (RL) meet the precision criteria if the absolute difference is less than ±2X the RL. For results greater than 2X the RL, the acceptance criteria is a relative percent difference (RPD) of ≤50% (soil), and <30% (groundwater). RLs and method detection limits (MDL) are provided in Attachment B.

***Accuracy***

Accuracy is the measurement of the reproducibility of the sampling and analytical methodology. It should be noted that precise data may not be accurate data. For the purpose of this QAPP, bias is defined as the constant or systematic distortion of a measurement process, which manifests itself as a persistent positive or negative deviation from the known or true value. This may be due to (but not limited to) improper sample collection, sample matrix interferences, poorly calibrated analytical or sampling equipment, or limitations or errors in analytical methods and techniques.

Accuracy in the field is assessed through the use of field blanks and through compliance to all sample handling, preservation, and holding time requirements. All field blanks should be non-detect when analyzed by the laboratory. Any contaminant detected in an associated field blank was evaluated against laboratory blanks (preparation or method) and evaluated against field samples collected on the same day to determine potential for bias.

Laboratory accuracy is assessed by evaluating the percent recoveries of MS/MSD samples, LCS/LCSDs, surrogate compound recoveries, internal standard responses and the results of method preparation blanks. MS/MSD, LCS/LCSD, internal standard responses and surrogate percent recoveries were compared to either method-specific control limits or laboratory-derived control limits. Sample volume permitting, samples

displaying outliers should be reanalyzed. All associated method blanks should be non-detect when analyzed by the laboratory.

***Completeness***

Laboratory completeness is the ratio of total number of samples analyzed and verified as acceptable compared to the number of samples submitted to the fixed-base laboratory for analysis, expressed as a percent. Three measures of completeness are defined:

- Sampling completeness, defined as the number of valid samples collected relative to the number of samples planned for collection;
- Analytical completeness, defined as the number of valid sample measurements relative to the number of valid samples collected; and
- Overall completeness, defined as the number of valid sample measurements relative to the number of samples planned for collection.

Soil and groundwater data will meet a 90% completeness criterion. If the criterion is not met, sample results will be evaluated for trends in rejected and unusable data. The effect of unusable data required for a determination of compliance will also be evaluated.

***Representativeness***

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. Representativeness is dependent upon the adequate design of the sampling program and was satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. This is performed by following applicable standard operating procedures (SOPs) and this QAPP. All field technicians will be given copies of appropriate documents prior to sampling events and will be required to read, understand, and follow each document as it pertains to the tasks at hand.

Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is performed by following all applicable EPA and standard methods, laboratory-issued SOPs, the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

***Comparability***

Comparability is an expression of the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and was satisfied by ensuring that the sampling plan is followed and that sampling is performed according to the SOPs or other project-specific procedures. Analytical data were comparable when similar sampling and analytical methods are used as documented in the QAPP. Comparability was controlled by requiring the use of specific nationally-recognized analytical methods and requiring consistent method performance criteria. Comparability is also dependent on similar quality assurance objectives. Previously collected data were evaluated to determine whether they may be combined with contemporary data sets.

***Sensitivity***

Sensitivity is the ability of the instrument or method to detect target analytes at the levels of interest (e.g., at the 6 NYCRR Part 375 Subpart 6.8(a) Unrestricted Use Soil Cleanup Objectives). The Project Manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection and QC acceptance limits that meet established performance criteria. Concurrently, the Project Manager will select the level of data assessment to ensure that only data meeting the project DQOs are used in decision-making.

Field equipment will be used that can achieve the required levels of detection for analytical measurements in the field. In addition, the field sampling staff will collect and submit full volumes of samples as required by the laboratory for analysis, whenever possible. Full volume aliquots will help ensure achievement of the required limits of detection and allow for reanalysis if necessary. The concentration of the lowest level check standard in a multi-point calibration curve will represent the reporting limit.

Analytical methods and quality assurance parameters associated with the sampling program are presented in Attachment C. The frequency of associated field blanks and duplicate samples will be based on the recommendations listed in DER-10 and as described in Section 5.3.2.

## 5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

Soil sampling will be conducted in accordance with the established NYSDEC protocols contained in DER-10/Technical Guidance for Site Investigation and Remediation (May 2010). The following sections describe procedures to be followed for specific tasks.

### 5.1 Field Documentation Procedures

Field documentation procedures will include summarizing field data in field books and proper sample labeling. These procedures are described in the following sections.

#### 5.1.1 Field Data and Notes

Field notebooks contain the documentary evidence regarding procedures conducted by field personnel. Hard cover, bound field notebooks will be used because of their compact size, durability and secure page binding. The pages of the notebook will not be removed.

Entries will be made in permanent blue or black ink. No erasures will be allowed. Incorrect entries will be crossed out with a single strike mark and the change initialed and dated by the team member making the change.

Each entry will be dated. Entries will be legible and contain accurate and complete documentation of the individual or sampling team's activities or observations made. The level of detail will be sufficient to explain and reconstruct the activity conducted. Each entry will be signed by the person(s) making the entry.

The following types of information will be provided for each sampling task, as appropriate:

- Project name and number;
- Reasons for being on-site or taking the sample;
- Date and time of activity;
- Sample identification numbers;
- Geographical location of sampling points with references to the site, other facilities or a map coordinate system. Sketches were made in the field logbook when appropriate;

- Physical location of sampling locations such as depth below ground surface;
- Description of the method of sampling including procedures followed, equipment used and any departure from the specified procedures;
- Description of the sample including physical characteristics, odor, etc.;
- Readings obtained from health and safety equipment;
- Weather conditions at the time of sampling and previous meteorological events that may affect the representative nature of a sample;
- Photographic information including a brief description of what was photographed, the date and time, the compass direction of the picture and the number of the picture on the camera;
- Other pertinent observations such as the presence of other persons on the site, actions by others that may affect performance of site tasks, etc.; and,
- Names of sampling personnel and signature of persons making entries.

Field records will also be collected on field data sheets including boring logs, which will be used for geologic and drilling data during soil boring activities, and groundwater parameter logs which will be used to track groundwater chemical parameter readings during groundwater sampling. Field data sheets will include the project-specific number and stored in the field project files when not in use. At the completion of the field activities, the field data sheets will be digitized for long term maintenance.

### 5.1.2 Sample Labeling

Each sample collected will be assigned a unique identification number and placed in an appropriate sample container. Each sample container will have a sample label affixed to the outside with the date and time of sample collection and project name. In addition, the label will contain the sample identification number, analysis required and chemical preservatives added, if any. All documentation will be completed in waterproof ink. Sample nomenclature procedures are included in Attachment D.

## 5.2 Equipment Calibration and Preventative Maintenance

A photoionization detector (PID) will be used during the sampling activities to evaluate work zone action levels and screen soil samples. Field calibration and/or field checking of the PID will be the responsibility of the field team leader and the site HSO, and will be accomplished by following the procedures outlined in the operating manual for the instrument. At a minimum, field calibration and/or field equipment checking will be performed once daily, prior to use. Field calibration will be documented in the field notebook. Entries made into the logbook regarding the status of field equipment will include the following information:

- Date and time of calibration
- Type of equipment serviced and identification number (such as serial number)
- Reference standard used for calibration
- Calibration and/or maintenance procedure used
- Other pertinent information

Equipment that fails calibration or becomes inoperable during use will be removed from service and segregated to prevent inadvertent utilization. The equipment will be properly tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated to the manufacturer's specifications by qualified personnel. Equipment that cannot be repaired will be replaced.

Off-site calibration and maintenance of field instruments will be conducted as appropriate throughout the duration of project activities. All field instrumentation, sampling equipment and accessories will be maintained in accordance with the manufacturer's recommendations and specifications and established field equipment practice. Off-site calibration and maintenance will be performed by qualified personnel. A logbook will be kept to document that established calibration and maintenance procedures have been followed. Documentation will include both scheduled and unscheduled maintenance.

## 5.3 Sample Collection

### 5.3.1 Soil Samples

Soil samples will be visually classified and field screened using a PID to assess potential impacts from VOCs and for health and safety monitoring.

Soil samples collected for analysis of VOCs will be collected using Terra Core® sampling equipment. For analysis of non-volatile parameters, samples will be homogenized and placed into glass jars. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at 4°C ±2°C until they are transferred to the laboratory for analysis, in accordance with the procedures outlined in Section 5.4. Analysis and/or extraction and digestion of collected soil samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected soil sample will meet all quality assurance criteria set forth by this QAPP and DER-10.

### 5.3.2 Sample Field Blanks and Duplicates

Use of dedicated sampling equipment is planned; therefore, collection of field blanks is not anticipated. If the use of reusable sampling equipment is required, proper decontamination procedures will be employed (as further described in Section 5.7) and field blanks will be collected for quality assurance purposes at a rate of one per 20 investigative soil samples. If required, field blanks will be obtained by pouring laboratory-demonstrated analyte-free water on or through a decontaminated sampling device following use and implementation of decontamination protocols. The water will be collected off of the sampling device into a laboratory-provided sample container for analysis. Field blank samples will be analyzed for the complete list of analytes on the day of sampling. Trip blanks will be collected at a rate of one per day if soil samples are analyzed for VOCs during that day.

