SITE MANAGEMENT PLAN

for

475 Bay Street and 31 Wave Street

Staten Island, New York

NYSDEC Site Number: C243044
USEPA ID # NYR000253807

Prepared for:

BFC 475 Residential LLC
c/o BFC Partners
150 Myrtle Avenue, Suite 2
Brooklyn, New York 11225

Prepared by:

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

LANGAN

Langan Project No.: 170610601
December 2022

CERTIFICATION STATEMENT

I, Jason J. Hayes, certify that I am currently a New York State registered professional engineer (P.E) as in defined in Title 6 New York Codes, Rules and Regulations (6 NYCRR) Part 375 and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

STATE OF NEW YORK
JASON JAMES HAYES
LICENSED PROFESSIONAL ENGINEER
085401

_____ P.E.

12/14/2022 _____ DATE

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List of Acronyms

AAI	All Appropriate Inquiry
AST	Above Ground Storage Tank
ASTM	ASTM International
AWQS	Ambient Water Quality Standards
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	Below Grade Surface
CAMP	Community Air Monitoring Plan
CEQR	City Environmental Quality Review
CHASP	Construction Health and Safety Plan
CMWP	Corrective Measures Work Plan
COC	Certificate of Completion
CP	Commissioner Policy
DCE	Dichloroethene
DER	Division of Environmental Remediation
DER-10	DER Technical Guidance for Site Investigation and Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
EE	Environmental Easement
el	Elevation
ELAP	Environmental Laboratory Approval Program
ESA	Environmental Site Assessment
EWP	Excavation Work Plan
FEMA	Federal Emergency Management Agency
HASP	Health and Safety Plan
IC	Institutional Control
$\mu g/m^3$	Microgram per cubic meter
NAVD88	North American Vertical Datum of 1988
NYCRR	New York Codes, Rules and Regulations
NYCT	New York City Transit
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PDI	Pre-Design Investigation

P.E	Professional Engineer
PFAS	Per- and poly-fluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PGW	Protection of Groundwater
PID	Photoionization Detector
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
RAO	Remedial Action Objective
RAP	Remedial Action Plan
RAWP	Remedial Action Work Plan
RCA	Recycled Concrete Aggregate
REC	Recognized Environmental Condition
RI	Remedial Investigation
RIR	Remedial Investigation Report
RURR	Restricted Use – Restricted Residential
SCO	Soil Cleanup Objective
SGV	Standard Guidance Value
SMP	Soil Management Plan
SOE	Support of Excavation
SRI	Supplemental Remedial Investigation
SVOC	Semivolatile Organic Compound
SW/LF	Solid Waste/Landfill
TCE	Trichloroethane
TOGS	Technical and Operational Guidance Series
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
UU	Unrestricted- Use
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

This Site Management Plan (SMP) was prepared for the 475 Bay Street and 31 Wave Street site located in the Stapleton Heights neighborhood of Staten Island, New York (the site). The Brownfield Cleanup Program (BCP) site is identified on the Borough of Staten Island Department of Finance Tax Map as Block 488, Lots 9, 157, 162, and 164[1]. The BCP site (Site No. C243044) was remediated pursuant to the November 12, 2020 Brownfield Cleanup Agreement (BCA), Index No. C243044-10-20, between the New York State Department of Environmental Conservation (NYSDEC) and BFC 475 Residential LLC (the Volunteer). The following amendments were made to the BCA:

- On October 10, 2022, the BCA was amended to add 475 Bay Street Housing Development Fund Corporation as the new fee owner of the future affordable housing portion of the site (i.e., current Lot 9 and the westerly part of Lot 164, tentative Lot 9 following reapportionment) and 475 Bay Street LLC as the new beneficial owner of the future affordable housing portion of the site.
- On October 16, 2022, the BCA was amended to designate the site as an affordable housing project based on the Volunteer's submission of a New York State Housing Finance Agency ("NYSHFA") Affordable Housing Regulatory Agreement pertaining to the site.

The following provides a brief summary of the controls implemented at the site, as well as the inspections, monitoring, maintenance and reporting activities required by this SMP:

Site Identification: C243044 (475 Bay Street and 31 Wave Street, Staten Island, New York, 10304)

Institutional Controls:	1. The site may be used for Restricted-Residential use as defined in Chapter 6 New York Codes, Rules and Regulations (6 NYCRR) Part 375-1.8(g)(2)(ii), Commercial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iii), and Industrial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iv)

[1] An application for lot reapportionment was tentatively approved by the New York City Department of Finance on June 22, 2021. As of the date of this SMP, the reapportionment has not yet been finalized. Once the reapportionment is finalized, current Lot 9 and the westerly part of Lot 164 will be merged and designated as new Lot 9, and current Lots 157, 162, and the easterly part of Lot 164 will be merged and designated as new Lot 157.

Site Identification: C243044 (475 Bay Street and 31 Wave Street, Staten Island, New York, 10304)

Institutional Controls Continued:	2. The site may not be used for Unrestricted Use as defined in 6 NYCRR Part 375-1.8(g)(1)(i) or Residential (single family) use as defined in 6 NYCRR Part 375-1.8(g)(2)(i) without additional remediation and amendment of the Environmental Easement (EE), as approved by the NYSDEC and New York State Department of Health (NYSDOH).
	3. The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) and New York City Department of Health (NYCDOH) to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
	4. Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP
	5. Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the EE
	6. Vegetable gardens and farming in remaining contamination on the site are prohibited
	7. The Volunteer must provide all persons who acquire any interest in the site a complete copy of the NYSDEC-approved SMP and amendments to the SMP

Site Identification: C243044 (475 Bay Street and 31 Wave Street, Staten Island, New York, 10304)

Engineering Controls:	There are no Engineering Controls (ECs) required for this site.

Inspections:	**Frequency:**
1. Site-Wide Inspection	Annually
2. Certification/PRR	Annually

Further descriptions of the above requirements are provided in detail in the latter sections of this SMP.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the 475 Bay Street and 31 Wave Street site located in the Stapleton Heights neighborhood of Staten Island, New York (the site). The site is enrolled in the New York State Brownfield Cleanup Program (BCP – Site No. C243044), which is administered by the New York State Department of Environmental Conservation (NYSDEC). BFC 475 Residential LLC (the Volunteer) executed a Brownfield Cleanup Agreement (BCA), Index No. C243044-10-20, with the NYSDEC on November 20, 2020 to investigate and remediate the site. The following amendments were made to the BCA:

- On October 10, 2022, the BCA was amended to add 475 Bay Street Housing Development Fund Corporation as the new fee owner of the future affordable housing portion of the site (i.e., current Lot 9 and the westerly part of Lot 164, tentative Lot 9 following reapportionment) and 475 Bay Street LLC as the new beneficial owner of the future affordable housing portion of the site.
- On October 16, 2022, the BCA was amended to designate the site as an affordable housing project based on the Volunteer's submission of a New York State Housing Finance Agency ("NYSHFA") Affordable Housing Regulatory Agreement pertaining to the site.

A site location map and site layout plan showing the site location and boundaries are provides as Figures 1 and 2, respectively. The boundaries of the site are described further in the metes and bounds site description that is part of the Environmental Easement (EE) provided in Appendix A.

Remediation was completed in accordance with the October 2021 Remedial Action Work Plan (RAWP). Site remediation included removal of soil exceeding the lower of NYSDEC Title 6 of the New York Codes, Rules and Regulation (6NYCRR) Part 375 Restricted Residential (RURR) and Protection of Groundwater (PGW) Soil Cleanup Objectives (SCOs) to a maximum depth of 15 feet below grade surface (bgs). Following completion of the remedial work, some contamination exceeding the Unrestricted Use (UU) SCOs was left at this site, which is hereafter referred to as "remaining contamination". Institutional Controls (ICs) have been incorporated into the site remedy to control exposure to remaining contamination for protection of public health and the environment. No Engineering Controls (ECs) are required for this site. An EE granted to the NYSDEC, and recorded with the NYC Office of the City Register, requires compliance with this SMP and all ICs placed on the site.

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) prepared this SMP on behalf of BFC 475 Residential LLC c/o BFC Partners in accordance with the requirements of the NYSDEC's Division of Environmental Remediation (DER) Technical

Guidance for Site Investigation and Remediation, dated May 3, 2010 (DER-10), and the guidelines provided by the NYSDEC. The SMP will manage remaining contamination at the site until the EE is extinguished in accordance with Environmental Conservation Law (ECL) Article 71, Title 36. This SMP has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the EE and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP details the site-specific implementation procedures that are required by the EE. Failure to properly implement the SMP is a violation of the EE, which is grounds for revocation of the Certificate of Completion (COC). Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 NYCRR Part 375 and the BCA (Index # C243044-10-20; Site # C243044) for the site, and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. Site-related contact information is provided in Appendix B of this SMP.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. The NYSDEC can also make changes to the SMP or request revisions from the remedial party. Revisions will be necessary upon, but not limited to, the following occurring: a post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the EE, the NYSDEC project manager will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in the agency's files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER-10 for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, 6 NYCRR Part 375 and/or ECL.
- 7-day advance notice of any field activity associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP). If the ground-intrusive activity qualifies as a change of use as defined in 6 NYCRR Part 375, the above-mentioned 60-day advance notice is also required.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change including a certification that the prospective purchaser/remedial party has been provided with a copy of the BCA, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

The following table includes contact information for the above notifications. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B. Responsibilities of the Owner and Remedial Party are provided in Appendix C.

Notifications*

Name	Contact Information
Remedial Engineer	Jason Hayes, PE Phone No.: 212-479-5427 Email: jahayes@langan.com
Program Manager	Michael Burke, PG, CHMM Phone No.: 212-479-5413 Email: mburke@langan.com
Project Manager	Brian Gochenaur, QEP Phone No.: 212-479-5479 Email: bgochenaur@langan.com
NYSDEC Project Manager	Meghan Medwid Phone No.: 518-402-8610 Email: meghan.medwid@dec.ny.gov
NYSDEC Chief of the Division of Environmental Remediation	Heide-Marie Dudek, PE Phone No.: 518-402-0193 Email: heidi.dudek@dec.ny.gov
NYSDEC Site Control	Kelly Lewandowski Phone No.: 518-402-9543 Email: kelly.lewandowski@dec.ny.gov
NYSDOH Project Manager	Steven Berninger Phone No.: 518-402-0443 Email: beei@health.ny.gov
Site Owner and Remedial Party	Donald Capoccia Phone No.: 718-422-9999 Email: dac@bfcnyc.com

* Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The site is located at 475 Bay Street and 31 Wave Street in the Stapleton Heights neighborhood of Staten Island, New York and is presently identified on the Borough of Staten Island Department of Finance Tax Map as Block 488, Lots 9, 157, 162, and 164[2]. The site encompasses an area of about 66,800 square feet (about 1.53 acres) and is being developed into a 12-story mixed use residential and commercial building and a three-story mixed-use commercial and community space. All of the new residential units are designated as affordable housing. The site is bounded by a two-story commercial building and a one-story industrial building to the north; a New York City Transit (NYCT) elevated Staten Island Rail structure to the east; Wave Street and a two-story McDonalds restaurant to the south; and Bay Street to the west. According to monitoring well survey measurements obtained by Langan on May 11, 2020, site surface elevations (el)[3] range from approximately el 9.32 feet (southeast corner of the site) to el 10.66 feet (center of the site). The topography of the site and immediate surrounding area slopes gently east, and the general topographic gradient of the surrounding areas slopes east towards The Narrows. A site location map and site plan are provided as Figures 1 and 2, respectively. The site boundary is fully described in the EE, which is included in Appendix A.

The owner at the time of issuance of this SMP, which is the party responsible for implementing the SMP under the BCA is:

BFC 475 Residential LLC
c/o BFC Partners
150 Myrtle Avenue, Suite 2
Brooklyn, New York 11201

2.2 Physical Settings

2.2.1 Land Use

The site is located in an R6 Residential District with a C2-3 commercial overlay, which allows for commercial and waterfront businesses. The Bay Street Corridor Rezoning (City Environmental Quality Review [CEQR] No. 16DCP156R), in which the site is located, serves to revitalize the North Shore of Staten Island by generating new opportunities for affordable housing, encourage

[2] An application for lot reapportionment was tentatively approved by the New York City Department of Finance on June 22, 2021. As of the date of this SMP, the reapportionment has not yet been finalized. Once the reapportionment is finalized, current Lot 9 and the westerly part of Lot 164 will be merged and designated as new Lot 9, and current Lots 157, 162, and the easterly part of Lot 164 will be merged and designated as new Lot 157.

[3] Elevations herein are referred to in North American Vertical Datum of 1988 (NAVD88).

retail development, improve public spaces, and creating a mixed-use walkable corridor connecting to the surrounding communities.

The properties adjoining the site and within the neighborhood surrounding the site primarily include commercial, residential, vacant properties, parking lots, and public parks. The site is adjoined by commercial and industrial buildings to the north, a NYCT elevated Staten Island Rail structure to the east, Wave Street and commercial buildings to the south, and Bay Street to the west.

2.2.2 Geology

Prior to redevelopment, environmental investigations performed prior to site development identified historic fill consisting predominantly of brown and black, fine- to coarse-grained sand with varying amounts of gravel, silt, brick, coal, coal ash, slag, glass, ceramics, wood, incinerated material and/or concrete was encountered across the site to depths ranging from about 5 to 16 feet below grade surface (bgs). Fill is underlain by native soil that predominantly consists of light gray to reddish brown silty fine sand with varying amounts of fine gravel and clay lenses in the northern part of the site and by a dark reddish-brown fine sand with varying amounts of silt and fine gravel in the southeastern part of the site. Bedrock was not encountered during the April 2020 Remedial Investigation (RI). According to the April 2020 Geotechnical Memorandum prepared by GeoDesign, competent bedrock was encountered at about 75 to 84 feet bgs. Based on "Plate 2 Bedrock Geology of Staten Island and Configuration of Bedrock Surface", dated 1986, prepared by the United States Department of the Interior Geological Survey in cooperation with the NYSDEC, the ground moraine is underlain by Staten Island Serpentine at the site. Historical boring logs from previous investigations are included in Appendix B of the Remedial Investigation Report (RIR).

2.2.3 Hydrogeology

Synoptic groundwater level measurements were collected from monitoring wells on August 6, 2021. Depth to groundwater was measured between approximately 3.78 and 5.14 feet bgs, with corresponding groundwater elevations ranging from approximately el 5.43 to 7.51. The groundwater elevation is highest in the central region of the site and appears to flow outwards to the northeast, east, southeast, and west; however, based on the general topography of the area, regional groundwater is expected to flow to the east towards the Narrows. The cause of the apparent groundwater flow pattern at the site is unknown but may be related to tidal influence, local utilities and/or unknown subsurface obstructions in the area.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

2.3.1 Past Uses

Historical Sanborn Fire Insurance Maps indicate that the site was located in a developed urban area as early as 1885. In 1885, Lot 9 was developed with a one- and two-story dwelling and a shed. Lots 157, 162 and 164 were unmapped in 1885; however, the 1898 map shows five individual buildings occupied by residential dwellings, a carpenter shop, and storage within the area comprising those Lots. Various commercial and industrial entities occupied the site including: James Thompson and Sons Lumber Yard (1989 to 1917), Chas F. McAteer, Inc. coal yard (1937 to 1950), a filling station with three gasoline tanks, a grease and oil storage shed (1937 to 1950), J.T. Montesani Company Inc. sand and gravel yard with one gasoline tank and two garages (1950 to 1962), and auto sales (1977 to 1990) on Lot 9; an auto painting shop (1937 to 1950), auto repair (1977) and unlabeled manufacturing (1981 to 1988) on Lot 164; and a truck shop (1937 to 1950) on Lot 157. By 1991, Lots 9, 157, and 162 are vacant, and Lot 164 is developed with a one-story commercial building. Site conditions appear generally the same from 1991 to 2007. City Directory documents also provide additional site usage detail including a gasoline service station (1928) on Lot 9 and auto repair facility (1934; 1979; 1990; 2000 to 2014) and iron works facility (1984) on Lot 164.

Prior to the current redevelopment plan, the Volunteer leased Lot 9 for use as a temporary parking lot in 2014. During this time, approximately three feet of fill from across the Lot 9 footprint was removed to install a small drainage system. The area was backfilled with sand and gravel after installation of the drainage system and the asphalt was repaired. The parking lot operation was closed due to lack of demand, and Lot 9 became a temporary storage space for construction materials (e.g., rebar, barricades, piping) through the beginning of 2020.

2.3.2 Previous Environmental Reports

The investigations listed below describe original site conditions prior to implementation of the remedy and were performed to characterize the nature and extent of contamination, and to fill data gaps to confirm environmental conditions and subsurface geology in order to develop remediation and mitigation strategies at the site.

- *Phase I Environmental Site Assessment (ESA) for 475 Bay Street, Staten Island, New York, dated January 12, 2000, prepared by AVT Enterprises (AVT)*

- *Phase I ESA for 475 Bay Street Staten Island, New York, dated April 2013, prepared by URS Corporation (URS)*
- *Subsurface (Phase II) Investigation for 475 Bay Street, Staten Island, New York, dated September 2013, prepared by AKRF Engineering, P.C. (AKRF)*
- *Remedial Action Plan (RAP) for 475 Bay Street, Staten Island, New York, dated April 2016, prepared by AKRF*
- *Phase I ESA, dated March 20, 2020, prepared by Langan*
- *Geotechnical Memorandum, dated April 20, 2020, prepared by GeoDesign, Inc. (GeoDesign)*
- *Phase II Environmental Site Investigation (ESI) for 31 Wave Street, Staten Island, New York, dated May 15, 2020, prepared by Langan*
- *RIR for 475 Bay Street and 31 Wave Street, dated August 2021, prepared by Langan*
- *RAWP for 475 Bay Street and 31 Wave Street, dated October 2021, prepared by Langan*
- *Pre-Design Investigation (PDI) Summary, dated January 2022, prepared by Langan*

Phase I ESA for 475 Bay Street, Staten Island, New York, dated January 2000, prepared by AVT

AVT prepared a Phase I ESA in January 2000 for Mr. Mervin Rampaul in accordance with the previous ASTM International (ASTM) E1257-99 standard for Lot 9. At the time of the Phase I, the parcel was a vacant, asphalt-paved parking lot. The following Recognized Environmental Conditions (RECs) were identified in the Phase I ESA:

- REC 1 – Historical On-Site Operations: Historical use of the site as a coal yard and filling station with potential petroleum bulk storage in 1934.
- REC 2 – Historical Adjoining and Surrounding Property Operations: Historical use of the adjoining and surrounding properties for industrial and commercial uses that predate regulatory controls.

Phase I ESA for 475 Bay Street, Staten Island, New York, dated April 2013, prepared by URS

URS conducted a Phase I ESA and geophysical survey in April 2013 for BFC Partners. The Phase I was conducted for Lot 9 in accordance with the previous ASTM E1257-05 standard. At the time of the Phase I, the site was vacant and partially paved with asphalt. The geophysical survey did not identify subsurface anomalies indicative of underground storage tanks (UST), aboveground storage tanks (AST) or drums; however, a suspected buried concrete pad, buried metal, and other unidentified objects were identified. The following RECs were identified in the Phase I ESA:

- REC 1 – Historical On-Site Operations: Historical use of the site as a lumber yard, coal storage yard, sand and gravel storage yard, and a vehicle storage yard.
- REC 2 – Historical Adjoining and Surrounding Operations: Historical use of the adjoining and up-gradient surrounding properties as a gasoline station, dry cleaner, and other historically industrial properties.

Phase II Investigation for 475 Bay Street, Staten Island, New York, dated September 2013, prepared by AKRF

AKRF conducted a subsurface investigation on Lot 9 to determine if the former use of the site and adjoining and surrounding properties had impacted the subsurface. The investigation was conducted between August 20 and 21, 2013 and consisted of the advancement of eight soil borings, installation of four temporary groundwater monitoring wells and four soil vapor points, and collection of soil, groundwater and soil vapor samples. The results of the subsurface investigation are summarized below:

- Historic fill consisting of sand with silt, gravel, asphalt and brick was identified from surface grade to approximately 5 to 10 feet bgs. Fill was underlain by native sad to termination depth of borings ranging from 20 to 25 feet bgs.
- Groundwater was encountered between 6 and 15 feet bgs. Sheen or product was not observed in groundwater samples.
- Volatile organic compounds (VOCs), polychlorinated biphenyls (PCB), pesticides and metals were detected in at least one or more soil samples above the 6 NYCRR Part 375 Unrestricted Use (UU) Soil Cleanup Objectives (SCOs), but below Restricted Use – Restricted Residential (RURR) SCOs. Four metals, including barium, cadmium, lead and nickel, were also detected above RURR SCOs.
- Semi volatile organic compound (SVOC) and dissolved metals were identified in groundwater samples above their NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1: Class GA Ambient Water Quality Standards (AWQS). VOCs were detected at concentrations below their respective AWQS. Pesticides and PCBs were not detected in groundwater samples.

Remedial Action Plan, dated April 2016, prepared by AKRF

AKRF prepared a RAP for Lot 9 to address the excavation and off-site disposal of historic fill, dewatering, and decommissioning and closure of USTs, if encountered, during redevelopment of the site. The RAP also discussed the removal of the suspected buried concrete pad, buried metal, and other unidentified objects identified in the August 2013 geophysical survey during remedial excavation.

Phase I ESA, dated March 20, 2020, prepared by Langan

The Phase I ESA was completed in accordance with ASTM Standard E1527-13 and the United States Environmental Protection (USEPA) All Appropriate Inquiries (AAI) Rule. The following RECs were identified:

- REC 1 - Historical On-Site Operations: Historical operations include a lumber yard (1898 to 1917), a gasoline service station (1929 to 1934), a coal yard (1934 to 1950), a gasoline filling station with petroleum bulk storage and an oil shed (1937 to 1950), auto painting (1937 to 1950), a truck shop (1937 to 1950), auto repair (1934; 1977 to 2019), a gravel and sand company with a gasoline tank (1950 to 1972), used auto sales (1968; 1977 to 1990), unidentified manufacturing (1981 to 1988) and an ironworks (1984). Additionally, Lot 164 is identified in the Solid Waste/Landfill (SW/LF) database as a car dismantling facility. Leaks or spills of petroleum products, solvents, chemicals and/or other hazardous materials associated with former business operations may have adversely affected soil, groundwater and/or soil vapor at the site.
- REC 2 – Potential Former Hydraulic Lifts Filled with Liquid: Three rectangular pits filled with water were observed in the former auto repair building located on Lot 164. The pits appeared to be lined with concrete. One pit measured about 15 x 8 x 3 feet and the remaining two measured about 3 x 3 x 3 feet. The pits appear to be remnants of former hydraulic lifts. What appeared to be globules of free product were observed floating on the surface of the water. Although the pits appeared to be lined with concrete the condition of the pits could not be inspected.
- REC 3 – Historical Use of the Adjoining and Surrounding Properties: Historical use of the adjoining and surrounding properties include an auto supply and factory (1917), dry cleaning company with historical generation of hazardous waste and petroleum bulk storage (1934 to present), a filling station with three gasoline tanks (1928 to 1996), a bus garage (1937), a factory (1937 to 1962), parking lot with an oil house (1937 to 1950), a gasoline filling station (1937 to 2011), used auto sales (1950 to 1995) and auto repair (1962 to 1992). Historical operations on adjoining and surrounding properties may have resulted in releases of petroleum products, solvents, chemicals, and/or other hazardous substances that may have affected groundwater or soil vapor beneath the site.

Geotechnical Memorandum, dated April 20, 2020, prepared by GeoDesign

GeoDesign completed a geotechnical investigation to determine subsurface conditions and provide geotechnical recommendations. The investigation included advancement of ten soil borings and installation of two temporary groundwater monitoring wells. The investigation revealed that the site stratigraphy generally consists of an approximately 5 to 12 feet thick historic

fill layer underlain by layers of silt, coarse to fine-grained sand, and clayey silt to depths of about 60 to 80 feet bgs. Top of bedrock was observed from 75 to 84 feet bgs. Groundwater was measured between 4.5 and 6 feet bgs across the site. GeoDesign recommended a pile-supported foundation.

Phase II ESI, dated May 15, 2020, prepared by Langan

A Phase II ESI report was prepared using the RI data for Lots 157, 162, and 164. The report was prepared to satisfy lender requirements prior to purchase of the property. The investigation consisted of the advancement of six environmental soil borings, installation of three permanent groundwater monitoring wells, installation of two soil vapor probes, two sub-slab probes, and collection of soil, groundwater and soil vapor samples. The field observations and analytical results are discussed in depth as part of the RIR.

RIR for 475 Bay Street and 31 Wave Street, dated August 2021, prepared by Langan

Langan completed a RI and Supplemental Remedial Investigation (SRI) at the site in accordance with 6 NYCRR Part 375-1.8, 3.8, 6.8, NYSDEC DER-10, and applicable NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006, with updates. The RI and SRI consisted of a geophysical survey, the collection of 156 soil samples from 70 soil borings, three aqueous samples from three former hydraulic lifts, 10 groundwater samples from nine groundwater monitoring wells, collection of nine soil vapor, two sub-slab soil vapor, two indoor air samples, and two ambient air samples (including quality assurance/quality control [QA/QC] samples).

The investigation findings are as follows:

1. Stratigraphy: The stratigraphy observed during the RI consists of a historic fill layer that extends from surface grade to depths ranging from 2 to 16 feet bgs. The historic fill predominantly consists of brown and dark gray, fine- to medium-grained sand with varying amounts of gravel, silt, asphalt, brick, coal, coal ash, slag, glass, ceramics, plastic, wood, incinerated material and/or concrete. On the northern half of the site, the fill layer is underlain by native soil that predominantly consists of gray to reddish brown silty fine sand with varying amounts of fine gravel and clay lenses that extend to the termination depth of each boring. Towards the southeastern part of the site, the fill layer is underlain by a dark reddish brown fine sand with varying amounts of silt and fine gravel followed by dark grayish brown silt layer. Bedrock was not encountered in any of the RI soil borings, but was encountered between 75 and 84 feet bgs during a prior geotechnical investigation.

2. Hydrogeology: Depth to groundwater was measured between about 3.56 to 4.32 feet bgs, with corresponding groundwater elevations ranging from about el 5.12 to el 6.31

NAVD88. The groundwater elevation is highest in the central region of the site and appears to flow outwards in all directions. The general topography of the area surrounding the site suggests that regional groundwater flow is to the east towards the Narrows.