Duplicate soil samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative soil samples and will be submitted to the laboratory as "blind" samples. If less than 20 samples are collected during a particular sampling event, one duplicate sample will be collected.

## 5.4 Sample Containers and Handling

Certified, commercially clean sample containers will be obtained from the analytical laboratory. The laboratory will also prepare and supply the required field blank sample containers and reagent preservatives. Sample containers, including the field blank containers, will be placed in plastic coolers by the laboratory. These

coolers will be received by the field sampling team within 24 hours of their preparation in the laboratory. Prior to the commencement of field work, Langan field personnel will fill the plastic coolers with ice in Ziploc® bags (or equivalent) to maintain a temperature of 4°C±2° C.

Samples collected in the field for laboratory analysis will be placed directly into the laboratory-supplied sample containers. Samples will then be placed and stored on-ice in laboratory provided coolers until shipment to the laboratory. The temperature in the coolers containing samples and associated field blanks will be maintained at a temperature of 4°C±2°C while on-site and during sample shipment to the analytical laboratory.

Possession of samples collected in the field will be traceable from the time of collection until they are analyzed by the analytical laboratory or are properly disposed. Chain-of-custody procedures, described in Section 5.9, will be followed to maintain and document sample possession. Samples will be packaged and shipped as described in Section 5.6.

## 5.5 Sample Preservation

Sample preservation measures will be used in an attempt to prevent sample decomposition by contamination, degradation, biological transformation, chemical interactions and other factors during the time between sample collection and analysis. Preservation will commence at the time of sample collection and will continue until analyses are performed. Should chemical preservation be required, the analytical laboratory will add the preservatives to the appropriate sample containers before shipment to the office or field. Samples will be preserved according to the requirements of the specific analytical method selected, as shown in Attachment C.

## 5.6 Sample Shipment

### 5.6.1 Packaging

Sample containers will be placed in plastic coolers. Ice in Ziploc® bags (or equivalent) will be placed around sample containers. Cushioning material will be added around the sample containers if necessary. Chains-of-custody and other paperwork will be placed in a Ziploc® bag (or equivalent) and placed inside the cooler and custody seals will be affixed to one side

of the cooler at a minimum. If the samples are being shipped by an express delivery company (third-party courier, e.g., FedEx) then laboratory address labels will be placed on top of the cooler.

### 5.6.2 Shipping

Standard procedures to be followed for shipping environmental samples to the analytical laboratory are outlined below.

- All environmental samples will be transported to the laboratory from the site, Langan office, or secure laboratory transfer station by a laboratory provided courier under the chain-of-custody protocols described in Section 5.9. A third-party courier may be used if necessary.
- Prior notice will be provided to the laboratory regarding when to expect shipped samples. If the number, type or date of shipment changes due to site constraints or program changes, the laboratory will be informed.

## 5.7 Decontamination Procedures

Though not anticipated, decontamination procedures will be used if non-dedicated sampling equipment is utilized during the SRIWP. Decontamination of field personnel is discussed in the site-specific Health and Safety Plan (HASP) included in Appendix A of the SRIWP. Field sampling equipment that is to be reused will be decontaminated in the field in accordance with the following procedures:

1. Laboratory-grade glassware detergent and tap water scrub to remove visual contamination
2. Generous tap water rinse
3. Distilled/de-ionized water rinse

## 5.8 Residuals Management

Debris (e.g., paper, plastic and disposable PPE) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Debris is expected to be transported to a local municipal landfill for disposal. If applicable, residual solids (e.g., leftover soil cuttings) will be placed back in the borehole from which it was sampled. If gross contamination is observed, soil will be collected and stored in Department of Transportation (DOT)-approved 55-gallon drums in a designated

storage area at the site. The residual materials stored in a designated storage area at the site for further characterization, treatment or disposal.

## 5.9 Chain of Custody Procedures

A chain-of-custody protocol has been established for collected samples will be followed during sample handling activities in both field and laboratory operations. The primary purpose of the chain-of-custody procedures is to document the possession of the samples from collection through shipping, storage and analysis to data reporting and disposal. Chain-of-custody refers to actual possession of the samples. Samples are considered to be in custody if they are within sight of the individual responsible for their security or locked in a secure location. Each person who takes possession of the samples, except for third-party shipping couriers, is responsible for sample integrity and safe keeping. Chain-of-custody procedures are provided below:

- Chain-of-custody will be initiated by the laboratory supplying the pre-cleaned and prepared sample containers. Chain-of-custody forms will accompany the sample containers.
- Following sample collection, the chain-of-custody form will be completed for the samples collected. The sample identification number, date and time of sample collection, analysis requested and other pertinent information (e.g., preservatives) will be recorded on the form. Entries will be made in waterproof, permanent blue or black ink.
- Langan field personnel will be responsible for the care and custody of the samples collected until the samples are transferred to another party, dispatched to the laboratory, or disposed. The sampling/Field Team Leader will be responsible for enforcing chain-of-custody procedures during field work.
- When the form is full or when all samples have been collected that will fit in a single cooler, the sampling/Field Team Leader will check the form for possible errors and sign the chain-of-custody form. Any necessary corrections will be made to the record with a single strike mark, dated, and initialed.

Samples will be packaged for shipment or pickup via courier to the laboratory with the appropriate chain-of-custody form. If applicable, a shipping bill will be completed for each cooler and the shipping bill number recorded on the chain-of-custody form. A copy of the form will be retained by the Langan sampling team for the project file, and the original will be sent to the laboratory with the samples. Bills of lading will also be retained as part of the documentation for the chain-of-custody records, if applicable. When transferring custody of the samples, the individuals relinquishing and receiving custody of the samples will verify sample numbers and condition and will document the sample acquisition and transfer by signing and dating the chain-of-custody form. This process documents sample custody transfer from the sampler to the analytical laboratory.

Laboratory chain-of-custody will be maintained throughout the analytical processes as described in the laboratory's Quality Assurance Manual. The analytical laboratory will provide a copy of the chain-of-custody in the analytical data deliverable package. The chain-of-custody becomes the permanent record of sample handling and shipment.

### 5.10 Laboratory Sample Storage Procedures

The subcontracted laboratory will use a laboratory information management system (LIMS) to track and schedule samples upon receipt by the analytical laboratories. Any sample anomalies identified during sample log-in must be evaluated on individual merit for the impact upon the results and the data quality objectives of the project. When irregularities do exist, Langan must be notified to discuss recommended courses of action and documentation of the issue must be included in the project file.

For samples requiring thermal preservation, the temperature of each cooler will be immediately recorded. Each sample and container will be assigned a unique laboratory identification number and secured within the custody room walk-in coolers designated for new samples. Samples will be, as soon as practical, disbursed in a manner that is functional for the operational team. The temperature of all coolers and freezers will be monitored and recorded using a certified temperature sensor. Any temperature excursions outside of acceptance criteria (i.e., below 2°C or above 6°C) will initiate an investigation to determine whether any samples may have been affected. Following analysis, the laboratory's specific

procedures for retention and disposal will be followed as specified in the laboratory's SOPs and/or QA manual.

## 6.0 DATA REDUCTION, VALIDATION, AND REPORTING

### 6.1 Introduction

Data collected during the field investigation will be reduced and reviewed by the laboratory QA personnel, and a report on the findings will be tabulated in a standard format. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates. The data package provided by the laboratory will contain all items specified in the USEPA SW-846 appropriate for the analyses to be performed, and be reported in standard format.

The completed copies of the chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

### 6.2 Data Reduction

The Analytical Services Protocol (ASP) Category B data packages and an electronic data deliverable (EDD) will be provided by the laboratory after receipt of a complete sample delivery group. The Project Manager will immediately arrange for archiving the results and preparation of result tables. These tables will form the database for assessment of the site contamination condition.

Each EDD deliverable must be formatted using a Microsoft Windows operating system and the NYSDEC data deliverable format for EQuIS. To avoid transcription errors, data will be loaded directly into the American Standard Code for Information Interchange (ASCII) format from the LIMS. If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

The Project Manager or Task Manager will maintain close contact with the QA reviewer to ensure all non-conformance issues are acted upon prior to data manipulation and assessment routines. Once the QA review has been completed,

the Project Manager may direct the Team Leaders or others to initiate and finalize the analytical data assessment.

### 6.3 Data Validation

Data validation will be performed in accordance with the USEPA validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of the QC sample results,
- Verification of the identification of sample results (both positive hits and non-detects),
- Recalculation of 10 percent of all investigative sample results, and
- Preparation of Data Usability Summary Reports (DUSR).

A DUSR will be prepared and reviewed by the QAO before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each SDG will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times;
- Instrument tuning;
- Instrument calibrations;
- Blank results;
- System monitoring compounds or surrogate recovery compounds (as applicable);
- Internal standard recovery results;
- MS and MSD results;
- Target compound identification;
- Chromatogram quality;
- Pesticide cleanup (if applicable);
- Compound quantitation and reported detection limits;

- System performance; and
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times;
- Calibrations;
- Blank results;
- Interference check sample;
- Laboratory check samples;
- Duplicates;
- Matrix Spike;
- Furnace atomic absorption analysis QC;
- Inductively couple plasma (ICP) serial dilutions; and
- Results verification and reported detection limits.

Based on the results of data validation, the validated analytical results reported by the laboratory will be assigned one of the following usability flags:

- "U" - Not detected. The associated number indicates the approximate sample concentration necessary to be detected significantly greater than the level of the highest associated blank;
- "UJ" - Not detected. Quantitation limit may be inaccurate or imprecise;
- "J" - Analyte is present. Reported value may be associated with a higher level of uncertainty than is normally expected with the analytical method
- "N" – Tentative identification. Analyte is considered present in the sample;
- "R" – Unreliable result; data is rejected or unusable. Analyte may or may not be present in the sample; and
- No Flag - Result accepted without qualification.

## 7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

### 7.1 Introduction

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the QAO. These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate quality assurance management, the QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

### 7.2 System Audits

System audits may be performed by the QAO or designated auditors, and encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be system audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Project Manager requests, additional audits may occur.

### 7.3 Performance Audits

The laboratory may be required to conduct an analysis of Performance Evaluation samples or provide proof that Performance Evaluation samples submitted by USEPA or a state agency have been analyzed within the past twelve months.

### 7.4 Formal Audits

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria.

Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be in noncompliance shall be identified at exit interviews conducted with the involved management. Non-compliances will be logged, and documented through audit findings, which are attached to and are a part of the integral audit report. These audit-finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

The Project Manager has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Project Manager within fifteen days of completion of the audit. Serious deficiencies will be reported to the Project Manager within 24 hours. All audit checklists, audit reports, audit findings, and acceptable resolutions are approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

## 8.0 CORRECTIVE ACTION

### 8.1 Introduction

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

### 8.2 Procedure Description

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Project Manager, Field Team Leader and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Corrective actions will be initiated as follows:

- When predetermined acceptance standards are not attained;
- When procedure or data compiled are determined to be deficient;
- When equipment or instrumentation is found to be faulty;
- When samples and analytical test results are not clearly traceable;
- When quality assurance requirements have been violated;
- When designated approvals have been circumvented;
- As a result of system and performance audits;
- As a result of a management assessment;
- As a result of laboratory/field comparison studies; and
- As required by USEPA SW-846, and subsequent updates, or by the NYSDEC ASP.

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities, or documents ascertained to be noncompliant with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 8.1 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The Project Manager will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

**FIGURE 8.1**

**CORRECTIVE ACTION REQUEST**

Number: _____ Date: _____

TO: _____

You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____

CONDITION:

REFERENCE DOCUMENTS:

RECOMMENDED CORRECTIVE ACTIONS:

_____ _____ _____ _____ _____ _____

Originator Date Approval Date Approval Date

RESPONSE

CAUSE OF CONDITION

CORRECTIVE ACTION

(A) RESOLUTION

(B) PREVENTION

(C) AFFECTED DOCUMENTS

C.A. FOLLOWUP:

CORRECTIVE ACTION VERIFIED BY: _____ DATE:_____

## 9.0 REFERENCES


NYSDEC. Division of Environmental Remediation. DER-10/Technical Guidance for Site Investigation and Remediation, dated May 3, 2010.

NYSDOH. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

Taylor, J. K., 1987. Quality Assurance of Chemical Measurements. Lewis Publishers, Inc., Chelsea, Michigan

USEPA, 1986. SW-846 "Test Method for Evaluating Solid Waste," dated November 1986. U.S. Environmental Protection Agency, Washington, D.C.

USEPA, 1987. Data Quality Objectives for Remedial Response Actions Activities: Development Process, EPA/540/G-87/003, OSWER Directive 9355.0-7- U.S. Environmental Protection Agency, Washington, D.C.

USEPA, 1992a. CLP Organics Data Review and Preliminary Review. SOP No.

HW-6, Revision #8, dated January 1992. USEPA Region II.

USEPA, 1992b. Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW 3/90. SOP No. HW-2, Revision XI, dated January 1992. USEPA Region II.

USEPA. Hazardous Waste Support Section. Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15. SOP No. HW-31, Revision #6, dated June 2014.

# ATTACHMENT A

# LANGAN RESUMES

# Emily G. Strake, CEP
**Senior Project Chemist/ Risk Assessor**

**Human Health Risk Assessment**
**Chemical Data Validation**



## 19 years in the industry ~ 6 years with Langan

Ms. Strake has eighteen years of environmental chemistry, risk assessment, auditing, and quality assurance experience. Most recently, she has focused her efforts on human health risk assessment, and has been the primary author or key contributor of risk assessment reports and screening evaluations for projects governed under RCRA, CERCLA, PADEP, DNREC, SWRCB, DTSC, NJDEP, CTDEEP, ODEQ, NYSDEC and MDE. She has experience in site-specific strategy development, which has enabled her to perform assessments to focus areas of investigation and identify risk-based alternatives for reducing remediation costs. Ms. Strake is a member of the Interstate Technology and Regulatory Council Risk Assessment Team responsible for the development and review of organizational risk assessment guidance documents and serves as a National Trainer in risk assessment for the organization.

Ms. Strake has extensive experience assessing potential adverse health effect to humans from exposure to hazardous contaminants in soil, sediment, groundwater, surface water, ambient and indoor air, and various types of animal, fish, and plant materials. She understands and applies environmental cleanup guidance and policies associated with multiple federal and state agencies. Additionally, she has broad experience in the development of preliminary remediation goals and site-specific action levels. She is proficient with the USEPA and state-modified Johnson and Ettinger Models for Subsurface Vapor Intrusion into Buildings, USEPA's Adult Lead Methodology, IEUBK Methodology, DTSC's Leadspread 7 and 8, evaluation of aerobic biodegradation potential using API's BioVapor Model, and statistical evaluation of data using USEPA's ProUCL software. In addition, Ms. Strake is experienced in presentation of risk information at public meetings.

Ms. Strake has extensive experience in environmental data validation, focused on ensuring laboratory deliverables follow specific guidelines as described by regulatory agencies and the analytical methods employed. She also has a broad range of environmental field experience and maintains current OSHA HAZWOPER certification.

Ms. Strake is experienced in auditing laboratory methodology and field-sampling activities for compliance with Quality Assurance Project Plans (QAPPs), the National Environmental Laboratory Accreditation Conference Standards Quality Systems manual, and applicable USEPA Guidance. Ms. Strake has also audited on-site laboratories in support of groundwater treatment operations and implemented corrective actions. Her responsibilities include writing reports on the value of laboratory work, writing/editing QAPPs for clients and project-specific sites, peer reviewing colleague's work, and mentoring staff within the office. She has also served as the Quality Assurance officer for several long-term projects, responsible for the achievement of all forms of Quality Control/Quality Assurance by onsite personnel relating to sampling, analysis, and data evaluation.

### Education

M.B.A., Business Administration
The University of Scranton

B.S., Chemistry
Cedar Crest College

### Certification

Board Certified Environmental Professional (CEP) in Assessment

### Memberships

Interstate Technology and Regulatory Council

Montgomery Township Environmental Advisory Committee Member, Term ending 1/1/2019.

Society for Risk Analysis

### Training

40 hr. OSHA HAZWOPER Training/Nov 2002

8 hr. HAZWOPER Supervisor/June 2004

8 hr. OSHA HAZWOPER Refresher/Oct 2018

### Publications/Presentations

*Decision Making at Contaminated Sites: Issues and Options in Human Health Risk Assessment.* Interstate Technology and Regulatory Council

*Alternate Approaches for Act 2 Risk Assessments Using Site-Specific Information.* Pennsylvania Brownfields Conference

*Risk Assessment in Remediation*
Montclair State University

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Ms. Strake has several years' experience analyzing investigative samples, writing laboratory Standard Operating Procedures (SOPs), and managing all aspects of procedures and analyses for Optical Emission Spectrometry, X-Ray Fluorescence, Ignition analysis, and Atomic Absorption. Her experience also includes operating and performing routine instrument maintenance for GC/MS and IR. Ms. Strake has worked extensively on developing rapid soil characterization programs for PCB and pesticide analyses utilizing enzyme-linked immunosorbent assays, and was also involved in efforts to develop new instrumentation to quantify microbial nitrification of ammonium.