3. Historic Fill: Historic fill material was identified below surface cover to depths ranging from 2 to 16 feet bgs. Contaminants related to historic fill material were identified up to 13 feet bgs and include SVOCs, metals, PCBs, and pesticides, which were detected at concentrations above UU and/or RURR SCOs within this layer. The detected concentrations are generally typical of historic fill material in New York City, with the exception of SVOCs and/or metals in SB-08, SB-101, SB-107, SB-108, SB-109, and SB-111, which may be related to the former site use in this location. Petroleum-nuisance conditions were identified during the SRI within surficial soil just outside of the former auto repair facility. The source appears to be incidental spills originating from the auto-repair facility.

4. Nickel was detected in native soil at depths ranging from about 5 to 21 feet bgs during the RI and SRI. Excavation ranging from 2 to 15 feet would be required to achieve Track 2 SCOs.

5. Mercury, barium and lead hot spots were identified on Lots 157, 162 and 164, respectively, during the RI. Additional sampling was conducted during the SRI to delineate these hot spots.

    a. The extent of the mercury hot spot centered on RI boring SB-111 is bounded by soil borings SB-111R_E2 to the east, SB-111R_W1 to the west, SB-111R_N2 to the north and the property line to the south and extends to 11 feet bgs.

    b. The extent of the lead and barium hot spot centered on RI boring SB-108 is bounded by SB107_7-8 to the north, SB106_9-10 to the northeast, SB06_0-2 to the east, SB109_9-10 to the south and SB09_11-12 to the west and extends to 10 feet bgs.

    c. The extent of the lead and barium hot spot centered on RI boring SB-08 is defined by SB-08R_N2 to the north, SB-08R_E1 to the east, SB-08R_S1 to the south, and SB-08R_W1 to the west and extends to 15 feet bgs.

6. Groundwater: Concentrations of SVOCs identified above the NYSDEC Technical and Operational Guidance Series (TOGS) Soil Guidance Values (SGVs) are attributed to historic fill. Dissolved metals in groundwater samples above SGVs and are characteristic of regional groundwater conditions. Total lead in groundwater is

attributed to historical fill entrainment and is not representative of groundwater quality. Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) were detected in groundwater at concentrations greater than the NYSDEC guidance values of 10 parts per trillion (ppt) but were not detected in soil at concentrations greater than the Unrestricted Use guidance values of 0.66 parts per billion (ppb) for PFOA and 0.88 ppb for PFOS; therefore, the site is not a source of per- and poly-fluoroalkyl substances (PFAS).

7. Soil Vapor: Petroleum-related and chlorinated VOCs were detected in soil vapor, but at concentrations below those which mitigation is recommended. An on-site source of VOCs in soil vapor was not identified.

RAWP for 475 Bay Street and 31 Wave Street, dated October 2021, prepared by Langan

A RAWP was prepared in accordance with DER-10 to address the contamination identified during the RI. A Decision Document was issued in October 2021 for a Track 2 Restricted Use – Restricted Residential remedy.

In preparation for site remediation, the existing building underwent abatement of hazardous materials, including asbestos-containing materials (ACM), lead based paint (LBP), PCB-containing building materials, and any other identified universal and miscellaneous hazardous waste articles. Following abatement of hazardous materials, the building was demolished in order to implement site remediation.

The selected remedy included the following components:

- Development and implementation of a Construction Health and Safety Plan (CHASP) and Community Air Monitoring Plan (CAMP) for the protection of on-site workers, community/residents, and the environment during remediation and construction activities
- Completion of a PDI to determine the aerial extent of deeper excavation areas required to achieve a Track 2 cleanup
- Implementation of soil erosion, pollution and sediment control measures in compliance with applicable laws and regulations
- Design and construction of a support of excavation (SOE) system, where needed, to facilitate the Track 2 remediation

- Dewatering, as necessary, to accommodate the removal of fill/soil that exceeds RURR SCOs above 15 feet bgs
- Excavation, stockpiling, off-site transport, and appropriate disposal of about 9,300 cubic yards of historic fill and native soil that exceeds RURR SCOs above 15 feet bgs as defined by 6 NYCRR Part 375-6.8
- Screening for indications of contamination (by visual means, odor, and/or photoionization detector [PID] monitoring) of excavated soil and fill during intrusive site work
- If encountered, removal, decommissioning, and off-site disposal of any USTs and/or associated appurtenances (e.g., fill lines, vent line, electrical conduit) during redevelopment in accordance with DER-10, 6 NYCRR Part 613.9, NYSDEC Commissioner's Policy (CP)-51, and other applicable NYSDEC UST closure requirements
- Collection and analysis of confirmation soil samples in accordance with DER-10 to confirm a Track 2 remedy was achieved
- Importation of clean fill (i.e., fill meeting lower of PGW or RURR SCOs as defined by 6 NYCRR Part 375-6.5), virgin stone, or recycled concrete aggregate (RCA), or virgin, native crushed stone to backfill over-excavated areas to construction depth
- Establishment of use restrictions including prohibitions on the use of groundwater from the site and prohibitions on sensitive site uses, such as farming or vegetable gardening in residual site soil, to eliminate future exposure pathways
- Recording of an EE to memorialize the remedial action and any ECs/ICs which require that future owners of the site continue to maintain these controls
- Establishment of a SMP and performance of periodic inspections and certification that the ICs are performing as they were intended.

Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, the future on-site building will include, at a minimum, a 20-mil vapor barrier/waterproofing membrane on the foundation to improve energy efficiency as an element of construction.

PDI Summary, 475 Bay Street and 31 Wave Street, prepared by Langan, dated January 2022

In January 2022, prior to implementation of the RAWP, Langan conducted a PDI, in accordance with the PDI Work Plan dated October 2021, to further define the areal extent of excavation required to achieve a Track 2 cleanup in specific locations across the site and delineate hazardous lead areas. The results of the investigation would define the areal extent of excavation areas where SOE would preclude sidewall sample collection. The investigation included advancement

of approximately 132 borings and collection of soil samples. Based on the findings of the PDI, the areal extent of locations requiring deeper excavation to achieve the Track 2 remedial objectives and hazardous lead hot spots were identified and defined.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated October 13, 2021 are as follows:

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards

RAOs for Environmental Protection

- Remove the source of ground or surface water contamination.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

2.5 Remaining Contamination

2.5.1 Soil

Confirmation soil samples were collected from the base and sidewalls of the excavation during implementation of the RAWP at a frequency of one sample per 900 square feet of base or one sample per 30 linear feet of sidewall. Support of excavation (e.g., sheeting) precluded sidewall samples from being collected around the perimeter of the site. In total, 81 base and 26 sidewall confirmation samples plus QA/QC samples were collected across the site footprint. Confirmation samples were analyzed for NYSDEC Part 375 VOCs, SVOCs, PCBs, pesticides, herbicides, cyanide, metals including hexavalent and trivalent chromium, 1,4-dioxane, and PFAS by a

NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory. Per the Track 2 remedy described in the 2021 NYSDEC-approved RAWP and Decision Document, the results were compared to the lower of the RURR and/or PGW SCOs for contaminants found in site groundwater above such standards, as provided in Table 1. Fill/soil was removed to depths ranging from about 2 to 15 feet bgs across the site. The remedial excavation plan is provided as Figure 3.

Figures 4A to 4C shows the location of confirmation soil samples and Tables 2A through 2C summarizes the results of confirmation soil samples, lead hotspot delineation samples and petroleum-impacted soil delineation samples, respectively.

2.5.2 Groundwater

Ten samples (including one QA/QC sample) were collected from ten monitoring wells during the RI. The groundwater samples were compared to the NYSDEC TOGS SGVs for VOCs, SVOCs, PCBs, pesticides, herbicides, PCBs, total and dissolved metals, and NYSDEC Guidance Values for 1,4-dioxane and PFAS and were analyzed by an NYSDOH ELAP-certified laboratory. The following constituents were detected in RI groundwater samples at concentrations exceeding TOGS SGVs:

- Two SVOCs, benzo(a)anthracene and chrysene, exceeded their respective TOGS SGVs in one groundwater sample collected from MW01. The presence of SVOCs in groundwater is attributed to suspended sediment associated with the presence of historic fill.
- Metals, including iron, lead, manganese, and sodium, were present above their respective TOGS SGVs. The presence of iron, manganese, and sodium is attributed to regional groundwater quality and is not considered indicative of an on-site release. Total lead was detected in two groundwater samples at concentrations greater than the SGV, but was not detected in dissolved groundwater; therefore, lead is not considered a groundwater contaminant of concern.
- PFOA and PFOS were detected in groundwater at concentrations greater than the NYSDEC guidance values of 10 ppt; however, the site is not a source of PFAS.

New York City does not use groundwater as a potable water source, which means there is no reasonably complete groundwater exposure pathway.

2.5.3 Soil Vapor

The chlorinated solvents carbon tetrachloride (max concentration of 0.78 micrograms per cubic meter [$\mu g/m^3$]), tetrachloroethene (PCE) (max concentration of 35 $\mu g/m^3$), trichloroethane (TCE) (max concentration of 0.38 $\mu g/m^3$), and cis-1,2-dichloroethene (DCE) (max concentration of 1.1 $\mu g/m^3$) were detected during the RI; however, these compounds were not identified in soil or

groundwater. Additionally, no on-site source of carbon tetrachloride, PCE, TCE, or cis-1,2-DCE was identified during site excavation. Chlorinated VOCs are likely related to an off-site source. Petroleum-related VOCs detected in soil vapor may have been related to releases from the former USTs located on the northern, central and southern parts of the site, which were removed as part of RAWP implementation.

Historic fill and petroleum-impacted soil has been removed from the site to depths ranging from 2 to 15 feet bgs across the site footprint. Additionally, a vapor barrier/waterproofing membrane was installed as a green building measure beneath the site below the 3- to 12-inch concrete slab that spans the entirety of both building footprints. The vapor barrier/waterproofing membrane and concrete slab effectively mitigate the potential for soil vapor intrusion by limiting potential exposure pathways from off-site sources.

3.0 INSTITUTIONAL CONTROLS PLAN

3.1 General

Since remaining contamination exists at the site, ICs are required to protect human health and the environment. This IC Plan describes the procedures for the implementation and management of all ICs at the site. The IC Plan is one component of the SMP and is subject to revision by the NYSDEC project manager.

This plan provides:

- A description of all ICs on the site;
- The basic implementation and intended role of each IC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of ICs, such as the implementation of the EWP, as provided in Appendix D, for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site
- A Health and Safety Plan (HASP) and CAMP to be implemented in conjunction with the EWP, included as Appendices E and F, respectively
- Any other provisions necessary to identify or establish methods for implementing the IC required by the site remedy, as determined by the NYSDEC project manager.

3.2 Institutional Controls

A series of ICs is required by the Decision Document to:

1. Prevent future exposure to remaining contamination
2. Limit the use and development of the site to restricted residential, commercial, and industrial uses only until extinguishment of the EE

Adherence to these ICs is required by the EE and will be implemented under this SMP. ICs identified in the EE may not be discontinued without an amendment to or extinguishment of the EE, as approved by the NYSDEC and NYSDOH. These ICs are:

- The property may be used for Restricted-Residential use as defined in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iii), and Industrial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iv)
- The site may not be used for high level uses such as Unrestricted Use as defined in 6 NYCRR Part 375-1.8(g)(1)(i) or Residential (single family) use as defined in 6 NYCRR Part 375-1.8(g)(2)(i) without additional remediation and amendment of the EE, as approved by the NYSDEC and NYSDOH
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH and NYCDOH to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from NYSDEC
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP
- Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the EE
- Vegetable gardens and farming in remaining contamination on the site are prohibited
- Volunteer must provide all persons who acquire any interest in the site a complete copy of the SMP that the NYSDEC approves for the site and all NYSDEC-approved amendments to the SMP.

4.0 PERIODIC ASSESSMENTS/EVALUATIONS

4.1 Site-Wide Inspection

Site-wide inspections will be performed by a qualified environmental professional (QEP) as defined in 6 NYCRR Part 375, a P.E who is licensed and registered in New York State, or a qualified person who directly reports to a P.E who is licensed and registered in New York State. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report (PRR).

During an inspection, the inspection form provided in Appendix G – Site Inspection Forms – will be completed. The inspections will determine and document the following:

- Compliance with all ICs, including site usage
- General site conditions at the time of the inspection
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection
- If these controls continue to be protective of human health and the environment
- Compliance with requirements of this SMP and the EE
- If site records are complete and up to date

Reporting requirements are outlined in Section 5.0 of this plan.

Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of emergency response actions taken, or to be taken, and the potential impact to the environment and the public.

4.2 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the site during periodic assessments, and briefly summarizes the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding.

As stated in Section 4.1, site-wide inspections and site cover inspections will be performed after severe weather events. According to the Federal Emergency Management Agency (FEMA) Flood Map Service Center (Map Number 3604970189F, dated September 5, 2007), the site is located in Zone AE, which is designated for areas subject to inundation by the 1% annual chance flood event and Zone B, which is designated for areas subject to inundation by the 0.2% annual chance flood event.

During periods of severe rain events, stormwater will be captured by on-site retention/detention systems. The site would not be susceptible to a spill or contaminant release because source material has been removed and/or is adequately protected by the building foundation.

4.3 Soil Vapor Intrusion Evaluation

The chlorinated solvents carbon tetrachloride (max concentration of 0.78 µg/m^3), PCE (max concentration of 35 µg/m^3), TCE (max concentration of 0.38 µg/m^3), cis-1,2-DCE (max concentration of 1.1 µg/m^3) were detected during the RI; however, these compounds were not identified in soil or groundwater. Additionally, no on-site source of carbon tetrachloride, PCE, TCE, or cis-1,2-DCE was identified during site excavation. Chlorinated VOCs are likely related to an off-site source. Petroleum-related VOCs detected in soil vapor may have been related to releases from the former USTs located on the northern, central and southern parts of the site, which were removed as part of RAWP implementation.

Historic fill/soil was excavated to depths ranging from 2 and 15 feet bgs across the site. Construction included installation of a vapor barrier/waterproofing membrane and a 3- to 12-inch concrete slab that span the entirety of both building footprints. The vapor barrier/waterproofing membrane and concrete slab effectively mitigate the potential for soil vapor intrusion by limiting potential exposure pathways from off-site sources.

5.0 REPORTING REQUIREMENTS

5.1 Site Management Reports

All site management inspection events will be recorded on the appropriate site management forms provided in Appendix G. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the table below and summarized in the PRR.

Schedule of Inspection Reports

Task/Report	Reporting Frequency*
PRR	Annually, or as otherwise determined by the NYSDEC

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC project manager.

All inspections reports will include, at a minimum:

- Date of event or reporting period
- Name, company, and position of person(s) conducting monitoring/inspection activities
- Description of the activities performed
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet)
- Any observations, conclusions, or recommendations
- A determination as to whether contaminant conditions have changed since the last reporting event

Non-routine event reporting forms will include, at a minimum:

- Date of event
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities
- Description of non-routine activities performed

- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet)

5.2 Periodic Review Report

The PRR will consist only of the certification as specified in Section 5.2.1 except in the event where there have been changes to the site or in the environmental data collected during the certifying period. Given such an event, the submittal of a comprehensive PR report will be necessary, as specified below.

A PRR will be submitted to the NYSDEC beginning 30 days after the initial 15 month certifying period. This initial certifying period commences upon issuance of the COC. After submittal of the initial PRR, the next PRR shall be submitted annually to the Department or at another frequency as may be subsequently required by the Department. In the event that the site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the site described in Appendix A – Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. The report will include:

- Identification, assessment and certification of all ICs required by the remedy for the site
- Results of the required annual site inspections and severe condition inspections, if applicable
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted
- A summary of any data and/or information generated during the reporting period, with comments and conclusions, if any
- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the site-specific RAWP or Decision Document
  - Any new conclusions or observations regarding site contamination based on inspections or data generated
  - Recommendations regarding any necessary changes to the remedy
  - The overall performance and effectiveness of the remedy

5.2.1 Certification of Institutional Controls

Within 30 days after the end of each certifying period, as determined by the NYSDEC, the following certification will be provided to the NYSDEC:

"For each institutional control identified for the site, I certify that all of the following statements are true:

- *The institutional control employed at this site is unchanged from the date the control was put in place, or last approved by the Department*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control*
- *Use of the site is compliant with the EE*
- *The information presented in this report is accurate and complete*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Jason Hayes, P.E., of Langan, Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., am certifying as the Remedial Party's Designated Site Representative: I have been authorized and designated by all site owners/remedial parties to sign this certification for the site."

For BCP projects, every five years the following certification will be added:

- *Based on the on-site data available to Langan and site observations, the assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the PRR, if such report is required for the period. Otherwise, the certification will be submitted as a stand-alone document.

The PRR will be submitted, in electronic format, to the NYSDEC Central Office, the NYSDEC Regional Office in which the site is located, and the NYSDOH Bureau of Environmental Exposure Investigation.

5.3 Corrective Measures Work Plan

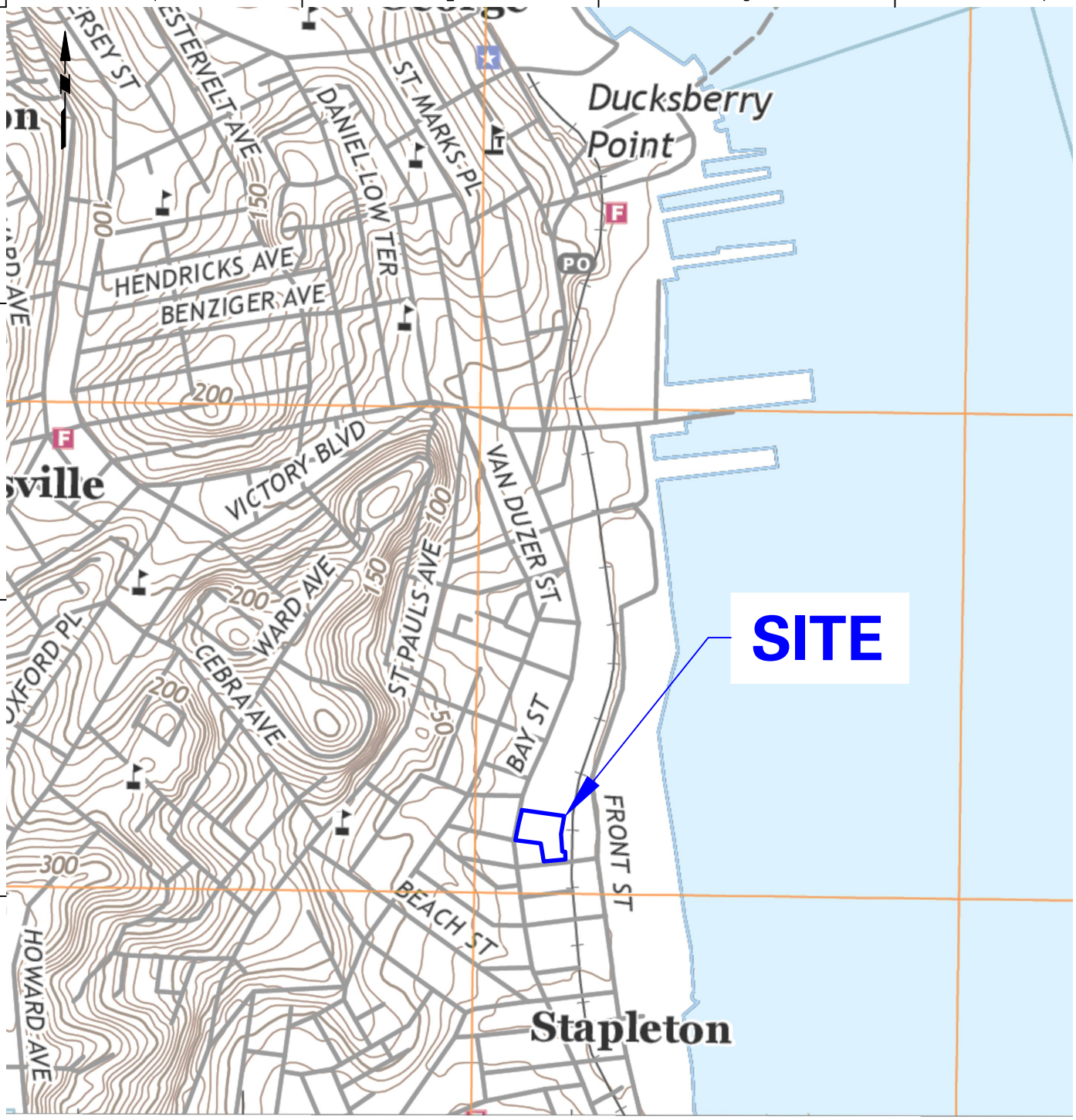
If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC, a Corrective Measures Work Plan (CMWP) will be submitted

to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the CMWP until it has been approved by the NYSDEC.

6.0 REFERENCES

1. 6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006
2. Geotechnical Memorandum, dated April 20, 2020, prepared by GeoDesign, Inc. (GeoDesign)
3. NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation"
4. NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum)
5. New York State Department of Health, Final Guidance for the Evaluation of Soil Vapor Intrusion in the State of New York, dated October 2006, revised May 2017
6. New York State Department of Environmental Conservation, Division of Environmental Remediation, Draft Brownfield Cleanup Program Guide, dated May 2004.
7. NYSDEC Decision Document, dated October 2021
8. Phase I ESA for 475 Bay Street, Staten Island, New York, dated January 12, 2000, prepared by AVT Enterprises (AVT)
9. Phase I ESA for 475 Bay Street Staten Island, New York, dated April 2013, prepared by URS Corporation (URS)
10. Phase I ESA, dated March 20, 2020, prepared by Langan,
11. Phase II Environmental Site Investigation for 31 Wave Street, Staten Island, New York, prepared by Langan, dated May 15, 2020
12. Remedial Action Plan for 475 Bay Street, Staten Island, New York, dated April 2016, prepared by AKRF
13. RIR for 475 Bay Street and 31 Wave Street, prepared by Langan, dated August 2021
14. RAWP for 475 Bay Street and 31 Wave Street, prepared by Langan, dated October 2021
15. Subsurface (Phase II) Investigation for 475 Bay Street, Staten Island, New York, dated September 2013, prepared by AKRF Engineering, P.C. (AKRF)

FIGURES



LEGEND:

APPROXIMATE SITE BOUNDARY

NOTES:

1. BASE MAP IS REFERENCED FROM UNITED STATES GEOLOGICAL SURVEY (USGS) 7.5-MINUTE SERIES TOPOGRAPHICAL MAPS, JERSEY CITY QUADRANGLE, DATED 2016.

1000 0 500 1000

SCALE IN FEET

LANGAN

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

Project

475 BAY STREET AND 31 WAVE STREET

BLOCK No. 488, LOT Nos. 9, 157, 162, & 164
STATEN ISLAND

RICHMOND COUNTY NEW YORK

Figure Title

SITE LOCATION MAP

Project No. 170610601	Figure No. 1
Date 10/03/2020	
Scale 1" = 1000'	
Drawn By DP / Checked By	
Submission Date	Sheet 1 of 4

Filename: \\langan.com\data\NYC\data6\170610601\Project Data\CAD\01\SheetFiles\Environmental\SMP\Figure 1 - Site Location Map.dwg Date: 7/19/2022 Time: 11:51 User: maronica Style Table: Langan.stb Layout: Site Location Map

LEGEND:

APPROXIMATE SITE BOUNDARY

APPROXIMATE TAX LOTS BOUNDARY

(9) TAX BLOCK ID

GENERAL NOTES:

1. BASEMAP TAKEN FROM LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE & GEOLOGY, D.P.C. NEARMAP WEB PORTAL, ACCESSED ON JANUARY 29, 2020.
2. AN APPLICATION FOR LOT REAPPORTIONMENT WAS TENTATIVELY APPROVED BY THE NEW YORK CITY DEPARTMENT OF FINANCE ON JUNE 22, 2021. AS OF THE DATE OF THIS FINAL ENGINEERING REPORT (FER), THE REAPPORTIONMENT HAS NOT YET BEEN FINALIZED. ONCE THE REAPPORTIONMENT IS FINALIZED, CURRENT LOT 9 AND THE WESTERLY PART OF LOT 164 WILL BE MERGED AND DESIGNATED AS NEW LOT 9, AND CURRENT LOTS 157, 162, AND THE EASTERLY PART OF LOT 164 WILL BE MERGED AND DESIGNATED AS NEW LOT 157.

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

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SCALE IN FEET

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Project
475 BAY STREET & 31 WAVE STREET
BLOCK No. 488, LOTS No. 9, 157, 162, 164
STATEN ISLAND
RICHMOND COUNTY NEW YORK

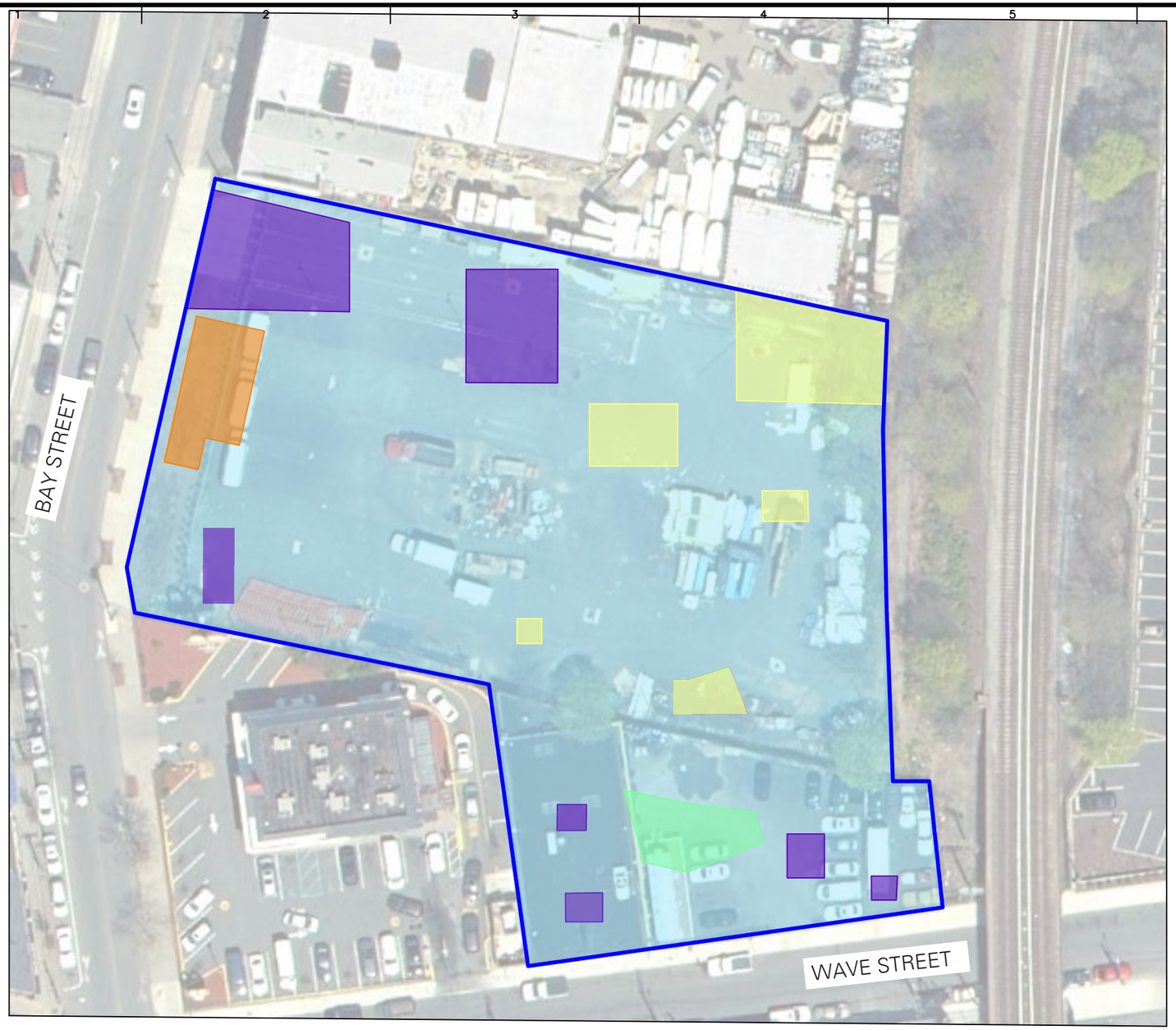
Figure Title
SITE LAYOUT MAP

Project No. 170610601
Date 5/18/2020
Drawn By DP
Checked By KS

Figure 2

Sheet 2 of 4

Filename: \\langan.com\data\NYC\data6\170610601\Project Data\CAD\01\SheetFiles\Environmental\SMP\Figure 2 - Site plan.dwg Date: 11/3/2022 Time: 13:07 User: maronica Style Table: Langan.stb Layout: ANSIB-BL (1)



LEGEND:

- APPROXIMATE SITE BOUNDARY
- EXCAVATION TO ABOUT 2 TO 5.5 FEET BGS
- EXCAVATION TO ABOUT 9 FEET BGS
- EXCAVATION TO ABOUT 11 FEET BGS
- EXCAVATION TO ABOUT 15 FEET BGS
- EXCAVATION RANGING BETWEEN 5 AND 11.5 FEET BGS

GENERAL NOTES:

1. BASEMAP TAKEN FROM LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE & GEOLOGY, D.P.C. NEARMAP WEB PORTAL, ACCESSED ON JANUARY 29, 2020.
2. BGS = BELOW GRADE SURFACE

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

50 0 25 50

SCALE: 1 INCH = 50 FEET

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Project
475 BAY STREET & 31 WAVE STREET
BLOCK No. 488, LOTS No. 9, 157, 162, 164
STATEN ISLAND
RICHMOND COUNTY NEW YORK

Figure Title
EXCAVATION LOCATION PLAN

Project No. 170610601
Date 11/03/2022
Drawn By MA
Checked By KS

Figure 3

Sheet 3 of 4

Filename: \\langan.com\data\NYC\data6\170610601\Project Data\CAD\01\SheetFiles\Environmental\SMP\Figure 3 - Excavation Plan.dwg Date: 11/3/2022 Time: 13:02 User: maronica Style Table: Langan.stb Layout: ANSIB-BL (1)

LEGEND:

- APPROXIMATE SITE BOUNDARY
- HAZARDOUS-LEAD IMPACTED SOIL REMOVAL CONFIRMATION SAMPLE LOCATION
- EXCAVATION RANGING BETWEEN 2 AND 5.5 FEET BGS
- EXCAVATION TO ABOUT 9 FEET BGS
- EXCAVATION TO ABOUT 11 FEET BGS
- EXCAVATION TO ABOUT 15 FEET BGS
- EXCAVATION RANGING BETWEEN 5 AND 11.5 FEET BGS

Sample Location	Latitude	Longitude	Sample Elevation (ft)	Sample Depth (ft)
WC11A_SW_W	40.63012783	-74.07627238	4.0	5.5
WC11A_BASE	40.63011887	-74.07623775 *	4.0	5.5
WC11A_SW_S	40.63010193	-74.07623642	4.0	5.5
WC11A_SW_N	40.63013956	-74.07623684	4.0	5.5
WC11A_SW_E	40.63011609	-74.0762061	4.0	5.5
SB07_SW_N	40.63010793	-74.07606011	4.0	5.5
SB107_BASE	40.63009021	-74.0760602	4.0	5.5
SB107_SW_E	40.63008446	-74.07602937	4.0	5.5
SB107_SW_S	40.6300703	-74.07605969	4.0	5.5
SB107_SW_W	40.6300962	-74.07609566	4.0	5.5

GENERAL NOTES:

1. BASEMAP TAKEN FROM MERIDIAN LAYOUT, INC. ENVIRONMENTAL EASEMENT SURVEY, DATED MAY 26, 2022
2. BGS = BELOW GRADE SURFACE
3. CONFIRMATION SAMPLES CONFIRMED THAT SOIL WITH HAZARDOUS CONCENTRATIONS OF LEAD WAS REMOVED

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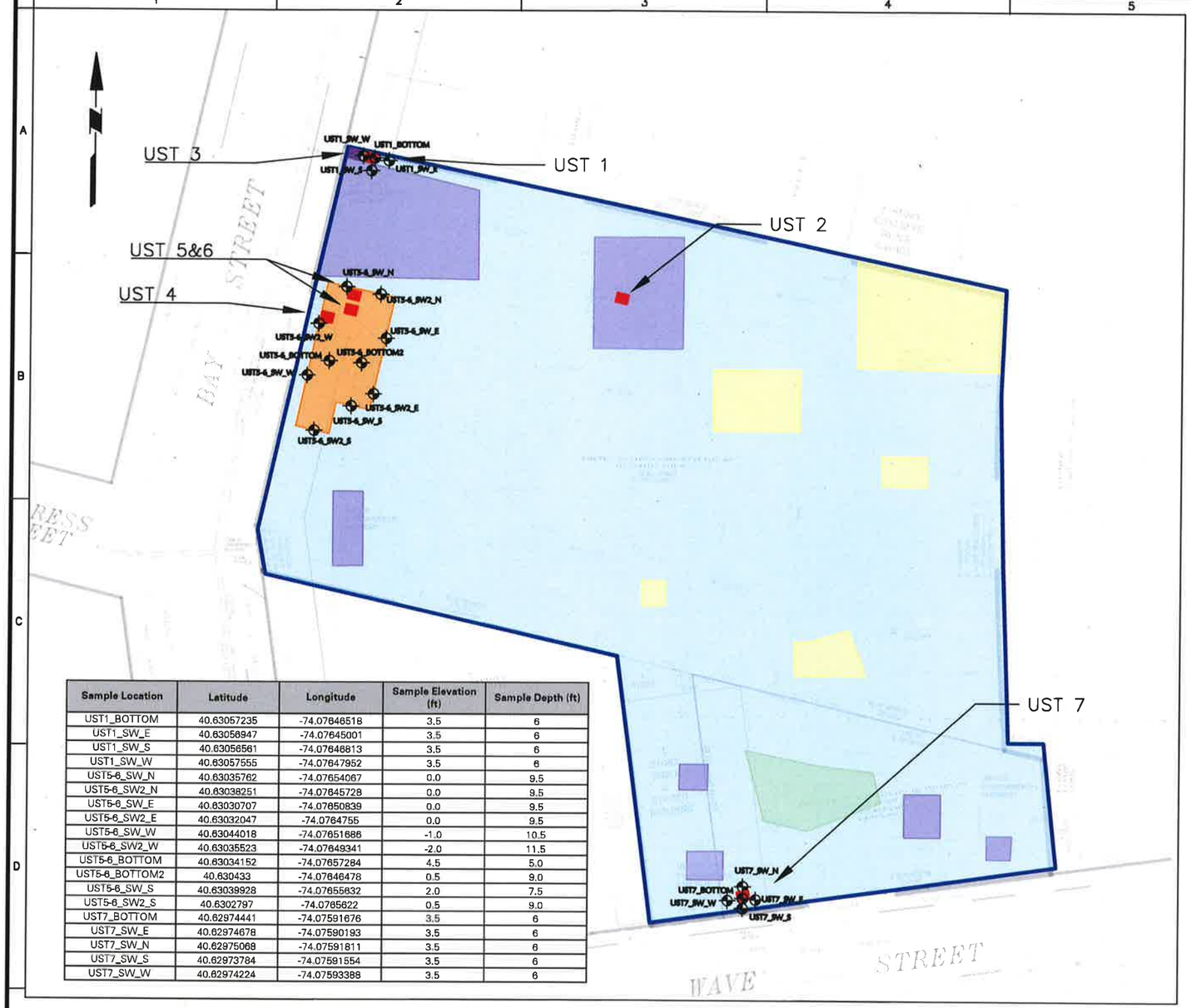
STATEN ISLAND
RICHMOND COUNTY NEW YORK

Figure Title
HAZARDOUS LEAD REMOVAL CONFIRMATION SOIL SAMPLE LOCATION MAP

Project No. 170610601
Date 12/13/2022
Drawn By MA
Checked By KS

Figure **4A**

Filename: \\langan.com\data\NYC\data6\170610601\Project Data\CAD\01\SheetFiles\Environmental\SMP\Figure 4A -Hazardous Lead Removal and Confirmation Soil Sample Location Map.dwg Date: 12/13/2022 Time: 11:40 User: maronica Style Table: Langan.stb Layout: ANSIB-BL (1)



Sample Location	Latitude	Longitude	Sample Elevation (ft)	Sample Depth (ft)
UST1_BOTTOM	40.63057235	-74.07646518	3.5	6
UST1_SW_E	40.63056947	-74.07645001	3.5	6
UST1_SW_S	40.63056561	-74.07646813	3.5	6
UST1_SW_W	40.63057555	-74.07647952	3.5	6
UST5-6_SW_N	40.63035762	-74.07654067	0.0	9.5
UST5-6_SW2_N	40.63038251	-74.07645728	0.0	9.5
UST5-6_SW_E	40.63030707	-74.07650839	0.0	9.5
UST5-6_SW2_E	40.63032047	-74.0764755	0.0	9.5
UST5-6_SW_W	40.63044018	-74.07651686	-1.0	10.5
UST5-6_SW2_W	40.63035523	-74.07649341	-2.0	11.5
UST5-6_BOTTOM	40.63034152	-74.07657284	4.5	5.0
UST5-6_BOTTOM2	40.630433	-74.07646478	0.5	9.0
UST5-6_SW_S	40.63039928	-74.07655632	2.0	7.5
UST5-6_SW2_S	40.6302797	-74.0765622	0.5	9.0
UST7_BOTTOM	40.62974441	-74.07591676	3.5	6
UST7_SW_E	40.62974678	-74.07590193	3.5	6
UST7_SW_N	40.62975068	-74.07591811	3.5	6
UST7_SW_S	40.62973784	-74.07591554	3.5	6
UST7_SW_W	40.62974224	-74.07593388	3.5	6

LEGEND:

- APPROXIMATE SITE BOUNDARY
- UNDERGROUND STORAGE TANK CONFIRMATION SAMPLE LOCATION`
- APPROXIMATE LOCATION OF FORMER USTs
- APPROXIMATE LOCATION OF CLOSED-IN-PLACE UST
- EXCAVATION RANGING BETWEEN 2 AND 5.5 FEET BGS
- EXCAVATION TO ABOUT 9 FEET BGS
- EXCAVATION TO ABOUT 11 FEET BGS
- EXCAVATION TO ABOUT 15 FEET BGS
- EXCAVATION RANGING BETWEEN 5 AND 11.5 FEET BGS

GENERAL NOTES:

1. BASEMAP TAKEN FROM MERIDIAN LAYOUT, INC. ENVIRONMENTAL EASEMENT SURVEY, DATED MAY 26, 2022.
2. ELEVATIONS HEREIN ARE IN FEET AND REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), WHICH IS ABOUT 1.1 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK, NJ.
3. BGS = BELOW GRADE SURFACE
2. UST = UNDERGROUND STORAGE TANK
3. UST 1, UST 2, AND UST 4 - UST 7 = 550-GALLON USTs
4. UST 3 = 1,080-GALLON UST
5. ALL SIDEWALL AND BOTTOM CONFIRMATION SAMPLE RESULTS WERE BELOW COMMISSIONER POLICY (CP-51) SOIL CLEANUP LEVELS.
6. BOTTOM AND SIDEWALL CONFIRMATION SAMPLES WERE COLLECTED AT THE FOLLOWING ELEVATIONS (NAVD88):
   - -UST 1 - EL. 3.5
   - -UST 7 - EL. 3.5, 2.5 AT UST7_SW_E
   - -UST 5-6:
   - -EL. 0.0 AT UST5-6_BOTTOM, UST5-6_SW_E, UST5-6_SW_S, UST5-6_SW2_E
   - -EL -2.0 AT UST5-6_BOTTOM2
   - -EL -1.0 AT UST5-6_SW_N
   - -EL. 4.5 AT UST5-6_SW_W
   - -EL. 2.0 AT UST5-6_SW2_W
   - -EL 0.5 AT UST5-6_SW2_N AND UST5-6_SW2_S

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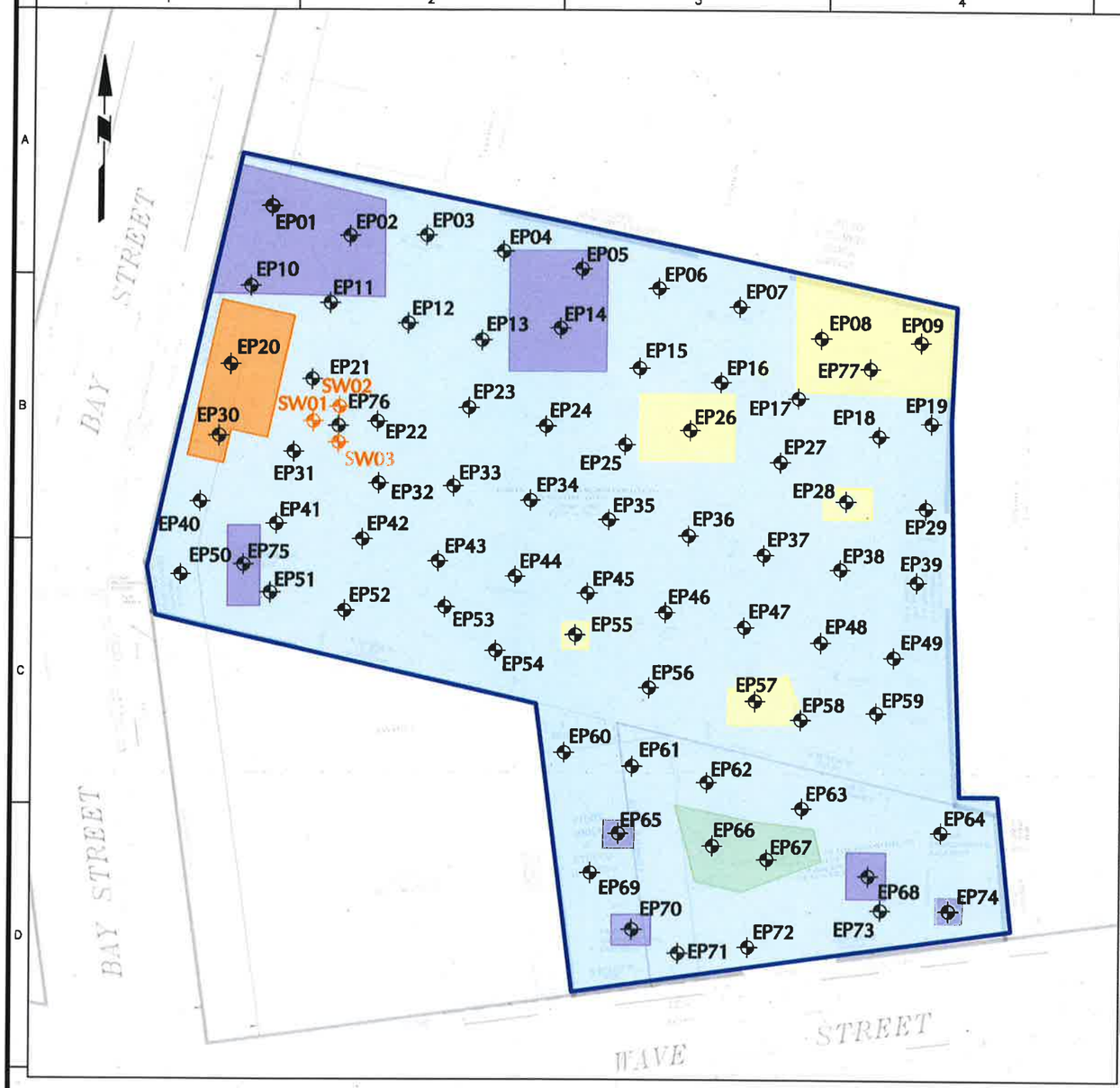
Figure Title
FORMER UST LOCATIONS AND UST CONFIRMATION SOIL SAMPLE LOCATION MAP

Project No.	170610601
Date	12/13/2022
Drawn By	MA
Checked By	KS

Figure **4B**

Filename: \\langan.com\data\NYC\data6\170610601\Project Data\CAD\01\SheetFiles\Environmental\SMP\Figure 4B - Former UST Locations and UST Confirmation Soil Sample Location Map.dwg Date: 12/13/2022 Time: 11:48 User: maronica Style Table: Langan.stb Layout: ANSIB-BL (1)



Sample Location	Latitude	Longitude	Sample Elevation (ft)	Sample Depth (ft)
EP01	40.63053262	-74.07647575	-5.5	15.0
EP02	40.63050268	-74.07636935	-5.5	15.0
EP03	40.63050341	-74.07626491	5.5	4.0
EP04	40.63048709	-74.07616068	6.5	3.0
EP05	40.63046905	-74.07605419	-5.5	15.0
EP06	40.6304489	-74.07595015	7.5	2.0
EP07	40.63043015	-74.07583975	7.5	2.0
EP08	40.63039784	-74.07572803	0.5	9.0
EP09	40.63039405	-74.0755919	0.5	9.0
EP10	40.63045042	-74.07650403	-5.5	15.0
EP11	40.6304332	-74.07639612	6.5	3.0
EP12	40.63041252	-74.07628935	6.5	3.0
EP13	40.63039529	-74.07618939	5.5	4.0
EP14	40.63040783	-74.07608306	-5.5	15.0
EP15	40.63036653	-74.07597527	5.5	4.0
EP16	40.63035198	-74.07586454	6.5	3.0
EP17	40.63033571	-74.07575833	6.5	3.0
EP18	40.63029683	-74.07564784	6.5	3.0
EP19	40.63031037	-74.0755767	5.5	4.0
EP20	40.63036931	-74.0765303	7.5	2.0
EP21	40.63035455	-74.07641995	6	3.5
EP22	40.63031064	-74.0763303	5.5	4.0
EP23	40.63032524	-74.07620634	7.5	2.0
EP24	40.63030628	-74.07610184	7.5	2.0
EP25	40.63028733	-74.07599393	7.5	2.0
EP26	40.63030216	-74.07590637	0.5	9.0
EP27	40.63026954	-74.07578233	6.5	3.0
EP28	40.63022943	-74.07569242	0.5	9.0
EP29	40.63022239	-74.07558352	6.5	3.0
EP30	40.63029561	-74.07654587	5.5	4.0
EP31	40.63027925	-74.07644478	6.5	3.0
EP32	40.63024715	-74.07632852	6.5	3.0
EP33	40.63024394	-74.07622669	5	4.5
EP34	40.63022931	-74.07612219	6	3.5
EP35	40.63020949	-74.07601542	4.5	5.0
EP36	40.63019313	-74.07590751	6.5	3.0
EP37	40.63017331	-74.07580414	4.5	5.0
EP38	40.63015868	-74.07569965	7.5	2.0
EP39	40.63014608	-74.07559482	7.5	2.0
EP40	40.63022718	-74.07657069	7.5	2.0
EP41	40.63020465	-74.07646728	7.5	2.0
EP42	40.63018903	-74.07634999	7.5	2.0
EP43	40.6301661	-74.07624704	7.5	2.0
EP44	40.63015061	-74.07614255	7.5	2.0
EP45	40.63013338	-74.07604386	7.5	2.0
EP46	40.63011356	-74.07593808	7.5	2.0
EP47	40.63009844	-74.07583031	7.5	2.0
EP48	40.63008308	-74.07572537	7.5	2.0
EP49	40.63006803	-74.07562548	7.5	2.0
EP50	40.63015179	-74.07659657	5.5	4.0
EP51	40.63013334	-74.0764753	5.5	4.0
EP52	40.63011487	-74.07637425	6.5	3.0
EP53	40.63011887	-74.07623775	4	5.5
EP54	40.63007363	-74.07616858	7.5	2.0
EP55	40.63009021	-74.0760602	0.5	9.0
EP56	40.63003572	-74.07595957	6.5	3.0
EP57	40.63002204	-74.07581431	0.5	9.0
EP58	40.630003	-74.07575171	0.5	9.0
EP59	40.63001052	-74.0756487	7.5	2.0
EP60	40.62996817	-74.07607434	4.5	5.0
EP61	40.62995428	-74.07598161	4.5	5.0
EP62	40.62993778	-74.07587971	6.5	3.0
EP63	40.62991116	-74.07574926	6.5	3.0
EP64	40.62988688	-74.07555923	7.5	2.0
EP65	40.6298846	-74.0759998	-5.5	15.0
EP66	40.62987215	-74.07587148	-1.5	11.0
EP67	40.62985825	-74.07579649	-1.5	11.0
EP68	40.62984122	-74.07565807	-5.5	3.0
EP69	40.62984387	-74.07603792	6.5	3.0
EP70	40.62978501	-74.07598071	-5.5	15.0
EP71	40.62976058	-74.07591782	5.5	4.0
EP72	40.62976727	-74.07582187	6.5	3.0
EP73	40.62980597	-74.07564085	6.5	3.0
EP74	40.62980603	-74.07554763	-5.5	15.0
SW01	40.63031107	-74.07641894	4.5	5
SW02	40.63032607	-74.07638291	4.5	5
SW03	40.63028909	-74.07638413	4.5	5

LEGEND:

- APPROXIMATE SITE BOUNDARY
- BASE CONFIRMATION SAMPLE LOCATION
- SIDEWALL CONFIRMATION SAMPLE LOCATION
- EXCAVATION RANGING BETWEEN 2 AND 5.5 FEET BGS
- EXCAVATION TO ABOUT 9 FEET BGS
- EXCAVATION TO ABOUT 11 FEET BGS
- EXCAVATION TO ABOUT 15 FEET BGS
- EXCAVATION RANGING BETWEEN 5 AND 11.5 FEET BGS

GENERAL NOTES:

1. BASEMAP TAKEN FROM MERIDIAN LAYOUT, INC. ENVIRONMENTAL EASEMENT SURVEY, DATED MAY 26, 2022.
2. BGS = BELOW GRADE SURFACE
3. ALL FINAL BOTTOM AND SIDEWALL CONFIRMATION SAMPLE RESULTS WERE BELOW THE RUR SCOS.
4. RUR SCOs = TITLE 6 OF THE NEW YORK CODES, RULES, AND REGULATIONS (6 NYCRR) PART 375 RESTRICTED USE RESIDENTIAL (RUR) SOIL CLEANUP OBJECTIVES (SCOS).