**Selected Project Experience**

Human Health Risk Assessment

- Major League Soccer's San Jose Earthquakes Stadium – Utilized heuristic soil gas model to calculate risk and hazard associated with inhalation of chlorinated solvents for the redevelopment of a public soccer stadium. Soil gas data was modeled assuming three soil stratum and site-specific soil, building, and exposure parameters. The Earthquakes' stadium opened in 2015.
- Completed a human health risk assessment to determine if exposure to asbestos fibers in dried sediment posed a potentially unacceptable risk to nearby residents. The health risk assessment considered the contribution of naturally occurring asbestos associated with serpentine rock. Soil background samples were used to derive the mean concentration of all polarized light microscopy (PLM) samples. Chrysotile was the only asbestos type found during the PLM analysis.
- Texas Instruments – Participated in a collaboration to develop comments to USEPA Region IX and the San Francisco Regional Water Quality Control Board regarding vapor intrusion at South Bay Superfund Sites. The focus of the response was to outline scientific and policy objections to EPA's recommended TCE interim short-term indoor air response action levels and guidelines, and to clarify the use of California-modified indoor air screening levels for assessing and responding to TCE and PCE subsurface vapor intrusion into indoor air.
- Confidential Client – derived cancer risk estimates associated with exposure to airborne asbestos fibers during construction of a NBA sports arena. A sensitive receptor zone, representing a 1,000 ft. radial diameter from the project site, was established to determine those receptors requiring quantitative risk evaluation. Risk-based ambient air quality standards were established for transmission electron microscopy (TEM) asbestos.
- Completed a human health risk assessment, including submission of a Memorandum on Exposure Scenarios and Assumptions (MESA), Pathways Analysis Report (PAR), and Baseline Human Health Risk Assessment (BHHRA) for a CERCLA site in Fair Lawn, New Jersey under USEPA Region 2 lead. The evaluation included assessment of potentially complete groundwater and surface water pathways for residents, industrial workers, recreators, utility workers, and construction workers. The risk assessment approach and conclusions received USEPA approval in 2018.
- Performed a baseline risk assessment for hypothetical future residents at a CERCLA site in Hagerstown, Maryland. The evaluation included evaluation of ingestion, dermal contact, and inhalation of chemicals in groundwater. Linear low dose cancer risk

was assessed as well as one-hit cancer risk, with specific focus on pesticides and PCBs.

- Confidential Client – Performed an exposure assessment associated with exposure to fiberglass/crystalline silica in broken acoustic tile. Supported the identification of analytical methodology for evaluation of silica on air filters.
- Golden Gate National Parks Conservancy – Peer reviewed a Preliminary Endangerment Assessment Report for the Battery East Trail. The assessment included a human health risk evaluation that estimated carcinogenic risk from exposure to PAHs and dioxin/furans in soil using toxic equivalency to benzo(a)pyrene and 2,3,7,8-TCDD.
- Performed a site-specific risk assessment for recreational land use at a CERCLA site in Santa Barbara County. The risk assessment derived incremental lifetime cancer risk estimates associated with PCBs evaluated as Aroclors in surface soil. The risk assessment approach and conclusions received multi-agency approval in 2017.
- Calculated a site-specific groundwater standard for indane on the basis of toxic analogy. A surrogate toxicity value approach was implemented due to limited availability of toxicological information related to indane. The site-specific standard was accepted by NJDEP in 2017.
- Delaware City Refinery - Performed comprehensive human health risk assessment for a petroleum refinery in Delaware City, Delaware under the RCRA program. The risk assessment was the basis for a thorough characterization and assessment of potential risks posed by site-specific conditions. Developed various human exposure scenarios by using both Federal and State-Specific guidance for soil, groundwater, and surface water exposure.
- DuPont - Worked as a key participant in the human health risk evaluation of mercury associated with legacy contamination of the South River located in Waynesboro, Virginia.
- Veteran's Affairs - Completed a human health risk evaluation of the potential future risk associated with inhalation of indoor air for the Veteran's Administration. Soil, soil gas, and groundwater samples were collected as part of the site characterization. Achieved DTSC approval of the risk assessment approach and conclusions.
- Santa Clara Landfill – Developed a human health risk assessment to characterize risk associated with exposure to landfill gas at the Santa Clara All Purpose Landfill. The risk assessment evaluated specific compounds in landfill gas, their concentrations, spatial patterns, and extent throughout the site, and assessed the potential for vapor intrusion associated with a proposed future redevelopment.
- Occidental Chemical – Completed multiple AOC-specific risk assessments utilizing and applying the guidance set forth by the DTSC's Human Health Risk Assessment Note 1 (Default Exposure Factors for Use in Risk Assessment), Note 3 (Recommended Methodology for Use of USEPA Regional Screening Levels), and Note 4 (Screening Level Human Health Risk Assessments).
- Exelon - Developed a human health risk assessment for a utility-owned former Manufactured Gas Plant (MGP) site in Pennsylvania, under Pennsylvania's Act 2 Program. Used ProUCL statistical

software to determine upper limits for full data sets and non-detect data. Conducted vapor intrusion modeling (via the Johnson & Ettinger model) and prepared vapor intrusion reports showing that risks to volatile organic compounds in soils and groundwater were not impacting indoor air quality.

- Avon - Completed a human health risk assessment for a redevelopment property located in Rye, New York. The objective of the evaluation was to characterize the risks associated with potential future human exposures to soil and groundwater affected by a release from the Site's former No. 2 fuel oil UST. The intended future use of the Site was a playground to be utilized by the general public for open play on commercial recreational equipment.
- Sunoco Refineries – Derived site-specific soil PRGs for lead using the EPA's adult lead model for two former Sunoco refineries. Achieved PADEP approval in May 2015. Completed receptor evaluations in accordance with USEPA risk assessment guidance to develop exposure parameters under current and reasonably anticipated future land use scenarios.
- Honeywell - Completed a focused human health risk evaluation of PAH contaminants for under NJDEP's Site Remediation Program. Applied a blended approach of qualitative risk characterization and quantitative risk calculation to propose closure of AOCs following the remedial investigation.
- Floreffe Terminal - Performed human health risk assessment for contamination resulting from a 3.9 million gallon diesel oil tank collapse along the Monongahela River. Evaluated potential impacts to human health via exposure to soil, groundwater, and surface water. Calculated site-specific standards for soil remediation.
- DOW Chemical - Calculated Medium Specific Concentrations for unregulated contaminants using the PADEP protocols to assist in the clean-up of a monomer tank explosion in Bristol, Pennsylvania. Selected appropriate surrogate toxicity data and evaluated novel on-site constituents by analogy.
- Ryder – Developed Alternative Direct Exposure Criteria for PAH-impacted fill material at a commercial facility. Site-specific soil screening levels for incidental ingestion of soil were calculated following a forward risk evaluation for current on-site receptors.
- Rohm and Haas - Prepared an Act 2 site-specific human health risk assessment for the oldest industrial facility in the United States, located in southeast Philadelphia. The objective of the risk assessment was to determine achievable possible future land-use options under Pennsylvania's Land Recycling Program. The risk assessment included evolution of multiple site-COPCs and constituent suites: VOCs, SVOCs, PCBs, pesticides, and metals (including lead). Evaluated the potential for indoor air inhalation through J&E modeling of soil gas and groundwater.
- Regency - Conducted vapor intrusion modeling for a dry cleaning facility in the Philadelphia area. Predictive modeling using the Johnson and Ettinger approach indicated that estimated contaminant levels would not adversely affect human receptors.

Chemical Data Quality

- Participated in a CERCLA site investigation; assessed the usability of sample results for numerous matrices including dust, sediment,

soils, and various aqueous matrices for a remedial investigation under the Contract Laboratory Program. Implemented an on-site pesticide immunoassay program to delineate soil contamination in real-time.

- Coordinated the collection of fish tissue samples and determined the validity of the analytical results associated with CERCLA and RCRA site characterizations. Assessed duck blood analytical results for the Connecticut Department of Energy and Environmental Protection Bureau of Natural Resources.
- Audited multiple accredited laboratories in New Jersey and Pennsylvania on behalf of clients using USEPA Guidance on Technical Audits and Related Assessments for Environmental Data Operations. The audits included full-suite USEPA and SW-846 methodology; and included reviewing staff experience and training records, equipment and facilities, policies, practices, procedures, and documentation for sample receipt, analysis, instrument maintenance, standard preparation, calibration and traceability, control charting, corrective actions, data reduction and review, report generation, and waste disposal.
- Reviewed and validated data packages for RCRA Facilities Investigation at a Philadelphia-area chemical site; issued data validation reports to project personnel and regulatory agencies. The reviews included evaluation of quarterly groundwater, soil, and soil vapor matrices. Participated in RCRA groundwater sampling, developed and executed the investigation's QAPP, and coordinated with the laboratory to schedule and perform field-sampling events.
- Completed Data Usability Summary Reports in accordance with NYSDEC DER-10 guidance for soil, groundwater, sediment surface water, soil gas, ambient air and indoor air analytical results.
- Acted as the Quality Assurance Officer for several long-term projects in Pennsylvania, Maryland, and New Jersey, Delaware, responsible for the achievement of all forms of QA/QC as it related to sampling, analysis, and data evaluation.

# Amanda Forsburg, CHMM

**Project Scientist**

**Environmental Oversight, Remedial Investigation, Remedial Action**



## 9 years in the industry ~ 9 years with Langan

Ms. Forsburg has over nine years of experience that includes working on environmental projects, particularly investigation and remediation of environmental contamination. She has assisted in remedial investigations and has been involved in the collection of field data and assisted in the preparation of reports and other environmental regulatory documents for projects in New Jersey and New York.

Ms. Forsburg's field experience includes investigation and remediation of contaminated sites including the collection of soil, groundwater, and air samples for environmental analysis, supervision of injections and remedial excavations, and the completion of air monitoring to ensure OSHA compliance on HAZWOPER sites. Office experience includes management of field investigation and remediation as well as completion of proposals, Phase I Environmental Site Assessments, remedial investigation reports, and remedial closure reports in support of these activities. Ms. Forsburg has worked on projects under regulatory oversight of the New Jersey Department of Environmental Protection (NJDEP), New York State Department of Environmental Conservation (NYSDEC), and New York City Office of Environmental Remediation (NYCOER).

## Selected Projects

NYSDEC Brownfield Redevelopment, Remedial Investigation and Remediation Action – 363 and 365 Bond Street, Brooklyn, NY
NYSDEC Brownfield Redevelopment, Remedial Investigation – Fashion Outlets of Niagara Falls, NY
NYSDEC Spills Redevelopment, Remedial Action – 540 West 26th Street, New York, NY
NYSDEC Spills Redevelopment, Remedial Investigation and Remedial Action – 101 Murray Street, New York, NY
NYSDEC Spills Redevelopment, Remedial Investigation and Remedial Action – 110 University Place, New York, NY
NYSDEC Spills Redevelopment, Remedial Action, Lowe's Home Centers, Kings Plaza Site Redevelopment – Brooklyn, NY
NYSDEC Spills Remediation, Con Edison Soil Remediation - Bronx, NY
NYSDEC Spills Remediation, Con Edison NAPL Monitoring and Removal, Various Sites – Manhattan, NY
NYCOER E-Designation Remediation and Volunteer Cleanup Program Redevelopment, Remedial Investigation and Remedial Action – 400 Park Avenue South, New York, NY
NYCOER E-Designation Remediation and Volunteer Cleanup Program Redevelopment, Remedial Investigation and Remedial Action – 540 West 53rd Street, New York, NY
Remedial Action – 508 West 24th Street, New York, NY

### Education

B.A., Environmental Studies
Bucknell University

B.A., Environmental Geology
Bucknell University

### Professional Registration

Certified Hazardous Materials Manager (CHMM)

OSHA 29 CFR 1910.120 Certification (HAZWOPER)

### Professional Affiliations

New Jersey Society of Women Environmental Professionals (NJSWEP)

Association of Environmental and Engineering Geologists – *New York-Philadelphia Chapter Secretary*

Professional Women in Construction - *New York Chapter Program Committee*

Alliance of Hazardous Materials Professionals New Jersey Chapter (AHMPNJ)

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NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 505 W 19th Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 53 West 53rd Street (MoMA Expansion), New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 525 West 52nd Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 412 Greenwich Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 508 West 24th Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 68 Charlton Street, New York, NY
NYCDEP Remediation, Remedial Investigation and Remedial Action – 225 East 39th Street, New York, NY
Sky View Parc Mixed-Use Construction, Sub-Slab Vapor Ventilation System Construction – Flushing, NY
Liberty Plaza Redevelopment Site, Remedial Investigation and Remedial Action – Randallstown, MD
Former Penick Corporation Facility RCRA Site, Remedial Investigation and Remedial Action – Montville, NJ
Former Pan Graphics Facility, Soil and Groundwater Remediation – Garfield, NJ
Former Pan Graphics Facility, Sediment Investigation and Cap Construction – Lodi, NJ
Former Flintkote Facility, Soil and Groundwater Investigation – East Rutherford, NJ
Interport Site, Impacted Soils Delineation and Remediation – Newark, NJ
Lowe's Home Center Store, Sub-Slab Vapor Ventilation System O&M – Eatontown, NJ
Lowe's Home Center Store, Sub-Slab Methane Gas Ventilation System O&M – Woodbridge, NJ
Lowe's Home Center Store, Sub-Slab Vapor Barrier Construction – Rosedale, NY
Stop & Shop, Groundwater and Indoor Air Monitoring – Emerson, NJ
Stop & Shop, Methane Gas Ventilation System O&M – Raritan, NJ
Stop & Shop, Sub-Slab Vapor Ventilation System O&M – New Paltz, NY
Former First Aviation Services Facility, Groundwater Monitoring and Remediation, Teterboro, NJ
Phase I Environmental Site Assessments and Due Diligence Investigations, Various Sites – NJ and NY

# Christopher McMahon, CHMM

**Associate**

**Brownfield Redevelopment, Environmental Site Assessments, Site Investigation/Remedial Actions, Vapor Intrusion Investigations**



## 15 years in the industry ~ 9 years with Langan

Mr. McMahon is a consulting geologist whose primary focus within his tenure at Langan has been in providing environmental support to redevelopment sites within the metropolitan New York area. He has experience with projects in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup, Voluntary Cleanup and Spill Programs, and New York City Office of Environmental Remediation E-Designated and New York City Voluntary Cleanup Program sites. These projects have included the completion of Phase I environmental site assessments, Phase II and remedial investigations, UST closures, NYSDEC closures and remedial excavation oversight for off-site disposal and/or treatment. Mr. McMahon also has significant field experience including implementation and management of all phases of environmental projects involving soil, sediment, groundwater, surface water, and soil vapor contamination including Phase I inspections, Phase II site investigations, Remedial Investigations, and Remedial Actions.

Many of these projects have included his oversight of remedial actions to clean up or mitigate hazardous waste sites in rural, urban, and industrial settings. These remedial action designs have included in-situ soil remedial injections, contaminated soil removal/disposal management plans, and soil vapor intrusion mitigation systems including advanced vapor barriers and sub-slab depressurization systems.

### Selected Projects

NYSDEC Brownfield Redevelopment 363 and 365 Bond Street, Brooklyn, NY
NYSDEC Brownfield Redevelopment, Fashion Outlets of Niagara Falls, NY
NYSDEC Spills Redevelopment, 540 West 26th Street, New York, NY
NYSDEC Spills Redevelopment, 101 Murray Street, New York, NY
NYSDEC Spills Redevelopment, 110 University Place, New York, NY
NYSDEC Spills Redevelopment, Grant Park, Yonkers, NY
NYSDEC Spills Redevelopment, The Shops At Nanuet, Nanuet, NY
NYCOER E-Designation Remediation, 505 W 19th Street, New York, NY
NYCOER E-Designation Remediation, 53 West 53rd Street, New York, NY
NYCOER E-Designation Remediation, 525 West 52nd Street, New York, NY
NYCOER E-Designation Remediation, 412 Greenwich Street, New York, NY
NYCOER E-Designation Remediation, 508 West 24th Street, New York, NY
NYSDEC (Region 7) Site Remedial Investigation, Hillcrest, NY
Former Manufactured Gas Plant Site Remedial Investigation, Geneva, NY
NYSDEC (Region 2) Superfund Site Remedial Investigation, Jamaica, NY
NYSDEC (Region 5) Superfund Site Remedial Investigation, Whitehall, NY
Former Manufactured Gas Plant Site Investigation/Confidential Client, Mechanicville, NY
Remedial Investigation of Industrial Facility/Confidential Client, Batavia, NY
OGS Geotechnical Survey for Construction, Rome, NY

### Education

B. A., Geology, State University of New York College at Potsdam
With Honors in Geology and Environmental Science

### Professional Registration

Certified Hazardous Materials Manager (CHMM)

OSHA 29 CFR 1910.120 Certification for Hazardous Waste Operations and Emergency Response

OSHA Certification for Hazardous Waste Site Supervisor

Red Cross CPR & First Aid Training

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# SATYAJIT VAIDYA, PE

## SENIOR ASSOCIATE/VICE PRESIDENT

## GEOTECHNICAL ENGINEERING & PROJECT MANAGEMENT

Mr. Vaidya has close to 20 years of geotechnical engineering experience with particular emphasis on design and construction of foundations for high-rise structures in urban areas. Mr. Vaidya's specific areas of expertise include planning and implementing sub-surface investigations; engineering shallow and deep foundation systems; inspection of soil compaction and foundation sub-grade preparation; static and dynamic load testing of driven pile foundations; design and installation of driven piles, mini-piles, auger pressure-grouted displacement (APGD) piles, and rock-socketed caissons; tie-back and tie-down anchor design and construction; design and monitoring of soil surcharges; design and construction of temporary and permanent excavation support systems; Plaxis finite element modeling; geotechnical instrumentation monitoring; and . He has obtained extensive fieldwork, office supervision, and project management experience on several projects in New York and New Jersey.