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RICHMOND COUNTY NEW YORK

Figure Title: CONFIRMATION SOIL SAMPLE LOCATION MAP

Project No. 170610601
Date 12/13/2022
Drawn By MA
Checked By KS

Figure 4C

Filename: \\langan.com\data\NYC\data6\170610601\Project Data\CAD\01\SheetFiles\Environmental\SMP\Figure 4C - Confirmation Soil Sample Location Map.dwg Date: 12/13/2022 Time: 11:49 User: maronica Style Table: Langan.stb Layout: ANSIB-BL (1)

TABLES

Table 1
Site Management Plan
Track 2 Soil Cleanup Objectives

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No. 170610601
BCP Site No: C243044

VOCs (mg/kg)	
1,1,1-Trichloroethane	100
1,1-Dichloroethane	26
1,1-Dichloroethylene	100
1,2,4-Trimethylbenzene	52
1,2-Dichlorobenzene	100
1,2-Dichloroethane	3.1
1,3,5-Trimethylbenzene	52
1,3-Dichlorobenzene	49
1,4-Dichlorobenzene	13
1,4-Dioxane	13
Acetone	100
Benzene	4.8
Carbon tetrachloride	2.4
Chlorobenzene	100
Chloroform	49
Cis-1,2-Dichloroethene	100
Ethyl Benzene	41
Hexachlorobenzene	1.2
Methyl Ethyl Ketone (2-Butanone)	100
Methyl tert-butyl ether (MTBE)	100
Methylene chloride	100
n-Butylbenzene	100
n-Propylbenzene	3.9
sec-Butylbenzene	100
tert-Butylbenzene	100
Tetrachloroethene	19
Toluene	100
trans-1,2-Dichloroethene	100
Trichloroethene	21
Vinyl Chloride	0.9
Xylenes, Total	100

Metals (mg/kg)	
Arsenic	16
Barium	400
Beryllium	72
Cadmium	4.3
Chromium, hexavalent	110
Copper	270
Cyanide	27
Lead	400
Manganese	2,000
Mercury	0.81
Nickel	310
Selenium	180
Silver	180
Zinc	10,000

SVOCs (mg/kg)	
Acenaphthene	100
Acenaphthylene	100
Anthracene	100
Benzo(a)anthracene	1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	1
Benzo(g,h,i)perylene	100
Benzo(k)fluoranthene	3.9
Chrysene	1
Dibenzo(a,h)anthracene	0.33
Fluoranthene	100
Fluorene	100
Indeno(1,2,3-cd)pyrene	0.5
m-Cresol	100
Naphthalene	100
o-Cresol	100
p-Cresol	100
Pentachlorophenol	6.7
Phenanthrene	100
Phenol	100
Pyrene	100

PCBs/Pesticides (mg/kg)	
2,4,5-TP Acid (Silvex)	100
4,4'-DDE	8.9
4,4'-DDT	7.9
4,4'-DDD	13
Aldrin	0.097
alpha-BHC	0.48
beta-BHC	0.36
Chlordane (alpha)	4.2
delta-BHC	100
Dibenzofuran	59
Dieldrin	0.2
Endosulfan I	24
Endosulfan II	24
Endosulfan sulfate	24
Endrin	11
Heptachlor	2.1
Lindane	1.3
Polychlorinated biphenyls	1

Notes:

1. The above criteria are the Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375 Restricted Use - Restricted-Residential and Restricted Use - Restricted-Residential and/or Protection of Groundwater Soil Cleanup Objectives of the contaminants found in site groundwater above standards (i.e., the Track 2 soil cleanup objectives)
2. VOC: volatile organic compound
3. SVOC: semivolatile organic compound
4. PCBs: polychlorinated biphenyls
5. mg/kg: milligram per kilogram

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP01	EP02	EP02	EP03	EP03	EP03	EP04	EP04	EP05	EP05	EP05	EP05	EP06	EP07
				Sample Name	EP01_-5.5	EP02_-5.5	DUP07_05102022	EP03_7.5_20220211	EP03_6.5	EP03_5.5	EP04_7.5	EP04_6.5	EP05_0.5	DUP05_03172022	EP05_-0.5	EP05_-5.5	EP06_7.5	EP07_7.5_20220201
				Sample Date	05/10/2022	05/10/2022	05/10/2022	02/11/2022	03/11/2022	03/22/2022	02/04/2022	03/11/2022	03/17/2022	03/17/2022	03/23/2022	03/30/2022	02/04/2022	02/01/2022
				Sample Elevation	-5.5	-5.5	-5.5	7.5	6.5	5.5	7.5	6.5	0.5	0.5	-0.5	-5.5	7.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																		
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 UJ
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 UJ	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 UJ	NA	NA	<0.0026 U	<0.0029 U
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 UJ
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.031 U	<0.055 U	<0.059 U	<0.056 U	NA	NA	<0.055 U	NA	<0.046 U	<0.05 U	NA	NA	<0.052 U	<0.057 U
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Acetone	67-64-1	**0.05**	100	mg/kg	0.0033 J	0.015	0.015	0.0071 J	NA	NA	0.013 J	NA	0.013	0.006 J	NA	NA	0.033	**0.056**
Acrolein	107-02-8	NS	NS	mg/kg	<0.0031 U	<0.0055 U	<0.0059 U	<0.0056 U	NA	NA	<0.0055 U	NA	<0.0046 U	<0.005 U	NA	NA	<0.0052 U	<0.0057 U
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Bromoform	75-25-2	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Chloroform	67-66-3	0.37	49	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	0.0052 J	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Cyclohexane	110-82-7	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Ethylbenzene	100-41-4	1	41	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
M,P-Xylene	179601-23-1	NS	NS	mg/kg	<0.0031 U	<0.0055 U	<0.0059 U	<0.0056 U	NA	NA	<0.0055 U	NA	<0.0046 U	<0.005 U	NA	NA	<0.0052 U	<0.0057 U
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	0.0041 J	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	<0.0016 U	0.004 J	0.003 J	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	0.0048 J	0.011
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0016 UJ	<0.0027 UJ	<0.0029 UJ	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 UJ	NA	NA	<0.0026 U	<0.0029 U
Methylcyclohexane	108-87-2	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	0.037	<0.0055 UJ	**0.065 J**	0.011	NA	NA	0.025 J	NA	<0.0093 U	<0.01 U	NA	NA	<0.0052 U	<0.0057 U
n-Butylbenzene	104-51-8	12	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
n-Propylbenzene	103-65-1	3.9	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Sec-Butylbenzene	135-98-8	11	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Styrene	100-42-5	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 UJ
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 UJ	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0016 UJ	<0.0027 UJ	<0.0029 UJ	<0.0028 U	NA	NA	0.012 J	NA	<0.0023 U	<0.0025 UJ	NA	NA	<0.0026 U	<0.0029 U
Toluene	108-88-3	**0.7**	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 UJ
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	<0.0047 U	<0.0082 U	<0.0088 U	<0.0084 U	NA	NA	<0.0082 U	NA	<0.0069 U	<0.0075 U	NA	NA	<0.0079 U	<0.0086 U
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	0.013	<0.0029 U
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0016 U	<0.0027 U	<0.0029 U	<0.0028 U	NA	NA	<0.0027 U	NA	<0.0023 U	<0.0025 U	NA	NA	<0.0026 U	<0.0029 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP01	EP02	EP02	EP03	EP03	EP03	EP04	EP04	EP05	EP05	EP05	EP05	EP06	EP07
				Sample Name	EP01_-5.5	EP02_-5.5	DUP07_05102022	EP03_7.5_20220211	EP03_6.5	EP03_5.5	EP04_7.5	EP04_6.5	EP05_0.5	DUP05_03172022	EP05_-0.5	EP05_-5.5	EP06_7.5	EP07_7.5_20220201
				Sample Date	05/10/2022	05/10/2022	05/10/2022	02/11/2022	03/11/2022	03/22/2022	02/04/2022	03/11/2022	03/17/2022	03/17/2022	03/23/2022	03/30/2022	02/04/2022	02/01/2022
				Sample Elevation	-5.5	-5.5	-5.5	7.5	6.5	5.5	7.5	6.5	0.5	0.5	-0.5	-5.5	7.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds																		
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS	mg/kg	<0.102 U	<0.106 U	<0.102 U	<0.106 U	NA	NA	<0.104 U	NA	<0.101 U	<0.101 U	NA	NA	<0.105 U	<0.0993 U
1,2-Diphenylhydrazine	122-66-7	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.0187 U	<0.0194 U	<0.0192 U	<0.0183 U	NA	NA	<0.0196 U	NA	<0.0198 U	<0.0198 U	NA	NA	<0.019 U	<0.0198 U
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS	mg/kg	<0.102 U	<0.106 U	<0.102 U	<0.106 U	NA	NA	<0.104 U	NA	<0.101 U	<0.101 U	NA	NA	<0.105 U	<0.0993 U
2,4,5-Trichlorophenol	95-95-4	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
2,4,6-Trichlorophenol	88-06-2	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
2,4-Dichlorophenol	120-83-2	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
2,4-Dimethylphenol	105-67-9	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
2,4-Dinitrophenol	51-28-5	NS	NS	mg/kg	<0.102 UJ	<0.106 UJ	<0.102 UJ	<0.106 U	NA	NA	<0.104 UJ	NA	<0.101 U	<0.101 U	NA	NA	<0.105 UJ	<0.0993 U
2,4-Dinitrotoluene	121-14-2	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
2,6-Dinitrotoluene	606-20-2	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
2-Chloronaphthalene	91-58-7	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 UJ	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
2-Chlorophenol	95-57-8	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 UJ	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
2-Methylnaphthalene	91-57-6	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
2-Methylphenol (o-Cresol)	95-48-7	0.33	100	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
2-Nitroaniline	88-74-4	NS	NS	mg/kg	<0.102 U	<0.106 U	<0.102 U	<0.106 U	NA	NA	<0.104 U	NA	<0.101 U	<0.101 U	NA	NA	<0.105 U	<0.0993 U
2-Nitrophenol	88-75-5	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 UJ	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
3,3'-Dichlorobenzidine	91-94-1	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
3-Nitroaniline	99-09-2	NS	NS	mg/kg	<0.102 U	<0.106 U	<0.102 U	<0.106 U	NA	NA	<0.104 U	NA	<0.101 U	<0.101 U	NA	NA	<0.105 U	<0.0993 U
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS	mg/kg	<0.102 UJ	<0.106 UJ	<0.102 UJ	<0.106 U	NA	NA	<0.104 UJ	NA	<0.101 U	<0.101 U	NA	NA	<0.105 UJ	<0.0993 U
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
4-Chloro-3-Methylphenol	59-50-7	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
4-Chloroaniline	106-47-8	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
4-Nitroaniline	100-01-6	NS	NS	mg/kg	<0.102 U	<0.106 U	<0.102 U	<0.106 U	NA	NA	<0.104 U	NA	<0.101 U	<0.101 U	NA	NA	<0.105 U	<0.0993 U
4-Nitrophenol	100-02-7	NS	NS	mg/kg	<0.102 U	<0.106 U	<0.102 U	<0.106 U	NA	NA	<0.104 U	NA	<0.101 U	<0.101 U	NA	NA	<0.105 U	<0.0993 U
Acenaphthene	83-32-9	20	100	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 UJ	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Acenaphthylene	208-96-8	100	100	mg/kg	<0.0512 U	<0.053 U	<0.051 U	0.576 J	NA	NA	0.178 D	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Acetophenone	98-86-2	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS	mg/kg	<0.204 U	<0.212 U	<0.204 U	<0.213 U	NA	NA	<0.208 U	NA	<0.203 U	<0.201 U	NA	NA	<0.209 U	<0.199 U
Anthracene	120-12-7	100	100	mg/kg	<0.0512 U	<0.053 U	<0.051 U	0.323 J	NA	NA	0.107 D	NA	<0.0507 U	<0.0504 U	NA	NA	0.0551 JD	<0.0498 U
Atrazine	1912-24-9	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Benzaldehyde	100-52-7	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Benzidine	92-87-5	NS	NS	mg/kg	<0.204 U	<0.212 U	<0.204 U	<0.213 U	NA	NA	<0.208 U	NA	<0.203 U	<0.201 U	NA	NA	<0.209 U	<0.199 U
Benzo(a)anthracene	56-55-3	**1**	1	mg/kg	<0.0512 U	<0.053 U	<0.051 U	0.839 J	NA	<0.0499 U	0.216 D	NA	<0.0507 U	<0.0504 U	NA	NA	0.211 D	0.0667 JD
Benzo(a)pyrene	50-32-8	**1**	1	mg/kg	<0.0512 U	<0.053 U	<0.051 U	1.67 D	4.8 D	<0.0499 U	0.418 D	NA	<0.0507 U	<0.0504 U	NA	NA	0.246 D	0.0873 JD
Benzo(b)fluoranthene	205-99-2	**1**	1	mg/kg	<0.0512 U	<0.053 U	<0.051 U	1.1 D	3.36 D	<0.0499 U	0.301 D	NA	<0.0507 U	<0.0504 U	NA	NA	0.204 D	0.0849 JD
Benzo(g,h,i)Perylene	191-24-2	100	100	mg/kg	<0.0512 U	<0.053 U	<0.051 U	1.13 D	NA	NA	0.287 D	NA	<0.0507 U	<0.0504 U	NA	NA	0.117 D	0.0555 JD
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9	mg/kg	<0.0512 U	<0.053 U	<0.051 U	**0.922 D**	NA	NA	0.249 D	NA	<0.0507 U	<0.0504 U	NA	NA	0.174 D	0.0627 JD
Benzoic Acid	65-85-0	NS	NS	mg/kg	<0.0512 UJ	<0.053 UJ	<0.051 UJ	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Benzyl Alcohol	100-51-6	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 UJ	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Benzyl Butyl Phthalate	85-68-7	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Biphenyl (Diphenyl)	92-52-4	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Bis(2-chloroethoxy) methane	111-91-1	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	0.106 D	<0.0498 U
Caprolactam	105-60-2	NS	NS	mg/kg	<0.102 U	<0.106 U	<0.102 U	<0.106 U	NA	NA	<0.104 U	NA	<0.101 U	<0.101 U	NA	NA	<0.105 U	<0.0993 U
Carbazole	86-74-8	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	0.0536 J	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Chrysene	218-01-9	**1**	1 *	mg/kg	<0.0512 U	<0.053 U	<0.051 U	0.914 J	NA	<0.0499 U	0.24 D	NA	<0.0507 U	<0.0504 U	NA	NA	0.193 D	0.0674 JD
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33	mg/kg	<0.0512 U	<0.053 U	<0.051 U	0.256 D	NA	<0.0499 U	0.0886 JD	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Dibenzofuran	132-64-9	7	59	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 UJ	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Dibutyl phthalate	84-74-2	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Diethyl phthalate	84-66-2	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 UJ	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Dimethyl phthalate	131-11-3	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 UJ	NA	NA	<0.0519 U	NA	0.108 D	<0.101 U	NA	NA	<0.0524 U	<0.0498 U
Dioctyl phthalate	117-84-0	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Diphenylamine	122-39-4	NS	NS	mg/kg	<0.102 U	<0.106 U	<0.102 U	<0.106 UJ	NA	NA	<0.104 U	NA	<0.101 U	<0.101 U	NA	NA	<0.105 U	<0.0993 U
Fluoranthene	206-44-0	**100**	100	mg/kg	<0.0512 U	<0.053 U	<0.051 U	1.05 J	NA	NA	0.339 D	NA	<0.0507 U	<0.0504 U	NA	NA	0.4 D	0.107 D
Fluorene	86-73-7	30	100	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 UJ	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Hexachlorobenzene	118-74-1	0.33	1.2	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Hexachlorocyclopentadiene	77-47-4	NS	NS	mg/kg	<0.0512 UJ	<0.053 UJ	<0.051 UJ	<0.0534 U	NA	NA	<0.0519 UJ	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 UJ	<0.0498 U
Hexachloroethane	67-72-1	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 UJ	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5	mg/kg	<0.0512 U	<0.053 U	<0.051 U	1.08 D	2.37 D	<0.0499 U	0.266 D	NA	<0.0507 U	<0.0504 U	NA	NA	0.14 D	0.0714 JD
Isophorone	78-59-1	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Naphthalene	91-20-3	12	100	mg/kg	<0.0512 U	<0.053 U	<0.051 U	0.0825 JD	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Nitrobenzene	98-95-3	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
n-Nitrosodimethylamine	62-75-9	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 UJ	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
n-Nitrosodiphenylamine	86-30-6	NS	NS	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Pentachlorophenol	87-86-5	0.8	6.7	mg/kg	<0.0512 U	<0.053 U	<0.051 U	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Phenanthrene	85-01-8	100	100	mg/kg	<0.0512 U	<0.053 U	<0.051 U	0.308 J	NA	NA	0.123 D	NA	<0.0507 U	<0.0504 U	NA	NA	0.176 D	<0.0498 U
Phenol	108-95-2	0.33	100	mg/kg	<0.0512 UJ	<0.053 UJ	<0.051 UJ	<0.0534 U	NA	NA	<0.0519 U	NA	<0.0507 U	<0.0504 U	NA	NA	<0.0524 U	<0.0498 U
Pyrene	129-00-0	**100**	100	mg/kg	<0.0512 U	<0.053 U	<0.051 U	1.16 D	NA	NA	0.291 D	NA	<0.0507 U	<0.0504 U	NA	NA	0.286 D	0.096 JD
Pyridine	110-86-1	NS	NS	mg/kg	<0.204 U	<0.212 U	<0.204 U	<0.213 U	NA	NA	<0.208 U	NA	<0.203 U	<0.201 U	NA	NA	<0.209 U	<0.199 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP01	EP02	EP02	EP03	EP03	EP03	EP04	EP04	EP05	EP05	EP05	EP05	EP06	EP07
				Sample Name	EP01_-5.5	EP02_-5.5	DUP07_05102022	EP03_7.5_20220211	EP03_6.5	EP03_5.5	EP04_7.5	EP04_6.5	EP05_0.5	DUP05_03172022	EP05_-0.5	EP05_-5.5	EP06_7.5	EP07_7.5_20220201
				Sample Date	05/10/2022	05/10/2022	05/10/2022	02/11/2022	03/11/2022	03/22/2022	02/04/2022	03/11/2022	03/17/2022	03/17/2022	03/23/2022	03/30/2022	02/04/2022	02/01/2022
				Sample Elevation	-5.5	-5.5	-5.5	7.5	6.5	5.5	7.5	6.5	0.5	0.5	-0.5	-5.5	7.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides																		
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	0.00705 D	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.04 U	<0.0412 U	<0.0402 U	<0.0423 U	NA	NA	0.0824 D	NA	<0.0401 U	<0.0398 U	NA	NA	<0.0416 U	<0.0388 U
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Endrin	72-20-8	0.014	11	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	0.0092 J	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.002 U	<0.00206 U	<0.00201 U	<0.00211 U	NA	NA	<0.00202 U	NA	<0.002 U	<0.00199 U	NA	NA	<0.00208 U	<0.00194 U
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.2 U	<0.206 U	<0.201 U	<0.211 U	NA	NA	<0.202 U	NA	<0.2 U	<0.199 U	NA	NA	<0.208 U	<0.194 U
Herbicides																		
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.0244 U	<0.0251 U	<0.0249 U	<0.026 U	NA	NA	<0.0247 U	NA	<0.0246 U	<0.0244 U	NA	NA	<0.0253 U	<0.0235 U
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.0244 U	<0.0251 U	<0.0249 U	<0.026 U	NA	NA	<0.0247 U	NA	<0.0246 U	<0.0244 U	NA	NA	<0.0253 U	<0.0235 U
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.0244 U	<0.0251 U	<0.0249 U	<0.026 U	NA	NA	<0.0247 U	NA	<0.0246 U	<0.0244 U	NA	NA	<0.0253 U	<0.0235 U
Polychlorinated Biphenyl																		
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.0202 U	<0.0208 U	<0.0203 U	<0.0213 U	NA	NA	<0.0204 U	NA	<0.0202 U	<0.0201 U	NA	NA	<0.021 U	<0.0196 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.0202 U	<0.0208 U	<0.0203 U	<0.0213 U	NA	NA	<0.0204 U	NA	<0.0202 U	<0.0201 U	NA	NA	<0.021 U	<0.0196 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.0202 U	<0.0208 U	<0.0203 U	<0.0213 U	NA	NA	<0.0204 U	NA	<0.0202 U	<0.0201 U	NA	NA	<0.021 U	<0.0196 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.0202 U	<0.0208 U	<0.0203 U	<0.0213 U	NA	NA	<0.0204 U	NA	<0.0202 U	<0.0201 U	NA	NA	<0.021 U	<0.0196 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.0202 U	<0.0208 U	<0.0203 U	<0.0213 U	NA	NA	<0.0204 U	NA	<0.0202 U	<0.0201 U	NA	NA	<0.021 U	<0.0196 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.0202 U	<0.0208 U	<0.0203 U	<0.0213 U	NA	NA	<0.0204 U	NA	<0.0202 U	<0.0201 U	NA	NA	<0.021 U	<0.0196 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.0202 U	<0.0208 U	<0.0203 U	<0.0213 U	NA	NA	<0.0204 U	NA	<0.0202 U	<0.0201 U	NA	NA	<0.021 U	<0.0196 U
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.0202 U	<0.0208 U	<0.0203 U	<0.0213 U	NA	NA	<0.0204 U	NA	<0.0202 U	<0.0201 U	NA	NA	<0.021 U	<0.0196 U
Metals																		
Aluminum	7429-90-5	NS	NS	mg/kg	3,390	5,220	5,170	7,790	NA	NA	11,400	NA	9,460	11,300	NA	NA	13,700	12,300
Antimony	7440-36-0	NS	NS	mg/kg	<3.07 UJ	<3.21 U	<3.12 U	<3.25 UJ	NA	NA	<3.12 UJ	NA	3.42	5.11	NA	NA	3.26	4.63
Arsenic	7440-38-2	**13**	16	mg/kg	<1.84 U	<1.93 U	<1.87 U	8.86 J	NA	NA	3.73	NA	<1.86 U	<1.85 U	NA	NA	3.18	2.49
Barium	7440-39-3	**350**	400	mg/kg	22 J	23.3 J	27.8 J	298 J	NA	NA	60.5 J	NA	52.9	54.9	NA	NA	66.9	85.2 J
Beryllium	7440-41-7	7.2	72	mg/kg	<0.061 U	<0.064 U	<0.062 U	<0.065 U	NA	NA	<0.062 U	NA	<0.062 U	<0.062 U	NA	NA	<0.064 U	<0.06 U
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	<0.368 U	<0.386 U	<0.375 U	0.792 J	NA	NA	<0.374 U	NA	<0.373 U	<0.369 U	NA	NA	<0.382 U	<0.359 U
Calcium	7440-70-2	NS	NS	mg/kg	1,830 J	1,710 B	1,560 B	21,300 J	NA	NA	11,700 J	NA	1,080	1,260	NA	NA	4,060 B	3,460
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.614 U	<0.643 U	<0.625 U	<0.651 U	NA	NA	<0.623 U	NA	<0.621 U	<0.615 U	NA	NA	<0.637 U	<0.599 U
Chromium, Total	7440-47-3	NS	NS	mg/kg	152	51.7	48.8	37.9 J	NA	NA	48.7 J	NA	39.2 J	77.9 J	NA	NA	52.7	53.3
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	**152**	**51.7**	**48.8**	**37.9**	NA	NA	**48.7**	NA	**39.2 J**	**77.9 J**	NA	NA	**52.7**	**53.3**
Cobalt	7440-48-4	NS	NS	mg/kg	67.3 J	22.8 J	21.2 J	17.2	NA	NA	18.7	NA	20.8	29.3	NA	NA	18.2	18.4 J
Copper	7440-50-8	**50**	270	mg/kg	15.1 J	12.6 J	13 J	**95.5 J**	NA	NA	37.4	NA	19.1	25.7	NA	NA	24.9	41.7 J
Cyanide	57-12-5	27	27	mg/kg	<0.614 UJ	<0.643 U	<0.625 U	<0.651 U	NA	NA	<0.623 U	NA	<0.621 U	<0.615 U	NA	NA	<0.637 U	<0.599 U
Iron	7439-89-6	NS	NS	mg/kg	39,400	23,100	21,000	25,700	NA	NA	23,800 B	NA	23,700	26,700	NA	NA	22,100 B	25,600
Lead	7439-92-1	**63**	400	mg/kg	1.42 J	11.3	12.9	2,070 J	**139 J**	NA	**74.8 J**	NA	6.74	9.44	NA	NA	39.3	**69.5**
Magnesium	7439-95-4	NS	NS	mg/kg	109,000	31,900	26,900	10,900 J	NA	NA	6,940	NA	5,750 J	15,300 J	NA	NA	7,210	7,140
Manganese	7439-96-5	1600	2000	mg/kg	636 J	227 J	232 J	321	NA	NA	288	NA	361	520	NA	NA	163	298 J
Mercury	7439-97-6	**0.18**	0.81	mg/kg	<0.0368 UJ	<0.0386 U	<0.0375 U	1.82	**0.545**	NA	1.23	**0.462**	<0.0373 U	<0.0369 U	NA	NA	0.132	0.165
Nickel	7440-02-0	**30**	310	mg/kg	1,630 J	450 J	405 J	**200 J**	NA	NA	**230 J**	NA	320 J	527 J	338 J	**140 J**	**199 J**	**184 J**
Potassium	7440-09-7	NS	NS	mg/kg	719 J	1,340	1,240	1,060 B	NA	NA	1,330	NA	1,500	1,620	NA	NA	1,090	996 B
Selenium	7782-49-2	3.9	180	mg/kg	<3.07 U	<3.21 U	<3.12 U	<3.25 U	NA	NA	<3.12 U	NA	<3.11 U	<3.08 U	NA	NA	<3.19 U	<3 U
Silver	7440-22-4	2	180	mg/kg	<0.614 U	<0.643 U	<0.625 U	0.787 J	NA	NA	<0.623 U	NA	<0.621 U	<0.615 U	NA	NA	<0.637 U	<0.599 U
Sodium	7440-23-5	NS	NS	mg/kg	143 J	186	174	380 J	NA	NA	223 J	NA	100	159	NA	NA	365	249
Thallium	7440-28-0	NS	NS	mg/kg	<3.07 U	<3.21 U	<3.12 U	<3.25 U	NA	NA	<3.12 U	NA	<3.11 U	<3.08 U	NA	NA	<3.19 U	<3 U
Vanadium	7440-62-2	NS	NS	mg/kg	14.3 J	25.6 J	21.3 J	109 J	NA	NA	50.4	NA	28.4	30.8	NA	NA	31.3	33.3
Zinc	7440-66-6	**109**	10000	mg/kg	20.6 J	31.3	29.5	**331**	NA	NA	102 J	NA	30	34	NA	NA	50.8	73.1
General Chemistry																		
Solids, Percent	SOLID	NS	NS	Percent	81.4	77.8	80	76.8	86	82.7	80.2	84.6	80.5	81.3	88.3	75.8	78.5	83.5