### SELECTED PROJECTS

- New York Wheel, Staten Island, New York, NY
- Central Park Tower Development, New York, NY
- American Dream Meadowlands, East Rutherford, NJ
- 250 South Street Development, New York, NY
- One 57 Development, New York, NY
- 610 Lexington Avenue Development, New York, NY
- The Orion, 350 West 42nd Street, New York, NY
- The Tower Residences (Battery Park Site 2A), New York, NY
- 363 and 365 Bond Street Development, Brooklyn, NY
- 18-30 MW Offshore Wind Farm, Offshore NJ
- 236 Livingston Street Development, Brooklyn, NY
- 303 East 51st Street, New York, New York
- 250 East 57th Street Development, New York, NY
- 508 West 24th Street development, New York, NY
- Gem Tower Development (55 West 46th Street), New York, NY
- 225 West 58th Street Development, New York, NY
- 135 West 45th Street Development, New York, NY
- 535 West End Avenue Development, New York, NY
- Parrish Art Museum Development, Water Mill, Long Island, NY
- 100 West 18th Street Development, New York, NY
- 255 Hudson Street Development, New York, NY
- 330 Spring Street Development, New York, NY
- The Standard (856 Washington Street) Development, New York, NY
- 499 Greenwich Street Development, New York, NY
- Bank Street Commons, White Plains, NY
- Watchung Square Mall, Watchung, NJ
- Nathani Heights Development, Mumbai, India
- Revanta Development, Gurgaon, India

### EDUCATION

M.S., Civil Engineering (Geotechnical)
University of Massachusetts, Amherst

B.E., Civil Engineering
University of Mumbai, India

### PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NJ and NY

### AFFILIATIONS

Deep Foundations Institute (DFI)

DFI India Regional Committee

American Society of Civil Engineers (ASCE)

Geo Institute of ASCE

# Steven Ciambruschini, PG, LEP

**Principal/Vice President**
**Environmental Site Assessments/Investigations, Brownfield Remediation, UST Management**



## 33 years in the industry ~ 28 years with Langan

Mr. Ciambruschini has over 30 years of experience in hydrogeologic and environmental investigations including management of environmental and geotechnical investigations relating to petroleum and chlorinated solvent spill sites, underground storage tank sites, manufactured gas plant sites, landfills, wastewater treatment facilities and industrial/commercial sites. His experience includes managing environmental compliance audits, remedial investigation, pre-acquisition due diligence and permitting assessment, feasibility studies and design, construction and operation of complex innovative remediation systems to treat, contain and recover contaminated soil and groundwater. These projects are managed under various NJDEP, PADEP, NYDEC, NYCDEP and CTDEP programs. Mr. Ciambruschini provides consultation to a diverse group of clients including private developers, utilities, retail and industrial facilities and is expert in assessing remediation options and funding options under various state and federal grant, loan and tax reimbursement programs including Brownfield programs.

## Selected Projects

- Brodson Property, Montville NJ, (RCRA, NJDEP ACO Cleanup)
- Carroll Gardens, Brooklyn, NY (NY Brownfield, EPA Superfund, OER E-designated Site)
- Con Edison Appendix B Spill Sites - Various Locations, NY
- Former MGP Site, Brooklyn, NY (VCP Site)
- Extell Development, Hudson Yards, New York, NY (NYC E-designated, NYS Brownfield Site)
- Pan Graphics, Bergen County, NJ (ISRA, LSRP)
- New Jersey Turnpike General Environmental Services Contract, Various Sites, NJ
- Liberty Science Center, Jersey City, NJ ( EO 215)
- Blue Back Square, West Hartford, CT (UST, Transfer Act, Brownfield)
- Hershey, Act II Investigation (PA VCP)
- Hershey, Naugatuck, CT (CT Transfer Act)
- Halby Chemical Sites, Various Sites, DE (CERCLA)
- Unisys, Middletown CT, (CT Transfer Act, Brownfield)
- Ryder Rental, Various Sites in CT (CT Transfer Act)
- St. Marks Avenue, Brooklyn, NY (Vapor Mitigation)
- Pan Graphics, Lodi, NJ (Eco Risk Assessment, LSRP)

### Education

M.S., Geology
Montclair State University

M.A., Environmental Science
Montclair University

B.S., Environmental Science
Cook College, Rutgers University

### Professional Registration

Professional Geologist (PG) in NY, DE, KY

Licensed Environmental Professional (LEP) in CT

Underground Storage Tank License in NJ

### Affiliations

National Ground Water Association

Association of Ground Water Scientists and Engineers

American Association of Petroleum Geologists

Environmental Professionals of Connecticut

American Bar Association (ABA)

LANGAN

# ATTACHMENT B

# LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

LANGAN

| Method | Matrix | Analyte | MDL | RL | Units |
|---|---|---|---|---|---|
| **VOC** | | | | | |
| EPA 8260C | Soil | 1,1,1,2-Tetrachloroethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,1,1-Trichloroethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,1,2,2-Tetrachloroethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113) | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,1,2-Trichloroethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,1-Dichloroethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,1-Dichloroethylene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Bromochloromethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,2,3-Trichloropropane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,2,4-Trichlorobenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,2,4-Trimethylbenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,2-Dibromo-3-chloropropane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,2-Dibromoethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,2-Dichlorobenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,2-Dichloroethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,2-Dichloropropane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,3,5-Trimethylbenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,3-Dichlorobenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,4-Dichlorobenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,4-Dioxane | 50 | 100 | ug/kg |
| EPA 8260C | Soil | Cyclohexane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 2-Butanone | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 2-Hexanone | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 4-Methyl-2-pentanone | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Acetone | 5 | 10 | ug/kg |
| EPA 8260C | Soil | Acrolein | 5 | 10 | ug/kg |
| EPA 8260C | Soil | Acrylonitrile | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Benzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Bromodichloromethane | 2.5 | 5 | ug/kg |

| Method | Matrix | Analyte | MDL | RL | Units |
|---|---|---|---|---|---|
| **VOC** | | | | | |
| EPA 8260C | Soil | Bromoform | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Bromomethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Carbon disulfide | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Carbon tetrachloride | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Chlorobenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Chloroethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Chloroform | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Chloromethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | cis-1,2-Dichloroethylene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | cis-1,3-Dichloropropylene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Dibromochloromethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Dibromomethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Dichlorodifluoromethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Naphthalene | 2.5 | 10 | ug/kg |
| EPA 8260C | Soil | Ethyl Benzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Methylcyclohexane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Hexachlorobutadiene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Isopropylbenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Methyl acetate | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Methyl tert-butyl ether (MTBE) | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Methylene chloride | 5 | 10 | ug/kg |
| EPA 8260C | Soil | n-Butylbenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | n-Propylbenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | 1,2,3-Trichlorobenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | o-Xylene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | p- & m- Xylenes | 5 | 10 | ug/kg |
| EPA 8260C | Soil | p-Isopropyltoluene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | sec-Butylbenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Styrene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | tert-Butyl alcohol (TBA) | 2.5 | 5 | ug/kg |

| Method | Matrix | Analyte | MDL | RL | Units |
|---|---|---|---|---|---|
| **VOC** | | | | | |
| EPA 8260C | Soil | tert-Butylbenzene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Tetrachloroethylene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Toluene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | trans-1,2-Dichloroethylene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | trans-1,3-Dichloropropylene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Trichloroethylene | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Trichlorofluoromethane | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Vinyl Chloride | 2.5 | 5 | ug/kg |
| EPA 8260C | Soil | Xylenes, Total | 7.5 | 15 | ug/kg |

| Method | Matrix | Analyte | MDL | RL | Units |
|---|---|---|---|---|---|
| **SVOC** | | | | | |
| EPA 8270D | Soil | Acenaphthene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Acenaphthylene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Acetophenone | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Aniline | 83.5 | 167 | ug/kg |
| EPA 8270D | Soil | Anthracene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Atrazine | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Benzaldehyde | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Benzidine | 83.5 | 167 | ug/kg |
| EPA 8270D | Soil | Benzo(a)anthracene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Benzo(a)pyrene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Benzo(b)fluoranthene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Benzo(g,h,i)perylene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Benzoic acid | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Benzo(k)fluoranthene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Benzyl alcohol | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Benzyl butyl phthalate | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 1,1'-Biphenyl | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 4-Bromophenyl phenyl ether | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Caprolactam | 41.7 | 83.3 | ug/kg |
| EPA 8270D | Soil | Carbazole | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 4-Chloro-3-methylphenol | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 4-Chloroaniline | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Bis(2-chloroethoxy)methane | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Bis(2-chloroethyl)ether | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Bis(2-chloroisopropyl)ether | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 2-Chloronaphthalene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 2-Chlorophenol | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 4-Chlorophenyl phenyl ether | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Chrysene | 20.9 | 41.7 | ug/kg |

| Method | Matrix | Analyte | MDL | RL | Units |
|---|---|---|---|---|---|
| **SVOC** | | | | | |
| EPA 8270D | Soil | Dibenzo(a,h)anthracene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Dibenzofuran | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Di-n-butyl phthalate | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 1,2-Dichlorobenzene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 1,3-Dichlorobenzene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 1,4-Dichlorobenzene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 3,3'-Dichlorobenzidine | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 2,4-Dichlorophenol | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Diethyl phthalate | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 2,4-Dimethylphenol | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Dimethyl phthalate | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 4,6-Dinitro-2-methylphenol | 41.7 | 83.3 | ug/kg |
| EPA 8270D | Soil | 2,4-Dinitrophenol | 41.7 | 83.3 | ug/kg |
| EPA 8270D | Soil | 2,4-Dinitrotoluene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 2,6-Dinitrotoluene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Di-n-octyl phthalate | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 1,2-Diphenylhydrazine (as Azobenzene) | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Bis(2-ethylhexyl)phthalate | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Fluoranthene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Fluorene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Hexachlorobenzene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Hexachlorobutadiene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Hexachlorocyclopentadiene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Hexachloroethane | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Indeno(1,2,3-cd)pyrene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Isophorone | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 2-Methylnaphthalene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 2-Methylphenol | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 3- & 4-Methylphenols | 20.9 | 41.7 | ug/kg |

| Method | Matrix | Analyte | MDL | RL | Units |
|---|---|---|---|---|---|
| **SVOC** | | | | | |
| EPA 8270D | Soil | Naphthalene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 4-Nitroaniline | 41.7 | 83.3 | ug/kg |
| EPA 8270D | Soil | 2-Nitroaniline | 41.7 | 83.3 | ug/kg |
| EPA 8270D | Soil | 3-Nitroaniline | 41.7 | 83.3 | ug/kg |
| EPA 8270D | Soil | Nitrobenzene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 2-Nitrophenol | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 4-Nitrophenol | 41.7 | 83.3 | ug/kg |
| EPA 8270D | Soil | N-nitroso-di-n-propylamine | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | N-Nitrosodimethylamine | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | N-Nitrosodiphenylamine | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Pentachlorophenol | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Phenanthrene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Phenol | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Pyrene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | Pyridine | 83.5 | 167 | ug/kg |
| EPA 8270D | Soil | 1,2,4,5-Tetrachlorobenzene | 41.7 | 83.3 | ug/kg |
| EPA 8270D | Soil | 2,3,4,6-Tetrachlorophenol | 41.7 | 83.3 | ug/kg |
| EPA 8270D | Soil | 1,2,4-Trichlorobenzene | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 2,4,6-Trichlorophenol | 20.9 | 41.7 | ug/kg |
| EPA 8270D | Soil | 2,4,5-Trichlorophenol | 20.9 | 41.7 | ug/kg |

| Method | Matrix | Analyte | MDL | RL | Units |
|---|---|---|---|---|---|
| **Pesticides** | | | | | |
| EPA 8081B | Soil | Aldrin | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | alpha-BHC | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | beta-BHC | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | delta-BHC | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | gamma-BHC (Lindane) | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | gamma-Chlordane | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | alpha-Chlordane | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | Chlordane, total | 1.32 | 1.32 | ug/kg |
| EPA 8081B | Soil | 4,4'-DDD | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | 4,4'-DDE | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | 4,4'-DDT | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | Dieldrin | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | Endosulfan I | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | Endosulfan II | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | Endosulfan sulfate | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | Endrin | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | Endrin aldehyde | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | Endrin ketone | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | Heptachlor | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | Heptachlor epoxide | 0.33 | 0.33 | ug/kg |
| EPA 8081B | Soil | Methoxychlor | 1.65 | 1.65 | ug/kg |
| EPA 8081B | Soil | Toxaphene | 16.7 | 16.7 | ug/kg |

| Method | Matrix | Analyte | MDL | RL | Units |
|---|---|---|---|---|---|
| **PCBs** | | | | | |
| EPA 8082A | Soil | Aroclor 1016 | 0.0167 | 0.0167 | mg/kg |
| EPA 8082A | Soil | Aroclor 1221 | 0.0167 | 0.0167 | mg/kg |
| EPA 8082A | Soil | Aroclor 1232 | 0.0167 | 0.0167 | mg/kg |
| EPA 8082A | Soil | Aroclor 1242 | 0.0167 | 0.0167 | mg/kg |
| EPA 8082A | Soil | Aroclor 1248 | 0.0167 | 0.0167 | mg/kg |
| EPA 8082A | Soil | Aroclor 1254 | 0.0167 | 0.0167 | mg/kg |
| EPA 8082A | Soil | Aroclor 1260 | 0.0167 | 0.0167 | mg/kg |
| EPA 8082A | Soil | Aroclor 1262 | 0.0167 | 0.0167 | mg/kg |
| EPA 8082A | Soil | Aroclor 1268 | 0.0167 | 0.0167 | mg/kg |
| EPA 8082A | Soil | Total PCBs | 0.0167 | 0.0167 | mg/kg |

| Method | Matrix | Analyte | MDL | RL | Units |
|---|---|---|---|---|---|
| **Herbicides** | | | | | |
| EPA 8151A m | Soil | 2,4-D | 20 | 20 | ug/kg |
| EPA 8151A m | Soil | 2,4,5-TP (Silvex) | 20 | 20 | ug/kg |
| EPA 8151A m | Soil | 2,4,5-T | 20 | 20 | ug/kg |

| Method | Matrix | Analyte | MDL | RL | Units |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| EPA 6010C | Soil | Aluminum | 1 | 1 | mg/kg |
| EPA 6010C | Soil | Antimony | 0.5 | 0.5 | mg/kg |
| EPA 6010C | Soil | Arsenic | 1 | 1 | mg/kg |
| EPA 6010C | Soil | Barium | 1 | 1 | mg/kg |
| EPA 6010C | Soil | Beryllium | 0.1 | 0.1 | mg/kg |
| EPA 6010C | Soil | Cadmium | 0.3 | 0.3 | mg/kg |
| EPA 6010C | Soil | Calcium | 0.5 | 5 | mg/kg |
| EPA 6010C | Soil | Chromium | 0.5 | 0.5 | mg/kg |
| EPA 6010C | Soil | Cobalt | 0.5 | 0.5 | mg/kg |
| EPA 6010C | Soil | Copper | 0.5 | 0.5 | mg/kg |
| EPA 6010C | Soil | Iron | 2 | 2 | mg/kg |
| EPA 6010C | Soil | Lead | 0.3 | 0.3 | mg/kg |
| EPA 6010C | Soil | Magnesium | 5 | 5 | mg/kg |
| EPA 6010C | Soil | Manganese | 0.5 | 0.5 | mg/kg |
| EPA 7473 | Soil | Mercury | 0.03 | 0.03 | mg/kg |
| EPA 6010C | Soil | Nickel | 0.5 | 0.5 | mg/kg |
| EPA 6010C | Soil | Potassium | 5 | 5 | mg/kg |
| EPA 6010C | Soil | Selenium | 1 | 1 | mg/kg |
| EPA 6010C | Soil | Silver | 0.5 | 0.5 | mg/kg |
| EPA 6010C | Soil | Sodium | 10 | 10 | mg/kg |
| EPA 6010C | Soil | Thallium | 1 | 1 | mg/kg |
| EPA 6010C | Soil | Vanadium | 1 | 1 | mg/kg |
| EPA 6010C | Soil | Zinc | 1 | 1 | mg/kg |

# ATTACHMENT C

# LABORATORY ANALYTICAL METHODS

LANGAN

**ATTACHMENT C**
**ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE**

| Matrix Type | Field Parameters | Laboratory Parameters | Analytical Methods | Sample Preservation | Sample Container Volume and Type | Sample Hold Time | Field Duplicate Samples | Equipment Blank Samples | Trip Blank Samples | Ambient Air Samples | MS/MSD Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Soil** | Total VOCs via PID | Part 375 + TCL VOCs / CP-51 VOCs | EPA 8260C | Cool to 4°C | Two 40-ml VOC vials with 5ml $H_2O$, one with MeOH or 3 Encore Samplers (separate container for % solids) | 14 days | 1 per 20 samples (minimum 1) | 1 per 20 samples (minimum 1) | 1 per shipment of VOC samples | NA | 1 per 20 samples |
| | | Part 375 + TCL SVOCs / CP-51 SVOCs | EPA 8270D | Cool to 4°C | 4 oz. jar* | 14 days extract, 40 days after extraction to analysis | | | | | |
| | | Part 375 + TAL Metals | EPA 6010C, EPA 7470, EPA 7196A, EPA 9014/9010C | Cool to 4°C | 2 oz. jar* | 6 months, except Mercury 28 days | | | | | |
| | | Part 375 + TCL Pesticides | EPA 8081B | Cool to 4°C | 4 oz. jar* | 14 days extract, 40 days after extraction to analysis | | | | | |
| | | Perfluoroalkyl Substances (PFAs) | ASTM D7968-17 | Cool to 4°C | 4 oz. jar* | 14 days | | | | | |
| | | Part 375 + TCL PCBs | EPA 8082A | Cool to 4°C | 4 oz. jar* | 14 days extract, 40 days after extraction to analysis | | | | | |
| **Groundwater** | Temperature, Turbidity, pH, ORP, Conductivity, DO | Part 375 + TCL VOCs / CP-51 VOCs | EPA 8260C | Cool to 4°C | 3 40-ml VOC vials with HCL | 14 days | 1 per 20 samples (minimum 1) | 1 per 20 samples (minimum 1) | 1 per shipment of VOC samples | NA | 1 per 20 samples |
| | | Part 375 + TCL SVOCs / CP-51 SVOCs | EPA 8270D | Cool to 4°C | 2 1-L Amber Glass | 7 days | | | | | |
| | | Part 375 + TAL Metals | EPA 6010C, EPA 7470, EPA 7196A, EPA 9014/9010C | Cool to 4°C | 250-ml platic bottle with $HNO_3$ | 6 months (28 days for mercury) | | | | | |
| | | Part 375 + TCL Pesticides | EPA 8081B | Cool to 4°C | 1-L Amber Glass | 7 days to extraction | | | | | |
| | | Perfluoroalkyl Substances (PFAs) | ASTM D7968-17 | Cool to 4°C | 1-L Amber Glass | 7 days to extraction | | | | | |
| | | Part 375 + TCL PCBs | EPA 8082A | Cool to 4°C | 2 1-L Amber Glass | 7 days | | | | | |

Notes:
*can be combined in one or more 8 oz. jars

# ATTACHMENT D

# SAMPLE NOMENCLATURE

**LANGAN**

# *SAMPLE NOMENCLATURE*

The sample nomenclature outlined below provides consistency between sample events and projects but, most importantly, establish unique sample IDs that will avoid confusion months or years after the sample has been collected. Furthermore, unique sample IDs are required for any data submitted to the NYSDEC in EDD format or being uploaded to an EQuIS database.