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP01	EP02	EP02	EP03	EP03	EP03	EP04	EP04	EP05	EP05	EP05	EP05	EP06	EP07
				Sample Name	EP01_-5.5	EP02_-5.5	DUP07_05102022	EP03_7.5_20220211	EP03_6.5	EP03_5.5	EP04_7.5	EP04_6.5	EP05_0.5	DUP05_03172022	EP05_-0.5	EP05_-5.5	EP06_7.5	EP07_7.5_20220201
				Sample Date	05/10/2022	05/10/2022	05/10/2022	02/11/2022	03/11/2022	03/22/2022	02/04/2022	03/11/2022	03/17/2022	03/17/2022	03/23/2022	03/30/2022	02/04/2022	02/01/2022
				Sample Elevation	-5.5	-5.5	-5.5	7.5	6.5	5.5	7.5	6.5	0.5	0.5	-0.5	-5.5	7.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids																		
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	0.00076	NA	NA	**0.00101**	NA	<0.000303 U	<0.000306 U	NA	NA	0.000392	<0.000276 U
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	0.000526	NA	NA	0.000345	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000292 U	<0.000312 U	<0.000298 U	<0.000312 U	NA	NA	<0.000287 U	NA	<0.000303 U	<0.000306 U	NA	NA	<0.000314 U	<0.000276 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP08	EP09	EP10	EP11	EP11	EP12	EP12	EP13	EP13	EP13	EP14	EP14
				Sample Name	EP08_0.5	EP09_0.5	EP10_-5.5	EP11_7.5_20220211	EP11_6.5	EP12_7.5_20220211	EP12_6.5	EP13_7.5_20220207	EP13_6.5	EP13_5.5	EP14_0.5	EP14_-5.5
				Sample Date	03/04/2022	03/04/2022	05/10/2022	02/11/2022	03/11/2022	02/11/2022	03/11/2022	02/07/2022	03/11/2022	03/22/2022	03/17/2022	03/30/2022
				Sample Elevation	0.5	0.5	-5.5	7.5	6.5	7.5	6.5	7.5	6.5	5.5	0.5	-5.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 UJ	NA	<0.0029 UJ	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	0.0039 J
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.071 U	<0.043 U	<0.042 U	<0.046 U	NA	<0.058 U	NA	<0.061 U	NA	NA	<0.029 U	<0.053 U
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Acetone	67-64-1	**0.05**	100	mg/kg	**0.051**	0.013	<0.0042 U	0.012	NA	0.021	NA	<0.0061 U	NA	NA	0.0034 J	0.016
Acrolein	107-02-8	NS	NS	mg/kg	<0.0071 U	<0.0043 U	<0.0042 U	<0.0046 U	NA	<0.0058 U	NA	<0.0061 U	NA	NA	<0.0029 U	<0.0053 U
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Bromoform	75-25-2	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Chloroform	67-66-3	0.37	49	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Cyclohexane	110-82-7	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Ethylbenzene	100-41-4	1	41	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
M,P-Xylene	179601-23-1	NS	NS	mg/kg	<0.0071 U	<0.0043 U	<0.0042 U	<0.0046 U	NA	<0.0058 U	NA	<0.0061 U	NA	NA	<0.0029 U	<0.0053 U
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	0.012	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	0.0033 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 UJ	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Methylcyclohexane	108-87-2	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	0.015	0.005 J	<0.0042 U	0.021	NA	0.021	NA	<0.012 U	NA	NA	<0.0058 U	0.0054 J
n-Butylbenzene	104-51-8	12	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
n-Propylbenzene	103-65-1	3.9	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Sec-Butylbenzene	135-98-8	11	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Styrene	100-42-5	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 UJ	NA	<0.0029 UJ	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 UJ	NA	NA	<0.0014 U	<0.0027 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0035 U	<0.0021 U	<0.0021 UJ	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 UJ
Toluene	108-88-3	**0.7**	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	<0.011 U	<0.0064 U	<0.0062 U	<0.0069 U	NA	<0.0087 U	NA	<0.0091 U	NA	NA	<0.0043 U	<0.008 U
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0035 U	<0.0021 U	<0.0021 U	<0.0023 U	NA	<0.0029 U	NA	<0.003 U	NA	NA	<0.0014 U	<0.0027 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs		Location	EP08	EP09	EP10	EP11	EP11	EP12	EP12	EP13	EP13	EP13	EP14	EP14
					Sample Name	EP08_0.5	EP09_0.5	EP10_-5.5	EP11_7.5_20220211	EP11_6.5	EP12_7.5_20220211	EP12_6.5	EP13_7.5_20220207	EP13_6.5	EP13_5.5	EP14_0.5	EP14_-5.5
					Sample Date	03/04/2022	03/04/2022	05/10/2022	02/11/2022	03/11/2022	02/11/2022	03/11/2022	02/07/2022	03/11/2022	03/22/2022	03/17/2022	03/30/2022
					Sample Elevation	0.5	0.5	-5.5	7.5	6.5	7.5	6.5	7.5	6.5	5.5	0.5	-5.5
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds																	
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS		mg/kg	<0.0961 U	<0.0941 U	<0.0947 U	<0.0899 U	NA	<0.0951 U	NA	<0.105 U	NA	NA	<0.104 U	<0.107 U
1,2-Diphenylhydrazine	122-66-7	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13		mg/kg	<0.0183 U	<0.019 U	<0.0198 U	<0.0194 U	NA	<0.019 U	NA	<0.0198 U	NA	NA	<0.019 U	<0.0194 U
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS		mg/kg	<0.0961 U	<0.0941 U	<0.0947 U	<0.0899 U	NA	<0.0951 U	NA	<0.105 U	NA	NA	<0.104 U	<0.107 U
2,4,5-Trichlorophenol	95-95-4	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
2,4,6-Trichlorophenol	88-06-2	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
2,4-Dichlorophenol	120-83-2	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
2,4-Dimethylphenol	105-67-9	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
2,4-Dinitrophenol	51-28-5	NS	NS		mg/kg	<0.0961 UJ	<0.0941 UJ	<0.0947 UJ	<0.0899 U	NA	<0.0951 U	NA	<0.105 UJ	NA	NA	<0.104 U	<0.107 U
2,4-Dinitrotoluene	121-14-2	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
2,6-Dinitrotoluene	606-20-2	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
2-Chloronaphthalene	91-58-7	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 UJ	NA	<0.0477 UJ	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
2-Chlorophenol	95-57-8	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 UJ	NA	<0.0477 UJ	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
2-Methylnaphthalene	91-57-6	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	0.108 D	NA	0.112 D	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
2-Methylphenol (o-Cresol)	95-48-7	0.33	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
2-Nitroaniline	88-74-4	NS	NS		mg/kg	<0.0961 U	<0.0941 U	<0.0947 U	<0.0899 U	NA	<0.0951 U	NA	<0.105 U	NA	NA	<0.104 U	<0.107 U
2-Nitrophenol	88-75-5	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 UJ	NA	<0.0477 UJ	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
3,3'-Dichlorobenzidine	91-94-1	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
3-Nitroaniline	99-09-2	NS	NS		mg/kg	<0.0961 U	<0.0941 U	<0.0947 U	<0.0899 U	NA	<0.0951 U	NA	<0.105 U	NA	NA	<0.104 U	<0.107 U
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS		mg/kg	<0.0961 U	<0.0941 U	<0.0947 UJ	<0.0899 U	NA	<0.0951 U	NA	<0.105 U	NA	NA	<0.104 U	<0.107 U
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
4-Chloro-3-Methylphenol	59-50-7	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
4-Chloroaniline	106-47-8	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
4-Nitroaniline	100-01-6	NS	NS		mg/kg	<0.0961 U	<0.0941 U	<0.0947 U	<0.0899 U	NA	<0.0951 U	NA	<0.105 U	NA	NA	<0.104 U	<0.107 U
4-Nitrophenol	100-02-7	NS	NS		mg/kg	<0.0961 U	<0.0941 U	<0.0947 U	<0.0899 U	NA	<0.0951 U	NA	<0.105 U	NA	NA	<0.104 U	<0.107 U
Acenaphthene	83-32-9	20	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	0.125 J	NA	0.132 J	NA	0.189 D	NA	NA	<0.0524 U	<0.0536 U
Acenaphthylene	208-96-8	100	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	1.39 J	NA	0.847 J	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Acetophenone	98-86-2	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS		mg/kg	<0.192 U	<0.188 U	<0.19 U	<0.18 U	NA	<0.191 U	NA	<0.21 U	NA	NA	<0.209 U	<0.214 U
Anthracene	120-12-7	100	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	1.33 J	NA	0.901 J	NA	0.476 D	NA	NA	<0.0524 U	<0.0536 U
Atrazine	1912-24-9	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Benzaldehyde	100-52-7	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Benzidine	92-87-5	NS	NS		mg/kg	<0.192 U	<0.188 U	<0.19 U	<0.18 U	NA	<0.191 U	NA	<0.21 U	NA	NA	<0.209 U	<0.214 U
Benzo(a)anthracene	56-55-3	**1**	1		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	3.94 J	0.454 D	2.54 J	0.326 D	0.748 D	NA	NA	<0.0524 U	<0.0536 U
Benzo(a)pyrene	50-32-8	**1**	1		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	5.35 D	0.52 D	3.82 D	0.383 D	0.726 D	NA	NA	<0.0524 U	<0.0536 U
Benzo(b)fluoranthene	205-99-2	**1**	1		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	4.07 D	0.37 D	2.79 D	0.274 D	0.568 D	NA	NA	<0.0524 U	<0.0536 U
Benzo(g,h,i)Perylene	191-24-2	100	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	3.66 D	NA	1.98 D	NA	0.485 D	NA	NA	<0.0524 U	<0.0536 U
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	**3.64 D**	NA	**2.46 D**	NA	0.537 D	NA	NA	<0.0524 U	<0.0536 U
Benzoic Acid	65-85-0	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 UJ	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Benzyl Alcohol	100-51-6	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 UJ	NA	<0.0477 UJ	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Benzyl Butyl Phthalate	85-68-7	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	0.171 D	NA	0.0882 JD	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Biphenyl (Diphenyl)	92-52-4	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Bis(2-chloroethoxy) methane	111-91-1	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	0.0601 JD	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Caprolactam	105-60-2	NS	NS		mg/kg	<0.0961 U	<0.0941 U	<0.0947 U	<0.0899 U	NA	<0.0951 U	NA	<0.105 U	NA	NA	<0.104 U	<0.107 U
Carbazole	86-74-8	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	0.233 J	NA	0.158 J	NA	0.104 JD	NA	NA	<0.0524 U	<0.0536 U
Chrysene	218-01-9	**1**	1	*	mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	3.81 J	0.469 D	2.46 J	0.319 D	0.694 D	NA	NA	<0.0524 U	<0.0536 U
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	0.735 D	0.127 D	0.462 D	0.0819 JD	0.112 D	NA	NA	<0.0524 U	<0.0536 U
Dibenzofuran	132-64-9	7	59		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 UJ	NA	<0.0477 UJ	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Dibutyl phthalate	84-74-2	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Diethyl phthalate	84-66-2	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 UJ	NA	<0.0477 UJ	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Dimethyl phthalate	131-11-3	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 UJ	NA	<0.0477 UJ	NA	<0.0525 U	NA	NA	0.148 D	<0.0536 U
Dioctyl phthalate	117-84-0	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Diphenylamine	122-39-4	NS	NS		mg/kg	<0.0961 U	<0.0941 U	<0.0947 U	<0.0899 UJ	NA	<0.0951 UJ	NA	<0.105 U	NA	NA	<0.104 U	<0.107 U
Fluoranthene	206-44-0	**100**	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	8.26 J	NA	5.85 J	NA	1.7 D	NA	NA	<0.0524 U	<0.0536 U
Fluorene	86-73-7	30	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	0.284 J	NA	0.269 J	NA	0.203 D	NA	NA	<0.0524 U	<0.0536 U
Hexachlorobenzene	118-74-1	0.33	1.2		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Hexachlorobutadiene	87-68-3	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Hexachlorocyclopentadiene	77-47-4	NS	NS		mg/kg	<0.0481 UJ	<0.0472 UJ	<0.0475 UJ	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Hexachloroethane	67-72-1	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 UJ	NA	<0.0477 UJ	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	3.8 D	0.264 D	2.21 D	0.191 D	0.568 D	0.293 D	NA	<0.0524 U	<0.0536 U
Isophorone	78-59-1	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Naphthalene	91-20-3	12	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	0.222 D	NA	0.2 D	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Nitrobenzene	98-95-3	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
n-Nitrosodimethylamine	62-75-9	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 UJ	NA	<0.0477 UJ	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
n-Nitrosodiphenylamine	86-30-6	NS	NS		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Pentachlorophenol	87-86-5	0.8	6.7		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Phenanthrene	85-01-8	100	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	2.86 J	NA	2.17 J	NA	1.85 D	NA	NA	<0.0524 U	<0.0536 U
Phenol	108-95-2	0.33	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 UJ	<0.045 U	NA	<0.0477 U	NA	<0.0525 U	NA	NA	<0.0524 U	<0.0536 U
Pyrene	129-00-0	**100**	100		mg/kg	<0.0481 U	<0.0472 U	<0.0475 U	7.04 D	NA	5.09 D	NA	1.65 D	NA	NA	<0.0524 U	<0.0536 U
Pyridine	110-86-1	NS	NS		mg/kg	<0.192 U	<0.188 U	<0.19 U	<0.18 U	NA	<0.191 U	NA	<0.21 U	NA	NA	<0.209 U	<0.214 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP08	EP09	EP10	EP11	EP11	EP12	EP12	EP13	EP13	EP13	EP14	EP14
				Sample Name	EP08_0.5	EP09_0.5	EP10_-5.5	EP11_7.5_20220211	EP11_6.5	EP12_7.5_20220211	EP12_6.5	EP13_7.5_20220207	EP13_6.5	EP13_5.5	EP14_0.5	EP14_-5.5
				Sample Date	03/04/2022	03/04/2022	05/10/2022	02/11/2022	03/11/2022	02/11/2022	03/11/2022	02/07/2022	03/11/2022	03/22/2022	03/17/2022	03/30/2022
				Sample Elevation	0.5	0.5	-5.5	7.5	6.5	7.5	6.5	7.5	6.5	5.5	0.5	-5.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides																
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.0374 U	<0.0365 U	<0.0376 U	<0.0359 U	NA	<0.038 U	NA	<0.0424 U	NA	NA	<0.0404 U	<0.0419 U
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Endrin	72-20-8	0.014	11	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.00187 U	<0.00183 U	<0.00188 U	<0.0018 U	NA	<0.0019 U	NA	<0.00212 U	NA	NA	<0.00202 U	<0.00209 U
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.187 U	<0.183 U	<0.188 U	<0.18 U	NA	<0.19 U	NA	<0.212 U	NA	NA	<0.202 U	<0.209 U
Herbicides																
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.0227 U	<0.0226 U	<0.0232 U	<0.0218 UJ	NA	<0.0229 UJ	NA	<0.0496 U	NA	NA	<0.0246 U	<0.026 U
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.0227 U	<0.0226 U	<0.0232 U	<0.0218 UJ	NA	<0.0229 UJ	NA	<0.0496 U	NA	NA	<0.0246 U	<0.026 U
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.0227 U	<0.0226 U	<0.0232 U	<0.0218 UJ	NA	<0.0229 UJ	NA	<0.0496 U	NA	NA	<0.0246 U	<0.026 U
Polychlorinated Biphenyl																
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.0189 U	<0.0184 U	<0.019 U	<0.0181 U	NA	<0.0192 U	NA	<0.0214 U	NA	NA	<0.0204 U	<0.0211 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.0189 U	<0.0184 U	<0.019 U	<0.0181 U	NA	<0.0192 U	NA	<0.0214 U	NA	NA	<0.0204 U	<0.0211 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.0189 U	<0.0184 U	<0.019 U	<0.0181 U	NA	<0.0192 U	NA	<0.0214 U	NA	NA	<0.0204 U	<0.0211 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.0189 U	<0.0184 U	<0.019 U	<0.0181 U	NA	<0.0192 U	NA	<0.0214 U	NA	NA	<0.0204 U	<0.0211 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.0189 U	<0.0184 U	<0.019 U	<0.0181 U	NA	<0.0192 U	NA	<0.0214 U	NA	NA	<0.0204 U	<0.0211 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.0189 U	<0.0184 U	<0.019 U	<0.0181 U	NA	<0.0192 U	NA	<0.0214 U	NA	NA	<0.0204 U	<0.0211 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.0189 U	<0.0184 U	<0.019 U	<0.0181 U	NA	<0.0192 U	NA	<0.0214 U	NA	NA	<0.0204 U	<0.0211 U
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.0189 U	<0.0184 U	<0.019 U	<0.0181 U	NA	<0.0192 U	NA	<0.0214 U	NA	NA	<0.0204 U	<0.0211 U
Metals																
Aluminum	7429-90-5	NS	NS	mg/kg	9,530	6,550	4,990	7,250	NA	8,390	NA	10,000	NA	NA	11,000	7,370
Antimony	7440-36-0	NS	NS	mg/kg	3.29	<2.85 U	<2.9 U	<2.75 U	NA	<2.9 U	NA	3.44 J	NA	NA	3.75 J	6.55
Arsenic	7440-38-2	**13**	16	mg/kg	<1.74 U	<1.71 U	<1.74 U	6.37	NA	6.65	NA	<1.93 U	NA	NA	<1.88 U	5.4
Barium	7440-39-3	**350**	400	mg/kg	55.6	39.5	36.3 J	83.6	NA	94.2	NA	81.7 J	NA	NA	68.5 J	37.2
Beryllium	7440-41-7	7.2	72	mg/kg	<0.058 U	<0.057 U	<0.058 U	<0.055 U	NA	<0.058 U	NA	<0.064 U	NA	NA	<0.063 U	<0.065 U
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	<0.348 U	<0.342 U	<0.349 U	<0.33 U	NA	0.386	NA	<0.387 U	NA	NA	<0.377 U	<0.391 U
Calcium	7440-70-2	NS	NS	mg/kg	1,580 B	1,190 B	1,260 B	27,800 B	NA	28,100 B	NA	8,210 B	NA	NA	2,650	1,650
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.58 U	<0.57 U	<0.581 U	<0.549 U	NA	<0.58 U	NA	<0.645 UJ	NA	NA	<0.628 UJ	<0.651 UJ
Chromium, Total	7440-47-3	NS	NS	mg/kg	41.8	20.3	177	44.4	NA	32.2	NA	82.7 J	NA	NA	48.5 J	42
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	**41.8**	20.3	**177**	**44.4**	NA	**32.2**	NA	**82.7**	NA	NA	**48.5**	**42**
Cobalt	7440-48-4	NS	NS	mg/kg	15.9	8.86	58.4 J	16.8	NA	16	NA	28.9	NA	NA	19.2	16.1
Copper	7440-50-8	**50**	270	mg/kg	**62.5**	34.2	28.9 J	49.2 J	NA	**52.5 J**	NA	**64.3**	NA	NA	33.3	17.3
Cyanide	57-12-5	27	27	mg/kg	<0.58 U	<0.57 U	<0.581 U	<0.549 U	NA	<0.58 U	NA	<0.645 U	NA	NA	<0.628 UJ	<0.651 UJ
Iron	7439-89-6	NS	NS	mg/kg	22,300	15,500	38,800	18,000	NA	18,900	NA	27,700	NA	NA	26,700	20,100
Lead	7439-92-1	**63**	400	mg/kg	8.51	5.51	3.51	**165**	NA	**137**	NA	**193 J**	NA	NA	11.7	58.4
Magnesium	7439-95-4	NS	NS	mg/kg	5,810	2,750	93,500	19,500	NA	9,820	NA	23,300	NA	NA	9,500	13,500
Manganese	7439-96-5	1600	2000	mg/kg	418	252	772 J	348	NA	336	NA	385 J	NA	NA	504 J	151
Mercury	7439-97-6	**0.18**	0.81	mg/kg	<0.0348 U	<0.0342 U	<0.0349 U	**0.324**	NA	**0.305**	NA	**0.474 J**	NA	NA	<0.0377 U	0.124
Nickel	7440-02-0	**30**	310	mg/kg	**165**	**80**	1,350 J	**214 J**	NA	**144 J**	NA	430	416 J	**212 J**	**295 J**	**233 J**
Potassium	7440-09-7	NS	NS	mg/kg	1,640 B	1,290 B	1,020	914 B	NA	1,070 B	NA	1,820 J	NA	NA	2,500	1,640
Selenium	7782-49-2	3.9	180	mg/kg	<2.9 U	<2.85 U	<2.9 U	<2.75 U	NA	<2.9 U	NA	<3.22 U	NA	NA	<3.14 U	<3.26 U
Silver	7440-22-4	2	180	mg/kg	<0.58 U	<0.57 U	<0.581 U	<0.549 U	NA	0.745	NA	<0.645 U	NA	NA	<0.628 UJ	<0.651 U
Sodium	7440-23-5	NS	NS	mg/kg	143	127	118	302	NA	368	NA	394	NA	NA	265 J	115
Thallium	7440-28-0	NS	NS	mg/kg	<2.9 U	<2.85 U	<2.9 U	<2.75 U	NA	<2.9 U	NA	<3.22 U	NA	NA	<3.14 U	<3.26 U
Vanadium	7440-62-2	NS	NS	mg/kg	31	26	23.3 J	33	NA	37.7	NA	39.7	NA	NA	31.6	22.7
Zinc	7440-66-6	**109**	10000	mg/kg	33.4	28	31.6	**207**	NA	**132**	NA	**161 B**	NA	NA	50.8	30.2
General Chemistry																
Solids, Percent	SOLID	NS	NS	Percent	86.2	87.8	86.1	91	86.9	86.2	87.8	77.6	81.9	79.7	79.6	76.7

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP08	EP09	EP10	EP11	EP11	EP12	EP12	EP13	EP13	EP13	EP14	EP14
				Sample Name	EP08_0.5	EP09_0.5	EP10_-5.5	EP11_7.5_20220211	EP11_6.5	EP12_7.5_20220211	EP12_6.5	EP13_7.5_20220207	EP13_6.5	EP13_5.5	EP14_0.5	EP14_-5.5
				Sample Date	03/04/2022	03/04/2022	05/10/2022	02/11/2022	03/11/2022	02/11/2022	03/11/2022	02/07/2022	03/11/2022	03/22/2022	03/17/2022	03/30/2022
				Sample Elevation	0.5	0.5	-5.5	7.5	6.5	7.5	6.5	7.5	6.5	5.5	0.5	-5.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids																
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 UJ	NA	NA	<0.000307 U	<0.000314 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	0.000373	NA	0.00041	NA	0.000773 J	NA	NA	<0.000307 U	<0.000314 U
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	0.000275	NA	0.000399	NA	0.000432	NA	NA	<0.000307 U	<0.000314 U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000272 U	<0.000278 U	<0.000282 U	<0.000272 U	NA	<0.000284 U	NA	<0.000299 U	NA	NA	<0.000307 U	<0.000314 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP15	EP15	EP15	EP16	EP16	EP17	EP17	EP18	EP18	EP19	EP19	EP19
				Sample Name	EP15_7.5_20220207	EP15_6.5	EP15_5.5	EP16_7.5_20220131	EP16_6.5	EP17_7.5_20220131	EP17_6.5	EP18_7.5_20220131	EP18_6.5	EP19_7.5_20220131	EP19_6.5	EP19_5.5_20220222
				Sample Date	02/07/2022	03/11/2022	03/22/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	02/22/2022
				Sample Elevation	7.5	6.5	5.5	7.5	6.5	7.5	6.5	7.5	6.5	7.5	6.5	5.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.053 U	NA	NA	<0.056 U	NA	<0.071 U	NA	<0.1 U	NA	<0.086 U	NA	NA
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Acetone	67-64-1	**0.05**	100	mg/kg	0.012	NA	NA	0.0056 J	NA	0.015	NA	<0.01 U	NA	<0.0086 U	NA	NA
Acrolein	107-02-8	NS	NS	mg/kg	<0.0053 U	NA	NA	<0.0056 U	NA	<0.0071 U	NA	<0.01 U	NA	<0.0086 U	NA	NA
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Bromoform	75-25-2	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Chloroform	67-66-3	0.37	49	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Cyclohexane	110-82-7	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Ethylbenzene	100-41-4	1	41	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
M,P-Xylene	179601-23-1	NS	NS	mg/kg	<0.0053 U	NA	NA	<0.0056 U	NA	<0.0071 U	NA	<0.01 U	NA	<0.0086 U	NA	NA
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 UJ	NA	<0.0036 UJ	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Methylcyclohexane	108-87-2	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	<0.0053 U	NA	NA	0.0061 J	NA	<0.0071 U	NA	<0.01 U	NA	<0.0086 U	NA	NA
n-Butylbenzene	104-51-8	12	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
n-Propylbenzene	103-65-1	3.9	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Sec-Butylbenzene	135-98-8	11	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Styrene	100-42-5	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0026 UJ	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Toluene	108-88-3	**0.7**	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	<0.0079 U	NA	NA	<0.0085 U	NA	<0.011 U	NA	<0.016 U	NA	<0.013 U	NA	NA
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0026 U	NA	NA	<0.0028 U	NA	<0.0036 U	NA	<0.0052 U	NA	<0.0043 U	NA	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP15	EP15	EP15	EP16	EP16	EP17	EP17	EP18	EP18	EP19	EP19	EP19
				Sample Name	EP15_7.5_20220207	EP15_6.5	EP15_5.5	EP16_7.5_20220131	EP16_6.5	EP17_7.5_20220131	EP17_6.5	EP18_7.5_20220131	EP18_6.5	EP19_7.5_20220131	EP19_6.5	EP19_5.5_20220222
				Sample Date	02/07/2022	03/11/2022	03/22/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	02/22/2022
				Sample Elevation	7.5	6.5	5.5	7.5	6.5	7.5	6.5	7.5	6.5	7.5	6.5	5.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds																
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS	mg/kg	<0.102 UJ	NA	NA	<0.0948 U	NA	<0.0982 U	NA	<0.101 U	NA	<0.103 U	NA	NA
1,2-Diphenylhydrazine	122-66-7	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.0189 U	NA	NA	<0.0196 U	NA	<0.0196 U	NA	<0.0194 U	NA	<0.0194 UJ	NA	NA
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS	mg/kg	<0.102 UJ	NA	NA	<0.0948 U	NA	<0.0982 U	NA	<0.101 U	NA	<0.103 U	NA	NA
2,4,5-Trichlorophenol	95-95-4	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
2,4,6-Trichlorophenol	88-06-2	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
2,4-Dichlorophenol	120-83-2	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
2,4-Dimethylphenol	105-67-9	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
2,4-Dinitrophenol	51-28-5	NS	NS	mg/kg	<0.102 UJ	NA	NA	<0.0948 U	NA	<0.0982 U	NA	<0.101 U	NA	<0.103 U	NA	NA
2,4-Dinitrotoluene	121-14-2	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
2,6-Dinitrotoluene	606-20-2	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
2-Chloronaphthalene	91-58-7	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
2-Chlorophenol	95-57-8	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
2-Methylnaphthalene	91-57-6	NS	NS	mg/kg	<0.0511 UJ	NA	NA	1.2 D	NA	0.0612 JD	NA	0.125 D	NA	0.0829 JD	NA	NA
2-Methylphenol (o-Cresol)	95-48-7	0.33	100	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
2-Nitroaniline	88-74-4	NS	NS	mg/kg	<0.102 UJ	NA	NA	<0.0948 U	NA	<0.0982 U	NA	<0.101 U	NA	<0.103 U	NA	NA
2-Nitrophenol	88-75-5	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
3,3'-Dichlorobenzidine	91-94-1	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
3-Nitroaniline	99-09-2	NS	NS	mg/kg	<0.102 UJ	NA	NA	<0.0948 U	NA	<0.0982 U	NA	<0.101 U	NA	<0.103 U	NA	NA
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS	mg/kg	<0.102 UJ	NA	NA	<0.0948 U	NA	<0.0982 U	NA	<0.101 U	NA	<0.103 U	NA	NA
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
4-Chloro-3-Methylphenol	59-50-7	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
4-Chloroaniline	106-47-8	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
4-Nitroaniline	100-01-6	NS	NS	mg/kg	<0.102 UJ	NA	NA	<0.0948 U	NA	<0.0982 U	NA	<0.101 U	NA	<0.103 U	NA	NA
4-Nitrophenol	100-02-7	NS	NS	mg/kg	<0.102 UJ	NA	NA	<0.0948 U	NA	<0.0982 U	NA	<0.101 U	NA	<0.103 U	NA	NA
Acenaphthene	83-32-9	20	100	mg/kg	<0.0511 UJ	NA	NA	0.634 D	NA	<0.0492 U	NA	0.34 D	NA	<0.0515 U	NA	NA
Acenaphthylene	208-96-8	100	100	mg/kg	0.115 J	NA	NA	0.268 D	NA	0.0596 JD	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Acetophenone	98-86-2	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS	mg/kg	<0.204 UJ	NA	NA	<0.19 U	NA	<0.197 U	NA	<0.203 U	NA	<0.206 U	NA	NA
Anthracene	120-12-7	100	100	mg/kg	0.138 J	NA	NA	0.522 D	NA	0.0785 JD	NA	0.8 D	NA	<0.0515 U	NA	NA
Atrazine	1912-24-9	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Benzaldehyde	100-52-7	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Benzidine	92-87-5	NS	NS	mg/kg	<0.204 UJ	NA	NA	<0.19 U	NA	<0.197 U	NA	<0.203 U	NA	<0.206 U	NA	NA
Benzo(a)anthracene	56-55-3	**1**	1	mg/kg	0.617 J	NA	NA	0.909 D	NA	0.341 D	NA	1.44 D	<0.0585 U	0.111 D	NA	NA
Benzo(a)pyrene	50-32-8	**1**	1	mg/kg	0.519 J	NA	NA	0.735 D	NA	0.336 D	NA	1.38 D	<0.0585 U	<0.0515 U	NA	NA
Benzo(b)fluoranthene	205-99-2	**1**	1	mg/kg	0.465 J	NA	NA	0.87 D	NA	0.294 D	NA	1.13 D	<0.0585 U	0.107 D	NA	NA
Benzo(g,h,i)Perylene	191-24-2	100	100	mg/kg	0.386 J	NA	NA	0.596 D	NA	0.29 D	NA	0.992 D	NA	0.0681 JD	NA	NA
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9	mg/kg	0.346 J	NA	NA	0.697 D	NA	0.305 D	NA	**0.96 D**	NA	0.0706 JD	NA	NA
Benzoic Acid	65-85-0	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Benzyl Alcohol	100-51-6	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Benzyl Butyl Phthalate	85-68-7	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Biphenyl (Diphenyl)	92-52-4	NS	NS	mg/kg	<0.0511 UJ	NA	NA	0.226 D	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Bis(2-chloroethoxy) methane	111-91-1	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Caprolactam	105-60-2	NS	NS	mg/kg	<0.102 UJ	NA	NA	<0.0948 U	NA	<0.0982 U	NA	<0.101 U	NA	<0.103 U	NA	NA
Carbazole	86-74-8	NS	NS	mg/kg	<0.0511 UJ	NA	NA	0.337 D	NA	<0.0492 U	NA	0.424 D	NA	<0.0515 U	NA	NA
Chrysene	218-01-9	**1**	1 *	mg/kg	0.563 J	NA	NA	1.01 D	<0.0479 U	0.413 D	NA	1.51 D	<0.0585 U	0.198 D	NA	NA
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33	mg/kg	0.108 J	NA	NA	0.293 D	NA	0.08 JD	NA	0.321 D	NA	<0.0515 U	NA	NA
Dibenzofuran	132-64-9	7	59	mg/kg	<0.0511 UJ	NA	NA	0.864 D	NA	<0.0492 U	NA	0.232 D	NA	<0.0515 U	NA	NA
Dibutyl phthalate	84-74-2	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Diethyl phthalate	84-66-2	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Dimethyl phthalate	131-11-3	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Dioctyl phthalate	117-84-0	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Diphenylamine	122-39-4	NS	NS	mg/kg	<0.102 UJ	NA	NA	<0.0948 U	NA	<0.0982 U	NA	<0.101 U	NA	<0.103 U	NA	NA
Fluoranthene	206-44-0	**100**	100	mg/kg	1.24 J	NA	NA	1.89 D	NA	0.482 D	NA	3.12 D	NA	0.102 JD	NA	NA
Fluorene	86-73-7	30	100	mg/kg	<0.102 U	NA	NA	0.99 D	NA	0.0502 JD	NA	0.338 D	NA	<0.0515 U	NA	NA
Hexachlorobenzene	118-74-1	0.33	1.2	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Hexachlorocyclopentadiene	77-47-4	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Hexachloroethane	67-72-1	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5	mg/kg	0.429 J	NA	NA	0.563 D	<0.0479 U	0.22 D	NA	0.87 D	<0.0585 U	<0.0515 U	NA	NA
Isophorone	78-59-1	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Naphthalene	91-20-3	12	100	mg/kg	0.057 J	NA	NA	2.53 D	NA	0.112 D	NA	0.222 D	NA	0.0747 JD	NA	NA
Nitrobenzene	98-95-3	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
n-Nitrosodimethylamine	62-75-9	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
n-Nitrosodiphenylamine	86-30-6	NS	NS	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Pentachlorophenol	87-86-5	0.8	6.7	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Phenanthrene	85-01-8	100	100	mg/kg	0.565 J	NA	NA	2.34 D	NA	0.274 D	NA	2.92 D	NA	0.183 D	NA	NA
Phenol	108-95-2	0.33	100	mg/kg	<0.0511 UJ	NA	NA	<0.0475 U	NA	<0.0492 U	NA	<0.0507 U	NA	<0.0515 U	NA	NA
Pyrene	129-00-0	**100**	100	mg/kg	1.12 J	NA	NA	1.93 D	NA	0.619 D	NA	3.25 D	NA	0.163 D	NA	NA
Pyridine	110-86-1	NS	NS	mg/kg	<0.204 UJ	NA	NA	<0.19 U	NA	<0.197 U	NA	<0.203 U	NA	<0.206 U	NA	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP15	EP15	EP15	EP16	EP16	EP17	EP17	EP18	EP18	EP19	EP19	EP19
				Sample Name	EP15_7.5_20220207	EP15_6.5	EP15_5.5	EP16_7.5_20220131	EP16_6.5	EP17_7.5_20220131	EP17_6.5	EP18_7.5_20220131	EP18_6.5	EP19_7.5_20220131	EP19_6.5	EP19_5.5_20220222
				Sample Date	02/07/2022	03/11/2022	03/22/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	02/22/2022
				Sample Elevation	7.5	6.5	5.5	7.5	6.5	7.5	6.5	7.5	6.5	7.5	6.5	5.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides																
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.0406 U	NA	NA	<0.0373 U	NA	<0.0388 U	NA	<0.0404 U	NA	<0.0406 U	NA	NA
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Endrin	72-20-8	0.014	11	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.00203 U	NA	NA	<0.00186 U	NA	<0.00194 U	NA	<0.00202 U	NA	<0.00203 U	NA	NA
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.203 U	NA	NA	<0.186 U	NA	<0.194 U	NA	<0.202 U	NA	<0.203 U	NA	NA
Herbicides																
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.0244 U	NA	NA	<0.023 U	NA	<0.0235 UJ	NA	<0.024 U	NA	<0.0245 U	NA	NA
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.0244 U	NA	NA	<0.023 U	NA	<0.0235 UJ	NA	<0.024 U	NA	<0.0245 U	NA	NA
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.0244 U	NA	NA	<0.023 U	NA	<0.0235 UJ	NA	<0.024 U	NA	<0.0245 U	NA	NA
Polychlorinated Biphenyl																
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.0205 U	NA	NA	<0.0188 U	NA	<0.0196 U	NA	<0.0204 U	NA	<0.0205 U	NA	NA
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.0205 U	NA	NA	<0.0188 U	NA	<0.0196 U	NA	<0.0204 U	NA	<0.0205 U	NA	NA
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.0205 U	NA	NA	<0.0188 U	NA	<0.0196 U	NA	<0.0204 U	NA	<0.0205 U	NA	NA
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.0205 U	NA	NA	<0.0188 U	NA	<0.0196 U	NA	<0.0204 U	NA	<0.0205 U	NA	NA
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.0205 U	NA	NA	<0.0188 U	NA	<0.0196 U	NA	<0.0204 U	NA	<0.0205 U	NA	NA
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.0205 U	NA	NA	<0.0188 U	NA	<0.0196 U	NA	<0.0204 U	NA	<0.0205 U	NA	NA
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.0205 U	NA	NA	<0.0188 U	NA	<0.0196 U	NA	<0.0204 U	NA	<0.0205 U	NA	NA
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.0205 U	NA	NA	<0.0188 U	NA	<0.0196 U	NA	<0.0204 U	NA	<0.0205 U	NA	NA
Metals																
Aluminum	7429-90-5	NS	NS	mg/kg	7,590	NA	NA	12,800	NA	8,820	NA	8,260	NA	3,480	NA	NA
Antimony	7440-36-0	NS	NS	mg/kg	3.87	NA	NA	4.29	NA	<2.97 U	NA	<3.08 U	NA	<3.12 U	NA	NA
Arsenic	7440-38-2	**13**	16	mg/kg	<1.85 U	NA	NA	5	NA	3.91	NA	7.58	NA	16.6	18.9	1.84
Barium	7440-39-3	**350**	400	mg/kg	66.9	NA	NA	77.9 J	NA	113 J	NA	184 J	NA	87.5 J	NA	NA
Beryllium	7440-41-7	7.2	72	mg/kg	<0.062 U	NA	NA	<0.058 U	NA	<0.059 U	NA	<0.062 U	NA	<0.062 U	NA	NA
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	0.53	NA	NA	<0.346 U	NA	<0.357 U	NA	<0.37 U	NA	<0.374 U	NA	NA
Calcium	7440-70-2	NS	NS	mg/kg	4,680 B	NA	NA	11,800 B	NA	16,500 B	NA	8,080 B	NA	7,660	NA	NA
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.617 U	NA	NA	<0.576 U	NA	<0.594 U	NA	<0.616 U	NA	<0.624 U	NA	NA
Chromium, Total	7440-47-3	NS	NS	mg/kg	62.3	NA	NA	56.4	NA	37.2	NA	24.7	NA	11.2	NA	NA
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	**62.3**	NA	NA	**56.4**	NA	**37.2**	NA	24.7	NA	11.2	NA	NA
Cobalt	7440-48-4	NS	NS	mg/kg	28.3	NA	NA	22.6	NA	21.5	NA	13.2	NA	6.42 J	NA	NA
Copper	7440-50-8	**50**	270	mg/kg	**77.6**	NA	NA	48.5 J	NA	**179 J**	NA	**63.6 J**	NA	36.3 J	NA	NA
Cyanide	57-12-5	27	27	mg/kg	<0.617 U	NA	NA	<0.576 U	NA	<0.594 U	NA	<0.616 U	NA	<0.624 U	NA	NA
Iron	7439-89-6	NS	NS	mg/kg	22,000	NA	NA	25,000	NA	34,300	NA	17,000	NA	16,100	NA	NA
Lead	7439-92-1	**63**	400	mg/kg	**118**	NA	NA	**117**	NA	430	**78.7**	**375**	NA	53.8	NA	NA
Magnesium	7439-95-4	NS	NS	mg/kg	27,800	NA	NA	9,050 B	NA	8,400 B	NA	5,920 B	NA	1,880	NA	NA
Manganese	7439-96-5	1600	2000	mg/kg	159	NA	NA	507	NA	364	NA	157	NA	58 J	NA	NA
Mercury	7439-97-6	**0.18**	0.81	mg/kg	**0.379**	NA	NA	0.0958	NA	1.89	0.0869	0.116	NA	0.127	NA	NA
Nickel	7440-02-0	**30**	310	mg/kg	496	563 J	**284 J**	**231 J**	NA	**229 J**	NA	**128 J**	NA	24.3 J	NA	NA
Potassium	7440-09-7	NS	NS	mg/kg	963 B	NA	NA	1,480 B	NA	1,020 B	NA	893 B	NA	562 B	NA	NA
Selenium	7782-49-2	3.9	180	mg/kg	<3.09 U	NA	NA	<2.88 U	NA	<2.97 U	NA	<3.08 U	NA	<3.12 U	NA	NA
Silver	7440-22-4	2	180	mg/kg	<0.617 U	NA	NA	<0.576 U	NA	0.715	NA	<0.616 U	NA	<0.624 U	NA	NA
Sodium	7440-23-5	NS	NS	mg/kg	217	NA	NA	286	NA	392	NA	411	NA	182	NA	NA
Thallium	7440-28-0	NS	NS	mg/kg	<3.09 U	NA	NA	<2.88 U	NA	<2.97 U	NA	<3.08 U	NA	<3.12 U	NA	NA
Vanadium	7440-62-2	NS	NS	mg/kg	28.9	NA	NA	37.7	NA	33.9	NA	25.7	NA	17.4	NA	NA
Zinc	7440-66-6	**109**	10000	mg/kg	**373 B**	NA	NA	**136**	NA	**169**	NA	**111**	NA	51.3	NA	NA
General Chemistry																
Solids, Percent	SOLID	NS	NS	Percent	81	75.7	86.4	86.8	87	84.1	84	81.1	70.8	80.2	68.7	85.8

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP15	EP15	EP15	EP16	EP16	EP17	EP17	EP18	EP18	EP19	EP19	EP19
				Sample Name	EP15_7.5_20220207	EP15_6.5	EP15_5.5	EP16_7.5_20220131	EP16_6.5	EP17_7.5_20220131	EP17_6.5	EP18_7.5_20220131	EP18_6.5	EP19_7.5_20220131	EP19_6.5	EP19_5.5_20220222
				Sample Date	02/07/2022	03/11/2022	03/22/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	01/31/2022	02/09/2022	02/22/2022
				Sample Elevation	7.5	6.5	5.5	7.5	6.5	7.5	6.5	7.5	6.5	7.5	6.5	5.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids																
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000304 UJ	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	0.000368 J	NA	NA	0.000413	NA	0.000482	NA	0.000288	NA	0.000454	NA	NA
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	<0.000304 U	NA	NA	0.000383	NA	0.000376	NA	**0.000739**	NA	**0.00113**	NA	NA
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 U	NA	<0.000252 U	NA	<0.000268 U	NA	NA
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000304 U	NA	NA	<0.000247 U	NA	<0.000268 UJ	NA	<0.000252 U	NA	<0.000268 U	NA	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP20	EP21	EP21	EP22	EP22	EP22	EP23	EP23	EP23	EP24	EP25	EP26
				Sample Name	EP20_7.5	EP21_7.0_20220211	EP21_6.0_20220221	EP22_7.5_20220211	EP22_6.5_20220221	EP22_5.5	DUP04_03092022	EP23_7.5	DUP04_03102022	EP24_7.5	EP25_7.5	EP26_0.5
				Sample Date	02/10/2022	02/11/2022	02/21/2022	02/11/2022	02/21/2022	02/24/2022	03/09/2022	03/10/2022	03/10/2022	03/10/2022	02/04/2022	03/16/2022
				Sample Elevation	7.5	7	6	7.5	6.5	5.5	7.5	7.5	7.5	7.5	7.5	0.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 U
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 U
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0024 UJ	<0.0028 UJ	NA	<0.0029 UJ	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	0.028	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 U
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	0.0073	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.048 U	<0.056 U	NA	<0.058 U	NA	NA	<0.046 U	<0.054 U	NA	<0.06 U	<0.062 U	<0.056 U
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Acetone	67-64-1	**0.05**	100	mg/kg	0.011	0.017	NA	0.014	NA	NA	0.014	0.032	NA	0.014	0.028	0.039
Acrolein	107-02-8	NS	NS	mg/kg	<0.0048 U	<0.0056 U	NA	<0.0058 U	NA	NA	<0.0046 U	<0.0054 U	NA	<0.006 U	<0.0062 U	<0.0056 U
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Bromoform	75-25-2	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 U
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 U
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 U
Chloroform	67-66-3	0.37	49	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 U
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Cyclohexane	110-82-7	NS	NS	mg/kg	0.0044 J	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 U
Ethylbenzene	100-41-4	1	41	mg/kg	0.0055	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	0.0068	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
M,P-Xylene	179601-23-1	NS	NS	mg/kg	0.027	<0.0056 U	NA	<0.0058 U	NA	NA	<0.0046 U	<0.0054 U	NA	<0.006 U	<0.0062 U	<0.0056 U
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	0.0036 J	0.0093	<0.0028 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	0.0049 J	NA	<0.003 U	0.0053 J	0.0054 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Methylcyclohexane	108-87-2	NS	NS	mg/kg	0.091	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	<0.0048 U	0.01 J	NA	0.0062 J	NA	NA	<0.034 U	<0.015 U	NA	<0.006 U	<0.0062 U	0.015
n-Butylbenzene	104-51-8	12	100	mg/kg	0.0063	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
n-Propylbenzene	103-65-1	3.9	100	mg/kg	0.014	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	0.014	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 U
Sec-Butylbenzene	135-98-8	11	100	mg/kg	0.0089	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Styrene	100-42-5	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0024 UJ	<0.0028 UJ	NA	<0.0029 UJ	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 UJ
Toluene	108-88-3	**0.7**	100	mg/kg	0.0049	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	0.042	<0.0084 U	NA	<0.0087 U	NA	NA	<0.0068 U	<0.0081 U	NA	<0.009 U	<0.0094 U	<0.0084 U
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 U
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 U	<0.0031 U	<0.0028 UJ
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 U
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0024 U	<0.0028 U	NA	<0.0029 U	NA	NA	<0.0023 U	<0.0027 U	NA	<0.003 UJ	<0.0031 U	<0.0028 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP20	EP21	EP21	EP22	EP22	EP22	EP23	EP23	EP23	EP24	EP25	EP26
				Sample Name	EP20_7.5	EP21_7.0_20220211	EP21_6.0_20220221	EP22_7.5_20220211	EP22_6.5_20220221	EP22_5.5	DUP04_03092022	EP23_7.5	DUP04_03102022	EP24_7.5	EP25_7.5	EP26_0.5
				Sample Date	02/10/2022	02/11/2022	02/21/2022	02/11/2022	02/21/2022	02/24/2022	03/09/2022	03/10/2022	03/10/2022	03/10/2022	02/04/2022	03/16/2022
				Sample Elevation	7.5	7	6	7.5	6.5	5.5	7.5	7.5	7.5	7.5	7.5	0.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds																
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS	mg/kg	<0.503 U	<0.0959 U	NA	<0.0879 U	NA	NA	<0.0898 U	<0.0909 U	NA	<0.098 U	<0.123 U	<0.0926 U
1,2-Diphenylhydrazine	122-66-7	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.0196 U	<0.019 U	NA	<0.0183 U	NA	NA	<0.0198 U	<0.0187 U	NA	<0.0189 U	<0.0194 U	<0.0187 U
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS	mg/kg	<0.503 U	<0.0959 U	NA	<0.0879 U	NA	NA	<0.0898 U	<0.0909 U	NA	<0.098 U	<0.123 U	<0.0926 U
2,4,5-Trichlorophenol	95-95-4	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
2,4,6-Trichlorophenol	88-06-2	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
2,4-Dichlorophenol	120-83-2	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
2,4-Dimethylphenol	105-67-9	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
2,4-Dinitrophenol	51-28-5	NS	NS	mg/kg	<0.503 UJ	<0.0959 U	NA	<0.0879 U	NA	NA	<0.0898 UJ	<0.0909 UJ	NA	<0.098 UJ	<0.123 UJ	<0.0926 U
2,4-Dinitrotoluene	121-14-2	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
2,6-Dinitrotoluene	606-20-2	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
2-Chloronaphthalene	91-58-7	NS	NS	mg/kg	<0.252 U	<0.0481 UJ	NA	<0.0441 UJ	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
2-Chlorophenol	95-57-8	NS	NS	mg/kg	<0.252 U	<0.0481 UJ	NA	<0.0441 UJ	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
2-Methylnaphthalene	91-57-6	NS	NS	mg/kg	<0.252 U	0.0506 JD	NA	0.0899 D	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
2-Methylphenol (o-Cresol)	95-48-7	0.33	100	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
2-Nitroaniline	88-74-4	NS	NS	mg/kg	<0.503 U	<0.0959 U	NA	<0.0879 U	NA	NA	<0.0898 U	<0.0909 U	NA	<0.098 U	<0.123 U	<0.0926 U
2-Nitrophenol	88-75-5	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100	mg/kg	<0.252 U	<0.0481 UJ	NA	<0.0441 UJ	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
3,3'-Dichlorobenzidine	91-94-1	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
3-Nitroaniline	99-09-2	NS	NS	mg/kg	<0.503 U	<0.0959 U	NA	<0.0879 U	NA	NA	<0.0898 U	<0.0909 U	NA	<0.098 U	<0.123 U	<0.0926 U
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS	mg/kg	<0.503 U	<0.0959 U	NA	<0.0879 U	NA	NA	<0.0898 UJ	<0.0909 UJ	NA	<0.098 UJ	<0.123 UJ	<0.0926 U
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
4-Chloro-3-Methylphenol	59-50-7	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
4-Chloroaniline	106-47-8	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
4-Nitroaniline	100-01-6	NS	NS	mg/kg	<0.503 U	<0.0959 U	NA	<0.0879 U	NA	NA	<0.0898 U	<0.0909 U	NA	<0.098 U	<0.123 U	<0.0926 U
4-Nitrophenol	100-02-7	NS	NS	mg/kg	<0.503 U	<0.0959 U	NA	<0.0879 U	NA	NA	<0.0898 U	<0.0909 U	NA	<0.098 U	<0.123 U	<0.0926 U
Acenaphthene	83-32-9	20	100	mg/kg	<0.252 U	0.0989 J	NA	0.196 J	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Acenaphthylene	208-96-8	100	100	mg/kg	<0.252 U	0.818 J	NA	0.994 J	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	0.1 JD	<0.0464 U
Acetophenone	98-86-2	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS	mg/kg	<1.01 U	<0.192 U	NA	<0.176 U	NA	NA	<0.18 U	<0.182 U	NA	<0.196 U	<0.246 U	<0.185 U
Anthracene	120-12-7	100	100	mg/kg	<0.252 U	0.847 J	NA	2.62 J	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	0.126 D	<0.0464 U
Atrazine	1912-24-9	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Benzaldehyde	100-52-7	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Benzidine	92-87-5	NS	NS	mg/kg	<1.01 U	<0.192 U	NA	<0.176 U	NA	NA	<0.18 U	<0.182 U	NA	<0.196 U	<0.246 U	<0.185 U
Benzo(a)anthracene	56-55-3	**1**	1	mg/kg	0.33 JD	3.98 J	0.0695 JD	9.98 J	1.03 D	0.298 D	0.0768 JD	<0.0456 U	NA	0.144 D	0.544 D	<0.0464 U
Benzo(a)pyrene	50-32-8	**1**	1	mg/kg	0.362 JD	4.92 D	0.0874 JD	10.6 D	1.31 D	0.277 J	0.0596 JD	<0.0456 U	NA	0.136 D	0.714 D	<0.0464 U
Benzo(b)fluoranthene	205-99-2	**1**	1	mg/kg	0.293 JD	3.96 D	0.0781 JD	8.47 D	0.954 D	NA	<0.045 U	<0.0456 U	NA	0.0948 JD	0.593 D	<0.0464 U
Benzo(g,h,i)Perylene	191-24-2	100	100	mg/kg	0.305 JD	2.84 D	NA	5.6 D	NA	NA	<0.045 U	<0.0456 U	NA	0.0925 JD	0.423 D	<0.0464 U
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9	mg/kg	<0.252 U	**3.69 D**	NA	8.05 D	**1.12 D**	NA	0.051 JD	<0.0456 U	NA	0.105 D	0.515 D	<0.0464 U
Benzoic Acid	65-85-0	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Benzyl Alcohol	100-51-6	NS	NS	mg/kg	<0.252 U	<0.0481 UJ	NA	<0.0441 UJ	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Benzyl Butyl Phthalate	85-68-7	NS	NS	mg/kg	<0.252 U	0.0605 JD	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Biphenyl (Diphenyl)	92-52-4	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Bis(2-chloroethoxy) methane	111-91-1	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS	mg/kg	<0.252 U	0.0552 JD	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Caprolactam	105-60-2	NS	NS	mg/kg	<0.503 U	<0.0959 U	NA	<0.0879 U	NA	NA	<0.0898 U	<0.0909 U	NA	<0.098 U	<0.123 U	<0.0926 U
Carbazole	86-74-8	NS	NS	mg/kg	<0.252 U	0.384 J	NA	0.538 J	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Chrysene	218-01-9	**1**	1 *	mg/kg	0.378 JD	4 J	0.0671 JD	9.18 J	1.13 D	0.274 D	0.0768 JD	<0.0456 U	NA	0.149 D	0.567 D	<0.0464 U
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33	mg/kg	<0.252 U	0.605 D	<0.049 U	1.4 D	0.12 D	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	0.141 D	<0.0464 U
Dibenzofuran	132-64-9	7	59	mg/kg	<0.252 U	<0.0481 UJ	NA	<0.0441 UJ	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Dibutyl phthalate	84-74-2	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Diethyl phthalate	84-66-2	NS	NS	mg/kg	<0.252 U	<0.0481 UJ	NA	<0.0441 UJ	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Dimethyl phthalate	131-11-3	NS	NS	mg/kg	<0.252 U	<0.0481 UJ	NA	<0.0441 UJ	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Dioctyl phthalate	117-84-0	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Diphenylamine	122-39-4	NS	NS	mg/kg	<0.503 U	<0.0959 UJ	NA	<0.0879 UJ	NA	NA	<0.0898 U	<0.0909 U	NA	<0.098 U	<0.123 U	<0.0926 U
Fluoranthene	206-44-0	**100**	100	mg/kg	0.784 D	8.91 J	NA	21.9 J	NA	NA	0.126 D	0.064 JD	NA	0.292 D	1.12 D	<0.0464 U
Fluorene	86-73-7	30	100	mg/kg	<0.252 U	0.226 J	NA	0.424 J	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Hexachlorobenzene	118-74-1	0.33	1.2	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Hexachlorocyclopentadiene	77-47-4	NS	NS	mg/kg	<0.252 UJ	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 UJ	<0.0464 U
Hexachloroethane	67-72-1	NS	NS	mg/kg	<0.252 U	<0.0481 UJ	NA	<0.0441 UJ	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5	mg/kg	<0.252 U	3.63 D	0.064 JD	6.67 D	0.801 D	0.161 D	0.051 JD	<0.0456 U	NA	0.0948 JD	0.468 D	<0.0464 U
Isophorone	78-59-1	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Naphthalene	91-20-3	12	100	mg/kg	<0.252 U	0.145 D	NA	0.261 D	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Nitrobenzene	98-95-3	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
n-Nitrosodimethylamine	62-75-9	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS	mg/kg	<0.252 U	<0.0481 UJ	NA	<0.0441 UJ	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
n-Nitrosodiphenylamine	86-30-6	NS	NS	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Pentachlorophenol	87-86-5	0.8	6.7	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 U	<0.0456 U	NA	<0.0491 U	<0.0616 U	<0.0464 U
Phenanthrene	85-01-8	100	100	mg/kg	0.458 JD	2.92 J	NA	7.38 J	NA	NA	0.0567 JD	<0.0456 U	NA	0.115 D	0.44 D	<0.0464 U
Phenol	108-95-2	0.33	100	mg/kg	<0.252 U	<0.0481 U	NA	<0.0441 U	NA	NA	<0.045 UJ	<0.0456 UJ	NA	<0.0491 UJ	<0.0616 U	<0.0464 U
Pyrene	129-00-0	**100**	100	mg/kg	0.707 D	6.68 D	NA	15.4 D	NA	NA	0.111 D	<0.0456 U	NA	0.306 D	0.916 D	<0.0464 U
Pyridine	110-86-1	NS	NS	mg/kg	<1.01 U	<0.192 U	NA	<0.176 U	NA	NA	<0.18 U	<0.182 U	NA	<0.196 U	<0.246 U	<0.185 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP20	EP21	EP21	EP22	EP22	EP22	EP23	EP23	EP23	EP24	EP25	EP26
				Sample Name	EP20_7.5	EP21_7.0_20220211	EP21_6.0_20220221	EP22_7.5_20220211	EP22_6.5_20220221	EP22_5.5	DUP04_03092022	EP23_7.5	DUP04_03102022	EP24_7.5	EP25_7.5	EP26_0.5
				Sample Date	02/10/2022	02/11/2022	02/21/2022	02/11/2022	02/21/2022	02/24/2022	03/09/2022	03/10/2022	03/10/2022	03/10/2022	02/04/2022	03/16/2022
				Sample Elevation	7.5	7	6	7.5	6.5	5.5	7.5	7.5	7.5	7.5	7.5	0.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides																
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	**0.00695 D**	<0.0018 U
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.0395 U	<0.0384 U	NA	<0.0351 U	NA	NA	<0.0364 U	<0.0361 UJ	NA	<0.0387 U	<0.0491 U	<0.0359 U
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Endrin	72-20-8	0.014	11	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.00198 U	<0.00192 U	NA	<0.00176 U	NA	NA	<0.00182 U	<0.00181 UJ	NA	<0.00193 U	<0.00246 U	<0.0018 U
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.198 U	<0.192 U	NA	<0.176 U	NA	NA	<0.182 U	<0.181 UJ	NA	<0.193 U	<0.246 U	<0.18 U
Herbicides																
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.0241 UJ	<0.0229 UJ	NA	<0.021 UJ	NA	NA	<0.0216 U	<0.0218 U	NA	<0.0238 U	<0.0295 U	<0.0218 U
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.0241 UJ	<0.0229 UJ	NA	<0.021 UJ	NA	NA	<0.0216 U	<0.0218 U	NA	<0.0238 U	<0.0295 U	<0.0218 U
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.0241 UJ	<0.0229 UJ	NA	<0.021 UJ	NA	NA	<0.0216 U	<0.0218 U	NA	<0.0238 U	<0.0295 U	<0.0218 U
Polychlorinated Biphenyl																
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.02 U	<0.0194 U	NA	<0.0177 U	NA	NA	<0.0184 U	<0.0182 U	NA	<0.0195 U	<0.0248 U	<0.0181 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.02 U	<0.0194 U	NA	<0.0177 U	NA	NA	<0.0184 U	<0.0182 U	NA	<0.0195 U	<0.0248 U	<0.0181 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.02 U	<0.0194 U	NA	<0.0177 U	NA	NA	<0.0184 U	<0.0182 U	NA	<0.0195 U	<0.0248 U	<0.0181 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.02 U	<0.0194 U	NA	<0.0177 U	NA	NA	<0.0184 U	<0.0182 U	NA	<0.0195 U	<0.0248 U	<0.0181 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.02 U	<0.0194 U	NA	<0.0177 U	NA	NA	<0.0184 U	<0.0182 U	NA	<0.0195 U	<0.0248 U	<0.0181 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.02 U	<0.0194 U	NA	<0.0177 U	NA	NA	<0.0184 U	<0.0182 U	NA	<0.0195 U	<0.0248 U	<0.0181 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.02 U	<0.0194 U	NA	<0.0177 U	NA	NA	<0.0184 U	<0.0182 U	NA	<0.0195 U	<0.0248 U	<0.0181 U
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.02 U	<0.0194 U	NA	<0.0177 U	NA	NA	<0.0184 U	<0.0182 U	NA	<0.0195 U	<0.0248 U	<0.0181 U
Metals																
Aluminum	7429-90-5	NS	NS	mg/kg	8,660 B	8,470	NA	<5.36 U	NA	NA	5,980	5,450	NA	5,950 J	8,470	5,940 B
Antimony	7440-36-0	NS	NS	mg/kg	<3.02 U	<2.92 U	NA	<2.68 U	NA	NA	3.13	<2.76 U	NA	10.7 J	7.3	<2.78 U
Arsenic	7440-38-2	**13**	16	mg/kg	4.83	6.61	NA	<1.61 U	NA	NA	<1.66 U	<1.66 U	NA	3.48 J	9.78	<1.67 U
Barium	7440-39-3	**350**	400	mg/kg	111 J	220	NA	<2.68 U	NA	NA	39.7	37.5	NA	59.2 J	108	35
Beryllium	7440-41-7	7.2	72	mg/kg	<0.06 U	<0.058 U	NA	<0.054 U	NA	NA	<0.055 U	<0.055 U	NA	<0.06 U	<0.075 U	<0.056 U
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	0.505	<0.351 U	NA	<0.321 U	NA	NA	<0.332 U	<0.331 U	NA	<0.361 U	2.49	<0.334 U
Calcium	7440-70-2	NS	NS	mg/kg	22,600	30,700 B	NA	<5.36 U	NA	NA	1,930	1,870	NA	9,610 J	23,700 B	1,240
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.605 U	<0.584 U	NA	<0.536 U	NA	NA	<0.553 U	<0.552 U	NA	<0.602 UJ	<0.755 U	<0.557 U
Chromium, Total	7440-47-3	NS	NS	mg/kg	31.9	27.9	NA	<0.536 U	NA	NA	17	16.2	NA	36.4 J	40.1	46.2 B
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	**31.9**	27.9	NA	<0.5 U	NA	NA	17	16.2	NA	**36.4**	**40.1**	**41.5**
Cobalt	7440-48-4	NS	NS	mg/kg	17.3 J	12.8	NA	<0.429 U	NA	NA	9.27	7.86	NA	16.2 J	17.1	15.2
Copper	7440-50-8	**50**	270	mg/kg	**74.3 J**	**65.8 J**	NA	<2.14 U	NA	NA	28.6 J	27.2 J	NA	**50.5 J**	**76**	27.6
Cyanide	57-12-5	27	27	mg/kg	<0.605 U	<0.584 U	NA	<0.536 U	NA	NA	<0.553 U	<0.552 U	NA	<0.602 U	<0.755 U	<0.557 U
Iron	7439-89-6	NS	NS	mg/kg	19,200	23,000	NA	<26.8 U	NA	NA	15,300	13,700	NA	16,500	24,000 B	14,600
Lead	7439-92-1	**63**	400	mg/kg	**209 J**	**322**	NA	<0.536 U	NA	NA	9.02	13.9	NA	**133 J**	**296**	6.91
Magnesium	7439-95-4	NS	NS	mg/kg	11,400	8,730	NA	<5.36 U	NA	NA	3,470	3,350	NA	14,500 J	14,100	7,020
Manganese	7439-96-5	1600	2000	mg/kg	365 J	295	NA	<0.536 U	NA	NA	225	269	NA	180 J	233	187
Mercury	7439-97-6	**0.18**	0.81	mg/kg	**0.372**	**0.314**	NA	**0.276**	NA	NA	0.103	0.134	NA	**0.453**	**0.796**	0.0369
Nickel	7440-02-0	**30**	310	mg/kg	**185 J**	**101 J**	NA	<1.07 U	NA	NA	**79.2 J**	**69.4 J**	NA	**237 J**	**220 J**	**246**
Potassium	7440-09-7	NS	NS	mg/kg	928 B	1,040 B	NA	10.4 J	NA	NA	1,260	1,090	NA	832 J	890	824
Selenium	7782-49-2	3.9	180	mg/kg	<3.02 U	<2.92 U	NA	<2.68 U	NA	NA	<2.76 U	<2.76 U	NA	<3.01 U	<3.77 U	<2.78 UJ
Silver	7440-22-4	2	180	mg/kg	0.801	0.869	NA	<0.536 U	NA	NA	<0.553 U	<0.552 U	NA	<0.602 UJ	<0.755 U	<0.557 U
Sodium	7440-23-5	NS	NS	mg/kg	424	399	NA	<53.6 U	NA	NA	132	121	NA	547 J	502	170
Thallium	7440-28-0	NS	NS	mg/kg	<3.02 U	<2.92 U	NA	<2.68 U	NA	NA	<2.76 U	<2.76 U	NA	<3.01 U	<3.77 U	<2.78 U
Vanadium	7440-62-2	NS	NS	mg/kg	34.4	33.5	NA	<1.07 U	NA	NA	27.2	27.1	NA	22.3 J	27.9	22.5
Zinc	7440-66-6	**109**	10000	mg/kg	**202**	**171**	NA	<2.68 U	NA	NA	28.8	28.6	NA	**123 J**	**529**	20.5
General Chemistry																
Solids, Percent	SOLID	NS	NS	Percent	82.7	85.6	84.8	93.3	81.4	91.5	90.4	90.5	88.7	83.1	66.3	89.8