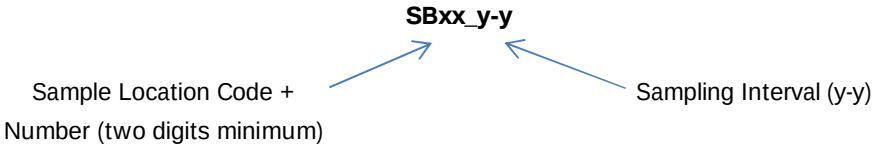
## 1.0 INVESTIGATION LOCATION CODES

| | | | |
|---|---|---|---|
| SB | Soil Boring | SV | Soil Vapor Point |
| WC | Waste Characterization Boring | IA | Indoor Air |
| TP | Test Pit | AA | Ambient Air |
| EPSW | Endpoint Location (Sidewall) | SVE | Vapor Extraction Well |
| EPB | Endpoint Location (Bottom) | DS | Drum |
| MW | Monitoring Well | IDW | Investigation Derived Waste |
| TMW | Temporary Monitoring Well | SL | Sludge |
| SW | Surface Water | FP | Free Product |

## 2.0 SAMPLE NOMENCLATURE

Each sample at a site must have a unique value.

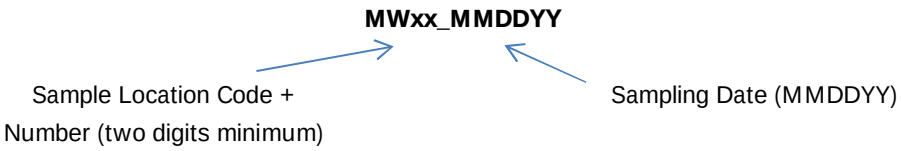
- **Soil/Sediment Samples:**




| Sample Type | Sample Location Code | Sampling Depth or Interval (feet bgs or approx. elevation) | Sample Name |
|---|---|---|---|
| **Phase II/Remedial Investigation** | | | |
| **Grab** Soil Sample | SB01 | 2 to 4 | SB01_2-4 |
| | SB02 | 4 | SB02_4 |
| **Waste Characterization** | | | |
| **Grab** Soil Sample | WC01 | 2 to 4 | WC01_2-4 |
| | WC02 | 4 | WC02_4 |
| **Composite** Soil Sample from one or more locations | COMP01 or COMP02 + COMP03 | 0 to 10 (Fill) | COMP01_0-10 |

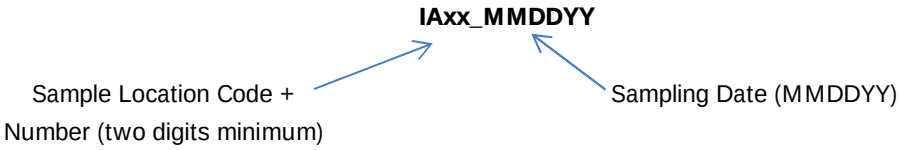
| Sample Type | Sample Location Code | Sampling Depth or Interval (feet bgs or approx. elevation) | Sample Name |
|---|---|---|---|
| **Endpoint Sampling** | | | |
| **Grab** Soil Sample | EPSW01_N | 5 | EPSW01_N_5 |
| | EPSW01_S | 5 | EPSW01_S_5 |
| | EPSW01_E | 5 | EPSW01_E_5 |
| | EPSW01_W | 5 | EPSW01_W_5 |
| | EPB01 | 6 | EPB01_6 |

- **Groundwater/Surface Water Samples:**




| Sample Type | Sample Location Code | Sampling Date | Sample Name |
|---|---|---|---|
| Groundwater Sample | MW01 | 02/21/2013 | MW01_022113 |

- **Air/Soil Vapor Samples:**



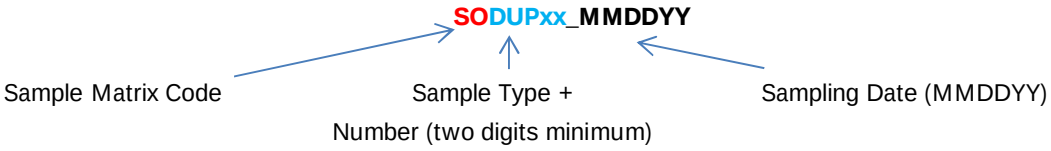

| Sample Type | Sample Location Code | Date | Sample Name |
|---|---|---|---|
| Air Sample | IA01 | 02/21/2013 | IA01_022113 |
| Soil Vapor Sample | SV01 | 02/21/2013 | SV01_022113 |
| Vapor Extraction Well Sample | SVE01 (INLET/MIDPOINT/OUTLET) | 02/21/2013 | SVE01_IN_022113<br>SVE01_ MID_022113<br>SVE01_ OUT_022113 |

- **QA/QC Samples:**

**Sample Matrix Codes**

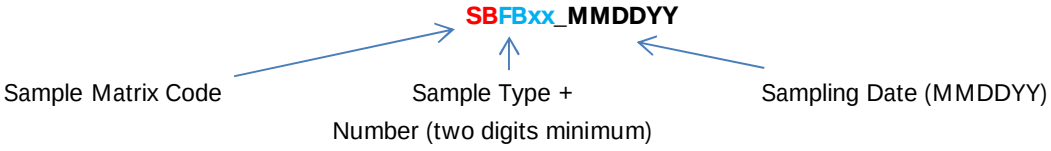
| | | | |
|---|---|---|---|
| SO | Soil | AS | Air |
| SE | Sediment | SV | Soil Vapor |
| GW | Groundwater | SL | Sludge |
| SW | Surface Water | FP | Free Product |

o Duplicates Samples




| Sample Type | Parent Sample Code | Date | Sample Name |
|---|---|---|---|
| Groundwater Duplicate Sample (DUP) | MW01_022113 | 02/21/2013 | GWDUP01_022113 |
| Soil boring Duplicate Sample (DUP) | SBP01_022113 | 02/21/2013 | SODUP01_022113 |
| Grab Waste Characterization | WC01 | 02/21/2013 | WCDUP01_022113 |
| Composite Waste Characterization | COMP01 | 02/21/2013 | COMPDUP01_022113 |

o Field Blanks and Trip Blanks




| Sample Type | Date | Sample Name |
|---|---|---|
| Groundwater Field Blank (FB) | 02/21/2013 | GWFB01_022113 |
| Groundwater Trip Blank (TB) | 02/21/2013 | GWTB01_022113 |
| Soil Field Blank | 02/21/2013 | SOFB01_022113 |
| Soil Trip Blank | 02/21/2013 | SOTB01_022113 |

o Matrix Spike/Matrix Spike Duplicate (MS/MSD)

**Parent Sample Name_MS or MSD**

| Sample Type | Sample Location | Parent Sample Name | Sample Name |
|---|---|---|---|
| Matrix Spike Soil (MS) | SB01 | SB01_2-4 | SB01_2-4_MS |
| Matrix Spike Soil Duplicate (MSD) | SB01 | SB01_2-4 | SB01_2-4_MSD |
| Matrix Spike GW (MS) | MW01 | MW01 | MW01_MS |
| Matrix Spike GW Duplicate (MSD) | MW01 | MW01 | MW01_MSD |

## 3.0 NOTES

1. The sample location code should not exceed 20 characters and the sample name should not exceed 40 characters.
2. Sample location code (**SB01, MW01, etc.)** is a sequential number (starting with 01) and should be a minimum of two digits.
3. Sample Interval (SB01_**0-5**) is separated from the sample location code with an underscore, and the top and bottom interval with a dash. Soil and sediment sample intervals should always be in

feet. Soil and sediment sample intervals should contain no "/" or "()" or unit.

4. Sample date (MW01_**022113**) is separated from the sample location code with an underscore and should be provided in MMDDYY format [the date should contain no "/" or "-"].
5. If groundwater samples are collected from multiple intervals within one well, you may assign a letter designation (in lower case) to the well ID to differentiate between intervals (i.e., MW01a_022113, MW01b_022113, and MW01c_022113). The letter "a" would indicate the shallowest interval and "c" the deepest. The actual depth intervals should be documented in the project field book or field sheets and the letter designations should be used consistently between sampling events.
6. According to USEPA's Contract Laboratory Program (CLP) Guidance for Field Samplers (January 2011), field duplicate samples should remain "blind" to the laboratory (i.e., they should have separate CLP Sample numbers). Assign two separate (unique) CLP sample numbers (i.e., one number to the field sample and one to the duplicate). Submit blind to the laboratory. (http://www.epa.gov/superfund/programs/clp/download/sampler/CLPSamp-01-2011.pdf)