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP20	EP21	EP21	EP22	EP22	EP22	EP23	EP23	EP23	EP24	EP25	EP26
				Sample Name	EP20_7.5	EP21_7.0_20220211	EP21_6.0_20220221	EP22_7.5_20220211	EP22_6.5_20220221	EP22_5.5	DUP04_03092022	EP23_7.5	DUP04_03102022	EP24_7.5	EP25_7.5	EP26_0.5
				Sample Date	02/10/2022	02/11/2022	02/21/2022	02/11/2022	02/21/2022	02/24/2022	03/09/2022	03/10/2022	03/10/2022	03/10/2022	02/04/2022	03/16/2022
				Sample Elevation	7.5	7	6	7.5	6.5	5.5	7.5	7.5	7.5	7.5	7.5	0.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids																
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	0.00125	<0.000269 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	0.000324	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	0.000638	<0.000269 U
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	<0.000282 U	**0.000829**	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 U	<0.000269 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000282 U	<0.000276 U	NA	<0.000255 U	NA	NA	NA	<0.000277 U	<0.000263 U	<0.00031 U	<0.000345 UJ	<0.000269 U

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Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP27	EP27	EP28	EP29	EP29	EP30	EP30	EP30	EP30	EP31	EP31
				Sample Name	EP27_7.5	EP-27_6.5_20220214	EP28_0.5	EP29_7.5_20220201	EP29_6.5_20220222	EP30_7.5	DUP02_021022	EP30_6.5_20220221	EP30_5.5	EP31_7.5	EP31_6.5_20220221
				Sample Date	02/03/2022	02/14/2022	03/22/2022	02/01/2022	02/22/2022	02/10/2022	02/10/2022	02/21/2022	02/24/2022	02/10/2022	02/21/2022
				Sample Elevation	7.5	6.5	0.5	7.5	6.5	7.5	7.5	6.5	5.5	7.5	6.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds															
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 UJ	<0.0027 UJ	NA	NA	<0.0025 UJ	NA
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.046 U	NA	<0.038 U	<0.081 U	NA	<0.048 U	<0.053 U	NA	NA	<0.05 U	NA
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Acetone	67-64-1	**0.05**	100	mg/kg	0.011	NA	0.0072 J	<0.0081 U	NA	0.017 J	0.0062 J	NA	NA	0.013	NA
Acrolein	107-02-8	NS	NS	mg/kg	<0.0046 U	NA	<0.0038 UJ	<0.0081 U	NA	<0.0048 U	<0.0053 U	NA	NA	<0.005 U	NA
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Bromoform	75-25-2	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 UJ	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Chloroform	67-66-3	0.37	49	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 UJ	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Cyclohexane	110-82-7	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 UJ	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Ethylbenzene	100-41-4	1	41	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
M,P-Xylene	179601-23-1	NS	NS	mg/kg	<0.0046 U	NA	<0.0038 U	<0.0081 U	NA	<0.0048 U	<0.0053 U	NA	NA	<0.005 U	NA
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	<0.0023 U	NA	0.0022 J	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0023 UJ	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Methylcyclohexane	108-87-2	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	<0.0046 U	NA	0.0073 J	<0.0081 U	NA	0.0062 J	0.0097 J	NA	NA	<0.005 U	NA
n-Butylbenzene	104-51-8	12	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
n-Propylbenzene	103-65-1	3.9	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Sec-Butylbenzene	135-98-8	11	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Styrene	100-42-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 UJ	<0.0027 UJ	NA	NA	<0.0025 UJ	NA
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Toluene	108-88-3	**0.7**	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	0.003 J	NA
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	<0.0069 U	NA	<0.0057 U	<0.012 U	NA	<0.0072 U	<0.008 U	NA	NA	<0.0075 U	NA
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0023 U	NA	<0.0019 U	<0.004 U	NA	<0.0024 U	<0.0027 U	NA	NA	<0.0025 U	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs		Location	EP27	EP27	EP28	EP29	EP29	EP30	EP30	EP30	EP30	EP31	EP31
					Sample Name	EP27_7.5	EP-27_6.5_20220214	EP28_0.5	EP29_7.5_20220201	EP29_6.5_20220222	EP30_7.5	DUP02_021022	EP30_6.5_20220221	EP30_5.5	EP31_7.5	EP31_6.5_20220221
					Sample Date	02/03/2022	02/14/2022	03/22/2022	02/01/2022	02/22/2022	02/10/2022	02/10/2022	02/21/2022	02/24/2022	02/10/2022	02/21/2022
					Sample Elevation	7.5	6.5	0.5	7.5	6.5	7.5	7.5	6.5	5.5	7.5	6.5
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds																
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS		mg/kg	<0.602 U	NA	<0.0939 U	<0.106 U	NA	<0.463 U	<0.47 U	NA	NA	<0.478 U	NA
1,2-Diphenylhydrazine	122-66-7	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13		mg/kg	<0.0194 UJ	NA	<0.0192 UJ	<0.019 U	NA	<0.0189 U	<0.0196 U	NA	NA	<0.0198 U	NA
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS		mg/kg	<0.602 U	NA	<0.0939 UJ	<0.106 U	NA	<0.463 U	<0.47 U	NA	NA	<0.478 U	NA
2,4,5-Trichlorophenol	95-95-4	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
2,4,6-Trichlorophenol	88-06-2	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
2,4-Dichlorophenol	120-83-2	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
2,4-Dimethylphenol	105-67-9	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	0.183 D	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
2,4-Dinitrophenol	51-28-5	NS	NS		mg/kg	<0.602 UJ	NA	<0.0939 UJ	<0.106 U	NA	<0.463 UJ	<0.47 UJ	NA	NA	<0.478 UJ	NA
2,4-Dinitrotoluene	121-14-2	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
2,6-Dinitrotoluene	606-20-2	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
2-Chloronaphthalene	91-58-7	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
2-Chlorophenol	95-57-8	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
2-Methylnaphthalene	91-57-6	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	0.687 D	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
2-Methylphenol (o-Cresol)	95-48-7	0.33	100		mg/kg	<0.302 U	NA	<0.047 U	0.0685 JD	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
2-Nitroaniline	88-74-4	NS	NS		mg/kg	<0.602 U	NA	<0.0939 U	<0.106 U	NA	<0.463 U	<0.47 U	NA	NA	<0.478 U	NA
2-Nitrophenol	88-75-5	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100		mg/kg	<0.302 U	NA	<0.047 U	0.304 D	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
3,3'-Dichlorobenzidine	91-94-1	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
3-Nitroaniline	99-09-2	NS	NS		mg/kg	<0.602 U	NA	<0.0939 U	<0.106 U	NA	<0.463 U	<0.47 U	NA	NA	<0.478 U	NA
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS		mg/kg	<0.602 UJ	NA	<0.0939 U	<0.106 U	NA	<0.463 U	<0.47 U	NA	NA	<0.478 U	NA
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
4-Chloro-3-Methylphenol	59-50-7	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
4-Chloroaniline	106-47-8	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
4-Nitroaniline	100-01-6	NS	NS		mg/kg	<0.602 U	NA	<0.0939 U	<0.106 U	NA	<0.463 U	<0.47 U	NA	NA	<0.478 U	NA
4-Nitrophenol	100-02-7	NS	NS		mg/kg	<0.602 U	NA	<0.0939 U	<0.106 U	NA	<0.463 U	<0.47 U	NA	NA	<0.478 U	NA
Acenaphthene	83-32-9	20	100		mg/kg	<0.302 U	NA	<0.047 U	2.89 D	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Acenaphthylene	208-96-8	100	100		mg/kg	0.875 D	NA	<0.047 U	3.12 D	NA	0.389 JD	0.484 D	NA	NA	0.749 D	NA
Acetophenone	98-86-2	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS		mg/kg	<1.2 U	NA	<0.188 U	<0.212 U	NA	<0.927 U	<0.94 U	NA	NA	<0.957 U	NA
Anthracene	120-12-7	100	100		mg/kg	0.587 JD	NA	<0.047 U	22 D	NA	0.344 JD	0.342 JD	NA	NA	0.745 D	NA
Atrazine	1912-24-9	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Benzaldehyde	100-52-7	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Benzidine	92-87-5	NS	NS		mg/kg	<1.2 U	NA	<0.188 UJ	<0.212 U	NA	<0.927 U	<0.94 U	NA	NA	<0.957 U	NA
Benzo(a)anthracene	56-55-3	**1**	1		mg/kg	2.13 D	0.48 D	<0.047 U	76.8 D	0.708 J	1.34 D	1.59 D	0.965 D	NA	2.92 D	<0.0487 U
Benzo(a)pyrene	50-32-8	**1**	1		mg/kg	2.47 D	0.566 D	<0.047 U	70.9 D	0.59 J	1.53 D	1.9 D	0.974 D	NA	3.31 D	<0.0487 U
Benzo(b)fluoranthene	205-99-2	**1**	1		mg/kg	2.12 D	0.448 D	<0.047 U	57.1 D	0.387 J	1.18 D	1.47 D	0.746 D	NA	2.52 D	<0.0487 U
Benzo(g,h,i)Perylene	191-24-2	100	100		mg/kg	1.53 D	NA	<0.047 U	41.8 D	NA	1.24 D	1.8 D	NA	NA	2.68 D	NA
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9		mg/kg	**2.18 D**	NA	<0.047 U	45.7 D	0.442 J	**1.23 D**	**1.54 D**	NA	NA	**2.98 D**	NA
Benzoic Acid	65-85-0	NS	NS		mg/kg	<0.302 UJ	NA	<0.047 UJ	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Benzyl Alcohol	100-51-6	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Benzyl Butyl Phthalate	85-68-7	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Biphenyl (Diphenyl)	92-52-4	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	0.244 D	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Bis(2-chloroethoxy) methane	111-91-1	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Caprolactam	105-60-2	NS	NS		mg/kg	<0.602 U	NA	<0.0939 UJ	<0.106 U	NA	<0.463 U	<0.47 U	NA	NA	<0.478 U	NA
Carbazole	86-74-8	NS	NS		mg/kg	0.322 JD	NA	<0.047 U	3.19 D	NA	<0.232 U	<0.235 U	NA	NA	0.493 D	NA
Chrysene	218-01-9	**1**	1	*	mg/kg	2.73 D	0.459 J	<0.047 U	63.9 D	0.756 J	1.42 D	1.66 D	0.933 D	NA	3.22 D	<0.0487 U
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33		mg/kg	0.534 JD	0.133 D	<0.047 U	17.1 D	0.102 J	0.244 JD	0.451 JD	0.134 D	NA	0.722 D	<0.0487 U
Dibenzofuran	132-64-9	7	59		mg/kg	<0.302 U	NA	<0.047 U	2.42 D	NA	<0.232 U	<0.235 U	NA	NA	0.245 JD	NA
Dibutyl phthalate	84-74-2	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Diethyl phthalate	84-66-2	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Dimethyl phthalate	131-11-3	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Dioctyl phthalate	117-84-0	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Diphenylamine	122-39-4	NS	NS		mg/kg	<0.602 U	NA	<0.0939 U	<0.106 U	NA	<0.463 U	<0.47 U	NA	NA	<0.478 U	NA
Fluoranthene	206-44-0	**100**	100		mg/kg	5.62 D	NA	<0.047 U	158 D	1.22 J	3.04 D	3.16 D	NA	NA	7.69 D	NA
Fluorene	86-73-7	30	100		mg/kg	0.476 JD	NA	<0.047 U	5.39 D	NA	<0.232 U	<0.235 U	NA	NA	0.302 JD	NA
Hexachlorobenzene	118-74-1	0.33	1.2		mg/kg	<0.302 U	NA	<0.047 UJ	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Hexachlorobutadiene	87-68-3	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Hexachlorocyclopentadiene	77-47-4	NS	NS		mg/kg	<0.302 UJ	NA	<0.047 UJ	<0.053 U	NA	<0.232 UJ	<0.235 UJ	NA	NA	<0.24 UJ	NA
Hexachloroethane	67-72-1	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5		mg/kg	1.41 D	0.384 D	<0.047 U	52 D	0.273 J	1.03 D	1.27 D	0.566 D	<0.0471 U	2.32 D	<0.0487 U
Isophorone	78-59-1	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Naphthalene	91-20-3	12	100		mg/kg	0.414 JD	NA	<0.047 U	1.29 D	NA	<0.232 U	<0.235 U	NA	NA	0.31 JD	NA
Nitrobenzene	98-95-3	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
n-Nitrosodimethylamine	62-75-9	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
n-Nitrosodiphenylamine	86-30-6	NS	NS		mg/kg	<0.302 U	NA	<0.047 U	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Pentachlorophenol	87-86-5	0.8	6.7		mg/kg	<0.302 U	NA	<0.047 UJ	<0.053 U	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Phenanthrene	85-01-8	100	100		mg/kg	3.07 D	NA	<0.047 U	82.5 D	NA	1.45 D	1.51 D	NA	NA	4.6 D	NA
Phenol	108-95-2	0.33	100		mg/kg	<0.302 U	NA	<0.047 U	0.108 D	NA	<0.232 U	<0.235 U	NA	NA	<0.24 U	NA
Pyrene	129-00-0	**100**	100		mg/kg	4.73 D	NA	<0.047 U	129 D	1.47 J	2.74 D	3.26 D	NA	NA	6.68 D	NA
Pyridine	110-86-1	NS	NS		mg/kg	<1.2 U	NA	<0.188 UJ	<0.212 U	NA	<0.927 U	<0.94 U	NA	NA	<0.957 U	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP27	EP27	EP28	EP29	EP29	EP30	EP30	EP30	EP30	EP31	EP31
				Sample Name	EP27_7.5	EP-27_6.5_20220214	EP28_0.5	EP29_7.5_20220201	EP29_6.5_20220222	EP30_7.5	DUP02_021022	EP30_6.5_20220221	EP30_5.5	EP31_7.5	EP31_6.5_20220221
				Sample Date	02/03/2022	02/14/2022	03/22/2022	02/01/2022	02/22/2022	02/10/2022	02/10/2022	02/21/2022	02/24/2022	02/10/2022	02/21/2022
				Sample Elevation	7.5	6.5	0.5	7.5	6.5	7.5	7.5	6.5	5.5	7.5	6.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides															
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	0.00931 J	NA
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.043 U	NA	<0.0371 U	<0.0419 U	NA	<0.0369 U	<0.0372 U	NA	NA	0.0816 D	NA
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Endrin	72-20-8	0.014	11	mg/kg	<0.00215 U	NA	<0.00186 UJ	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	0.00739 D	NA
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.00215 U	NA	<0.00186 U	<0.00209 U	NA	<0.00184 U	<0.00186 U	NA	NA	<0.00188 U	NA
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.215 U	NA	<0.186 U	<0.209 U	NA	<0.184 U	<0.186 U	NA	NA	<0.188 U	NA
Herbicides															
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.0263 U	NA	<0.0228 U	<0.0252 U	NA	<0.0221 U	<0.0226 U	NA	NA	<0.0229 UJ	NA
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.0263 U	NA	<0.0228 U	<0.0252 U	NA	<0.0221 U	<0.0226 U	NA	NA	<0.0229 UJ	NA
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.0263 U	NA	<0.0228 U	<0.0252 U	NA	<0.0221 U	<0.0226 U	NA	NA	<0.0229 UJ	NA
Polychlorinated Biphenyl															
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.0217 U	NA	<0.0187 U	<0.0211 U	NA	<0.0186 U	<0.0188 U	NA	NA	<0.019 U	NA
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.0217 U	NA	<0.0187 U	<0.0211 U	NA	<0.0186 U	<0.0188 U	NA	NA	<0.019 U	NA
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.0217 U	NA	<0.0187 U	<0.0211 U	NA	<0.0186 U	<0.0188 U	NA	NA	<0.019 U	NA
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.0217 U	NA	<0.0187 U	<0.0211 U	NA	<0.0186 U	<0.0188 U	NA	NA	<0.019 U	NA
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.0217 U	NA	<0.0187 U	<0.0211 U	NA	<0.0186 U	<0.0188 U	NA	NA	<0.019 U	NA
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.0217 U	NA	<0.0187 U	<0.0211 U	NA	<0.0186 U	<0.0188 U	NA	NA	<0.019 U	NA
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.0217 U	NA	<0.0187 U	<0.0211 U	NA	<0.0186 U	<0.0188 U	NA	NA	<0.019 U	NA
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.0217 U	NA	<0.0187 U	<0.0211 U	NA	<0.0186 U	<0.0188 U	NA	NA	<0.019 U	NA
Metals															
Aluminum	7429-90-5	NS	NS	mg/kg	8,670	NA	6,390	4,790	NA	6,080 B	7,650 B	NA	NA	6,130 B	NA
Antimony	7440-36-0	NS	NS	mg/kg	<3.34 U	NA	<2.86 U	<3.2 U	NA	<2.81 U	<2.85 U	NA	NA	<2.88 U	NA
Arsenic	7440-38-2	**13**	16	mg/kg	8.08	NA	<1.72 U	5.99	NA	5.82	9.23	NA	NA	8.87	NA
Barium	7440-39-3	**350**	400	mg/kg	160 J	NA	43.5	78.6 J	NA	118 J	217 J	NA	NA	83.8 J	NA
Beryllium	7440-41-7	7.2	72	mg/kg	1.12 J	NA	<0.057 U	<0.064 U	NA	<0.056 U	<0.057 U	NA	NA	<0.058 U	NA
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	0.84 J	NA	<0.343 U	<0.384 U	NA	0.386 J	1.18 J	NA	NA	<0.345 U	NA
Calcium	7440-70-2	NS	NS	mg/kg	24,800 B	NA	1,570 B	3,440	NA	22,800	34,000	NA	NA	35,200	NA
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.667 U	NA	<0.572 U	<0.641 U	NA	<0.563 U	<0.571 U	NA	NA	<0.575 U	NA
Chromium, Total	7440-47-3	NS	NS	mg/kg	35.9	NA	21.9	13	NA	32.5	25.6	NA	NA	26.5	NA
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	**35.9**	NA	21.9	13	NA	**32.5**	25.6	NA	NA	26.5	NA
Cobalt	7440-48-4	NS	NS	mg/kg	16.2 J	NA	9.05	7.88 J	NA	15.5 J	11.3 J	NA	NA	12.9 J	NA
Copper	7440-50-8	**50**	270	mg/kg	**54**	NA	30.6	**52.3 J**	NA	**51.5 J**	**51.4 J**	NA	NA	**50.9 J**	NA
Cyanide	57-12-5	27	27	mg/kg	<0.667 U	NA	<0.572 U	<0.641 U	NA	<0.563 U	<0.571 U	NA	NA	<0.575 U	NA
Iron	7439-89-6	NS	NS	mg/kg	18,300	NA	12,700	10,600	NA	16,100	16,400	NA	NA	13,600	NA
Lead	7439-92-1	**63**	400	mg/kg	**167**	NA	15.4	**109**	NA	**236 J**	**350 J**	NA	NA	**144 J**	NA
Magnesium	7439-95-4	NS	NS	mg/kg	8,870	NA	3,280	2,170	NA	14,700 J	8,200 J	NA	NA	14,300	NA
Manganese	7439-96-5	1600	2000	mg/kg	249	NA	215	60.9 J	NA	301 J	317 J	NA	NA	229 J	NA
Mercury	7439-97-6	**0.18**	0.81	mg/kg	**0.214**	NA	<0.0343 U	**0.226**	NA	**0.395**	**0.399**	NA	NA	0.99	**0.762**
Nickel	7440-02-0	**30**	310	mg/kg	**190 J**	NA	**87.8 J**	**59.6 J**	NA	**238 J**	**102 J**	NA	NA	**207 J**	NA
Potassium	7440-09-7	NS	NS	mg/kg	1,070	NA	1,130	427 B	NA	861 B	979 B	NA	NA	838 B	NA
Selenium	7782-49-2	3.9	180	mg/kg	<3.34 U	NA	<2.86 UJ	<3.2 U	NA	<2.81 U	<2.85 U	NA	NA	<2.88 U	NA
Silver	7440-22-4	2	180	mg/kg	<0.667 U	NA	<0.572 U	0.667	NA	<0.563 U	<0.571 U	NA	NA	0.767	NA
Sodium	7440-23-5	NS	NS	mg/kg	359	NA	140	236	NA	311	267	NA	NA	332	NA
Thallium	7440-28-0	NS	NS	mg/kg	<3.34 U	NA	<2.86 U	<3.2 U	NA	<2.81 U	<2.85 U	NA	NA	<2.88 U	NA
Vanadium	7440-62-2	NS	NS	mg/kg	27.7	NA	27.6	18.1	NA	25.4	29.6	NA	NA	22.7	NA
Zinc	7440-66-6	**109**	10000	mg/kg	**221**	NA	25.6	**118**	NA	**174 J**	**369 J**	NA	NA	109	NA
General Chemistry															
Solids, Percent	SOLID	NS	NS	Percent	74.9	74.6	87.4	78	90.7	88.9	87.6	88.9	88.5	86.9	85

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP27	EP27	EP28	EP29	EP29	EP30	EP30	EP30	EP30	EP31	EP31
				Sample Name	EP27_7.5	EP-27_6.5_20220214	EP28_0.5	EP29_7.5_20220201	EP29_6.5_20220222	EP30_7.5	DUP02_021022	EP30_6.5_20220221	EP30_5.5	EP31_7.5	EP31_6.5_20220221
				Sample Date	02/03/2022	02/14/2022	03/22/2022	02/01/2022	02/22/2022	02/10/2022	02/10/2022	02/21/2022	02/24/2022	02/10/2022	02/21/2022
				Sample Elevation	7.5	6.5	0.5	7.5	6.5	7.5	7.5	6.5	5.5	7.5	6.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids															
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	0.000663	NA	0.000675 J	<0.000274 UJ	NA	NA	0.000476	NA
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	<0.000324 U	NA	<0.000277 U	**0.0027**	NA	<0.00028 U	<0.000274 U	NA	NA	0.00044	NA
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	<0.000324 U	NA	<0.000277 U	**0.000918**	NA	<0.00028 U	<0.000274 U	NA	NA	0.000524	NA
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	0.00381	NA
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 U	NA
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 UJ	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 UJ	NA
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000324 U	NA	<0.000277 U	<0.000309 U	NA	<0.00028 U	<0.000274 U	NA	NA	<0.000276 UJ	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP32	EP32	EP33	EP33	EP34	EP34	EP35	EP35	EP36	EP36
				Sample Name	EP32_7.5	EP32_6.5_20220221	EP33_6.0_20220221	EP33_5.0	EP34_6.0_20220221	DUP03_02212022_20220221	EP35_5.5_20220221	EP35_4-5	EP36_7.5_20220201	EP-36_6.5_20220214
				Sample Date	02/10/2022	02/21/2022	02/21/2022	02/24/2022	02/21/2022	02/21/2022	02/21/2022	02/24/2022	02/01/2022	02/14/2022
				Sample Elevation	7.5	6.5	6	5	6	6	5.5	5	7.5	6.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds														
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0025 UJ	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.049 U	NA	<0.072 U	NA	<0.051 U	<0.056 U	<0.049 U	NA	<0.08 U	NA
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Acetone	67-64-1	**0.05**	100	mg/kg	0.01	NA	0.026	NA	**0.052 J**	0.03 J	0.028	NA	<0.008 U	NA
Acrolein	107-02-8	NS	NS	mg/kg	<0.0049 U	NA	<0.0072 U	NA	<0.0051 UJ	<0.0056 U	<0.0049 U	NA	<0.008 U	NA
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Bromoform	75-25-2	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Chloroform	67-66-3	0.37	49	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Cyclohexane	110-82-7	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Ethylbenzene	100-41-4	1	41	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
M,P-Xylene	179601-23-1	NS	NS	mg/kg	<0.0049 U	NA	<0.0072 U	NA	<0.0051 U	<0.0056 U	<0.0049 U	NA	<0.008 U	NA
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.011 U	<0.0056 U	<0.0049 U	NA	<0.004 U	NA
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Methylcyclohexane	108-87-2	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	0.0053 J	NA	<0.014 U	NA	<0.0051 U	<0.0056 U	<0.0049 U	NA	<0.008 U	NA
n-Butylbenzene	104-51-8	12	100	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
n-Propylbenzene	103-65-1	3.9	100	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Sec-Butylbenzene	135-98-8	11	100	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Styrene	100-42-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0025 UJ	NA	<0.0036 UJ	NA	<0.0026 U	<0.0028 UJ	<0.0025 UJ	NA	<0.004 U	NA
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Toluene	108-88-3	**0.7**	100	mg/kg	0.003 J	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	<0.0074 U	NA	<0.011 U	NA	<0.0077 U	<0.0084 U	<0.0074 U	NA	<0.012 U	NA
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0025 U	NA	<0.0036 U	NA	<0.0026 U	<0.0028 U	<0.0025 U	NA	<0.004 U	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs		Location	EP32	EP32	EP33	EP33	EP34	EP34	EP35	EP35	EP36	EP36
					Sample Name	EP32_7.5	EP32_6.5_20220221	EP33_6.0_20220221	EP33_5.0	EP34_6.0_20220221	DUP03_02212022_20220221	EP35_5.5_20220221	EP35_4-5	EP36_7.5_20220201	EP-36_6.5_20220214
					Sample Date	02/10/2022	02/21/2022	02/21/2022	02/24/2022	02/21/2022	02/21/2022	02/21/2022	02/24/2022	02/01/2022	02/14/2022
					Sample Elevation	7.5	6.5	6	5	6	6	5.5	5	7.5	6.5
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds															
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS		mg/kg	<0.47 U	NA	<0.102 U	NA	<0.103 U	<0.105 U	<0.11 U	NA	<0.107 U	NA
1,2-Diphenylhydrazine	122-66-7	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13		mg/kg	<0.019 U	NA	<0.0192 U	NA	<0.0185 U	<0.019 U	<0.0198 U	NA	<0.0192 UJ	NA
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS		mg/kg	<0.47 U	NA	<0.102 U	NA	<0.103 U	<0.105 U	<0.11 U	NA	<0.107 U	NA
2,4,5-Trichlorophenol	95-95-4	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
2,4,6-Trichlorophenol	88-06-2	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
2,4-Dichlorophenol	120-83-2	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
2,4-Dimethylphenol	105-67-9	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
2,4-Dinitrophenol	51-28-5	NS	NS		mg/kg	<0.47 UJ	NA	<0.102 U	NA	<0.103 U	<0.105 U	<0.11 U	NA	<0.107 U	NA
2,4-Dinitrotoluene	121-14-2	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
2,6-Dinitrotoluene	606-20-2	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
2-Chloronaphthalene	91-58-7	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
2-Chlorophenol	95-57-8	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
2-Methylnaphthalene	91-57-6	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
2-Methylphenol (o-Cresol)	95-48-7	0.33	100		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
2-Nitroaniline	88-74-4	NS	NS		mg/kg	<0.47 U	NA	<0.102 U	NA	<0.103 U	<0.105 U	<0.11 U	NA	<0.107 U	NA
2-Nitrophenol	88-75-5	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
3,3'-Dichlorobenzidine	91-94-1	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
3-Nitroaniline	99-09-2	NS	NS		mg/kg	<0.47 U	NA	<0.102 U	NA	<0.103 U	<0.105 U	<0.11 U	NA	<0.107 U	NA
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS		mg/kg	<0.47 U	NA	<0.102 U	NA	<0.103 U	<0.105 U	<0.11 U	NA	<0.107 U	NA
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
4-Chloro-3-Methylphenol	59-50-7	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
4-Chloroaniline	106-47-8	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
4-Nitroaniline	100-01-6	NS	NS		mg/kg	<0.47 U	NA	<0.102 U	NA	<0.103 U	<0.105 U	<0.11 U	NA	<0.107 U	NA
4-Nitrophenol	100-02-7	NS	NS		mg/kg	<0.47 U	NA	<0.102 U	NA	<0.103 U	<0.105 U	<0.11 U	NA	<0.107 U	NA
Acenaphthene	83-32-9	20	100		mg/kg	<0.236 U	NA	0.0727 JD	NA	<0.0515 U	0.09 JD	<0.0549 U	NA	<0.0538 U	NA
Acenaphthylene	208-96-8	100	100		mg/kg	0.26 JD	NA	0.668 D	NA	0.154 D	0.189 D	0.0561 JD	NA	0.0729 JD	NA
Acetophenone	98-86-2	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS		mg/kg	<0.942 U	NA	<0.205 U	NA	<0.206 U	<0.211 U	<0.219 U	NA	<0.215 U	NA
Anthracene	120-12-7	100	100		mg/kg	0.38 JD	NA	0.469 D	NA	0.154 D	0.315 D	0.12 D	NA	0.0832 JD	NA
Atrazine	1912-24-9	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Benzaldehyde	100-52-7	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Benzidine	92-87-5	NS	NS		mg/kg	<0.942 U	NA	<0.205 U	NA	<0.206 U	<0.211 U	<0.219 U	NA	<0.215 U	NA
Benzo(a)anthracene	56-55-3	**1**	1		mg/kg	2 D	0.56 D	1.92 D	<0.0452 U	0.369 J	0.686 J	0.322 D	NA	0.155 D	NA
Benzo(a)pyrene	50-32-8	**1**	1		mg/kg	2.07 D	0.639 D	1.55 D	<0.0452 U	0.283 J	0.72 J	0.324 D	NA	0.179 D	NA
Benzo(b)fluoranthene	205-99-2	**1**	1		mg/kg	1.65 D	0.535 D	1.25 D	<0.0452 U	0.236 J	0.543 J	0.236 D	NA	0.181 D	NA
Benzo(g,h,i)Perylene	191-24-2	100	100		mg/kg	1.52 D	NA	0.947 D	NA	0.199 D	0.361 D	0.155 D	NA	0.11 D	NA
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9		mg/kg	**1.7 D**	NA	**1.36 D**	NA	0.256 J	0.53 J	0.217 D	NA	0.124 D	NA
Benzoic Acid	65-85-0	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Benzyl Alcohol	100-51-6	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Benzyl Butyl Phthalate	85-68-7	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Biphenyl (Diphenyl)	92-52-4	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Bis(2-chloroethoxy) methane	111-91-1	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	0.0625 JD	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Caprolactam	105-60-2	NS	NS		mg/kg	<0.47 U	NA	<0.102 U	NA	<0.103 U	<0.105 U	<0.11 U	NA	<0.107 U	NA
Carbazole	86-74-8	NS	NS		mg/kg	<0.236 U	NA	0.089 JD	NA	<0.0515 U	0.0589 JD	<0.0549 U	NA	<0.0538 U	NA
Chrysene	218-01-9	**1**	1	*	mg/kg	2.04 D	0.568 D	1.73 D	<0.0452 U	0.358 J	0.631 J	0.285 D	NA	0.161 D	NA
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33		mg/kg	0.485 D	0.131 D	0.407 D	<0.0452 U	0.0674 JD	0.122 D	<0.0549 U	NA	<0.0538 U	NA
Dibenzofuran	132-64-9	7	59		mg/kg	<0.236 U	NA	0.0662 JD	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Dibutyl phthalate	84-74-2	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Diethyl phthalate	84-66-2	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Dimethyl phthalate	131-11-3	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Dioctyl phthalate	117-84-0	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Diphenylamine	122-39-4	NS	NS		mg/kg	<0.47 U	NA	<0.102 U	NA	<0.103 U	<0.105 U	<0.11 U	NA	<0.107 U	NA
Fluoranthene	206-44-0	**100**	100		mg/kg	4.32 D	NA	4.01 D	NA	0.904 J	1.6 J	0.654 D	NA	0.289 D	NA
Fluorene	86-73-7	30	100		mg/kg	<0.236 U	NA	0.168 D	NA	0.0657 JD	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Hexachlorobenzene	118-74-1	0.33	1.2		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Hexachlorobutadiene	87-68-3	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Hexachlorocyclopentadiene	77-47-4	NS	NS		mg/kg	<0.236 UJ	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Hexachloroethane	67-72-1	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5		mg/kg	1.32 D	0.356 D	0.92 D	<0.0452 U	0.167 J	0.416 J	0.193 D	NA	0.128 D	NA
Isophorone	78-59-1	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Naphthalene	91-20-3	12	100		mg/kg	<0.236 U	NA	0.149 D	NA	<0.0515 U	0.0665 JD	<0.0549 U	NA	<0.0538 U	NA
Nitrobenzene	98-95-3	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
n-Nitrosodimethylamine	62-75-9	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
n-Nitrosodiphenylamine	86-30-6	NS	NS		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Pentachlorophenol	87-86-5	0.8	6.7		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Phenanthrene	85-01-8	100	100		mg/kg	1.7 D	NA	0.961 D	NA	0.317 J	0.849 J	0.362 D	NA	0.166 D	NA
Phenol	108-95-2	0.33	100		mg/kg	<0.236 U	NA	<0.0512 U	NA	<0.0515 U	<0.0527 U	<0.0549 U	NA	<0.0538 U	NA
Pyrene	129-00-0	**100**	100		mg/kg	3.58 D	NA	3.36 D	NA	0.631 J	1.15 J	0.576 D	NA	0.232 D	NA
Pyridine	110-86-1	NS	NS		mg/kg	<0.942 U	NA	<0.205 U	NA	<0.206 U	<0.211 U	<0.219 U	NA	<0.215 U	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP32	EP32	EP33	EP33	EP34	EP34	EP35	EP35	EP36	EP36
				Sample Name	EP32_7.5	EP32_6.5_20220221	EP33_6.0_20220221	EP33_5.0	EP34_6.0_20220221	DUP03_02212022_20220221	EP35_5.5_20220221	EP35_4-5	EP36_7.5_20220201	EP-36_6.5_20220214
				Sample Date	02/10/2022	02/21/2022	02/21/2022	02/24/2022	02/21/2022	02/21/2022	02/21/2022	02/24/2022	02/01/2022	02/14/2022
				Sample Elevation	7.5	6.5	6	5	6	6	5.5	5	7.5	6.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides														
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	**0.0077 D**	NA
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.0371 U	NA	<0.0404 U	NA	<0.0412 U	<0.0415 U	<0.0438 U	NA	<0.0428 U	NA
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Endrin	72-20-8	0.014	11	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.00186 U	NA	<0.00202 U	NA	<0.00206 U	<0.00208 U	<0.00219 U	NA	<0.00214 U	NA
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.186 U	NA	<0.202 U	NA	<0.206 U	<0.208 U	<0.219 U	NA	<0.214 U	NA
Herbicides														
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.0226 UJ	NA	<0.0247 U	NA	<0.0247 U	<0.0249 U	<0.0263 U	NA	<0.0259 UJ	NA
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.0226 UJ	NA	<0.0247 U	NA	<0.0247 U	<0.0249 U	<0.0263 U	NA	<0.0259 UJ	NA
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.0226 UJ	NA	<0.0247 U	NA	<0.0247 U	<0.0249 U	<0.0263 U	NA	<0.0259 UJ	NA
Polychlorinated Biphenyl														
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.0187 U	NA	<0.0204 U	NA	<0.0208 U	<0.021 U	<0.0221 U	NA	<0.0216 U	NA
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.0187 U	NA	<0.0204 U	NA	<0.0208 U	<0.021 U	<0.0221 U	NA	<0.0216 U	NA
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.0187 U	NA	<0.0204 U	NA	<0.0208 U	<0.021 U	<0.0221 U	NA	<0.0216 U	NA
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.0187 U	NA	<0.0204 U	NA	<0.0208 U	<0.021 U	<0.0221 U	NA	<0.0216 U	NA
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.0187 U	NA	<0.0204 U	NA	<0.0208 U	<0.021 U	<0.0221 U	NA	<0.0216 U	NA
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.0187 U	NA	<0.0204 U	NA	<0.0208 U	<0.021 U	<0.0221 U	NA	<0.0216 U	NA
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.0187 U	NA	<0.0204 U	NA	<0.0208 U	<0.021 U	<0.0221 U	NA	<0.0216 U	NA
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.0187 U	NA	<0.0204 U	NA	<0.0208 U	<0.021 U	<0.0221 U	NA	<0.0216 U	NA
Metals														
Aluminum	7429-90-5	NS	NS	mg/kg	7,830 B	NA	7,830	NA	9,060	7,770	7,630	NA	5,710	NA
Antimony	7440-36-0	NS	NS	mg/kg	3.65	NA	4.44 J	NA	13.1	15.2	28.3	NA	<3.26 U	NA
Arsenic	7440-38-2	**13**	16	mg/kg	9.57	NA	4.02	NA	5.39	7.03	**14.5**	NA	6.43	NA
Barium	7440-39-3	**350**	400	mg/kg	121 J	NA	74.9 J	NA	101 J	101 J	130 J	NA	79.5 J	NA
Beryllium	7440-41-7	7.2	72	mg/kg	<0.057 U	NA	<0.063 U	NA	<0.063 U	<0.064 U	<0.067 U	NA	<0.065 U	NA
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	0.42	NA	<0.376 U	NA	<0.377 U	<0.381 U	<0.399 U	NA	<0.391 U	NA
Calcium	7440-70-2	NS	NS	mg/kg	18,800	NA	10,500 J	NA	11,400	10,600	11,000	NA	13,900	NA
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.574 U	NA	<0.627 UJ	NA	<0.629 U	<0.635 U	<0.666 U	NA	<0.652 U	NA
Chromium, Total	7440-47-3	NS	NS	mg/kg	31.7	NA	59.7 J	NA	49.5	45.9	49.5	NA	18.3	NA
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	**31.7**	NA	**59.7**	NA	**49.5**	**45.9**	**49.5**	NA	18.3	NA
Cobalt	7440-48-4	NS	NS	mg/kg	22.4 J	NA	27.4 J	NA	22.5	19.1	19.4	NA	9.88 J	NA
Copper	7440-50-8	**50**	270	mg/kg	**95.7 J**	NA	**63.4 J**	NA	**96.5 J**	**88.6 J**	**135 J**	NA	35.8 J	NA
Cyanide	57-12-5	27	27	mg/kg	<0.574 U	NA	<0.627 U	NA	<0.629 U	<0.635 U	<0.666 U	NA	<0.652 U	NA
Iron	7439-89-6	NS	NS	mg/kg	18,600	NA	22,800	NA	21,000	19,600	22,200	NA	13,600	NA
Lead	7439-92-1	**63**	400	mg/kg	**248 J**	NA	**168 J**	NA	**228**	**282**	540	6.34	**132**	NA
Magnesium	7439-95-4	NS	NS	mg/kg	9,990	NA	25,500 B	NA	13,200 B	10,900 B	12,800 B	NA	3,790	NA
Manganese	7439-96-5	1600	2000	mg/kg	369 J	NA	398	NA	320	260	197	NA	178 J	NA
Mercury	7439-97-6	**0.18**	0.81	mg/kg	3.7	**0.256**	**0.593 J**	NA	**0.51**	**0.557**	0.938	<0.0332 U	0.891	**0.647**
Nickel	7440-02-0	**30**	310	mg/kg	**191 J**	NA	649 J	**67.2 J**	**283 J**	**250 J**	**257 J**	NA	**61.6 J**	NA
Potassium	7440-09-7	NS	NS	mg/kg	1,080 B	NA	1,320	NA	1,520 J	869 J	978	NA	711 B	NA
Selenium	7782-49-2	3.9	180	mg/kg	<2.87 U	NA	<3.13 U	NA	<3.14 U	<3.18 U	<3.33 U	NA	<3.26 U	NA
Silver	7440-22-4	2	180	mg/kg	0.587	NA	<0.627 UJ	NA	<0.629 U	<0.635 U	<0.666 U	NA	0.72	NA
Sodium	7440-23-5	NS	NS	mg/kg	464	NA	291 J	NA	426	349	360	NA	266	NA
Thallium	7440-28-0	NS	NS	mg/kg	<2.87 U	NA	<3.13 U	NA	<3.14 U	<3.18 U	<3.33 U	NA	<3.26 U	NA
Vanadium	7440-62-2	NS	NS	mg/kg	30.9	NA	28	NA	32.8	29.9	31	NA	18.8	NA
Zinc	7440-66-6	**109**	10000	mg/kg	**149**	NA	**249 J**	NA	**282**	**273**	**308**	NA	**135**	NA
General Chemistry														
Solids, Percent	SOLID	NS	NS	Percent	87.2	83.9	79.7	90.6	79.5	78.7	75.1	90.3	76.7	76.7

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP32	EP32	EP33	EP33	EP34	EP34	EP35	EP35	EP36	EP36
				Sample Name	EP32_7.5	EP32_6.5_20220221	EP33_6.0_20220221	EP33_5.0	EP34_6.0_20220221	DUP03_02212022_20220221	EP35_5.5_20220221	EP35_4-5	EP36_7.5_20220201	EP-36_6.5_20220214
				Sample Date	02/10/2022	02/21/2022	02/21/2022	02/24/2022	02/21/2022	02/21/2022	02/21/2022	02/24/2022	02/01/2022	02/14/2022
				Sample Elevation	7.5	6.5	6	5	6	6	5.5	5	7.5	6.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids														
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	0.000495	0.000444	<0.000287 U	NA	<0.000309 U	NA
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	0.000438	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	0.000519	NA
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	0.000405	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	0.000555	NA
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000272 U	NA	<0.000291 U	NA	<0.0003 U	<0.000286 U	<0.000287 U	NA	<0.000309 U	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP37	EP37	EP37	EP37	EP38	EP39	EP40	EP41	EP42	EP43	EP44
				Sample Name	EP37_7.5_20220201	EP-37_6.5_20220214	EP37_5.5_20220222	EP37_4.5	EP38_7.5_20220201	EP39_7.5_20220201	EP40_7.5	EP41_7.5	EP42_7.5_20220207	EP43_7.5	EP44_7.5
				Sample Date	02/01/2022	02/14/2022	02/22/2022	02/25/2022	02/01/2022	02/01/2022	02/09/2022	02/09/2022	02/07/2022	03/10/2022	03/10/2022
				Sample Elevation	7.5	6.5	5.5	4.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds															
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 UJ	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 UJ	<0.0041 UJ	<0.0028 UJ	<0.0023 U	<0.0023 U
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	0.44 J	<0.0023 U	<0.0023 U
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 UJ	<0.0041 UJ	<0.0028 UJ	<0.0023 U	<0.0023 U
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 UJ	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	0.096 J	<0.0023 U	<0.0023 U
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 UJ	<0.0041 UJ	<0.0028 UJ	<0.0023 U	<0.0023 U
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.052 U	NA	NA	NA	<0.095 U	<0.091 U	<0.055 U	<0.082 U	<0.057 UJ	<0.046 U	<0.046 U
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Acetone	67-64-1	**0.05**	100	mg/kg	<0.0052 U	NA	NA	NA	<0.0095 U	<0.0091 U	<0.0055 U	<0.0082 U	0.0071 J	0.011	0.025
Acrolein	107-02-8	NS	NS	mg/kg	<0.0052 U	NA	NA	NA	<0.0095 U	<0.0091 U	<0.0055 U	<0.0082 U	<0.0057 UJ	<0.0046 U	<0.0046 U
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	**0.07 J**	<0.0023 U	<0.0023 U
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Bromoform	75-25-2	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Chloroform	67-66-3	0.37	49	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Cyclohexane	110-82-7	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	0.059 J	<0.0023 U	<0.0023 U
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Ethylbenzene	100-41-4	1	41	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	0.28 J	<0.0023 U	<0.0023 U
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 UJ	<0.0041 UJ	<0.0028 UJ	<0.0023 U	<0.0023 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	0.019 J	<0.0023 U	<0.0023 U
M,P-Xylene	179601-23-1	NS	NS	mg/kg	<0.0052 U	NA	NA	NA	<0.0095 U	<0.0091 U	<0.0055 U	<0.0082 U	1.2 J	0.0086 J	<0.0046 U
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Methylcyclohexane	108-87-2	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	0.14 J	<0.0023 U	<0.0023 U
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	<0.0052 U	NA	NA	NA	<0.0095 U	<0.0091 U	<0.0055 U	<0.0082 U	<0.0057 UJ	0.0066 J	0.0058 J
n-Butylbenzene	104-51-8	12	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	0.0097 J	<0.0023 U	<0.0023 U
n-Propylbenzene	103-65-1	3.9	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	0.066 J	<0.0023 U	<0.0023 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	0.52 J	0.0038 J	<0.0023 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	0.0031 J	<0.0023 U	<0.0023 U
Sec-Butylbenzene	135-98-8	11	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	0.0038 J	<0.0023 U	<0.0023 U
Styrene	100-42-5	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 UJ	<0.0045 U	<0.0027 U	<0.0041 U	0.017 J	<0.0023 U	<0.0023 U
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 UJ	<0.0041 UJ	<0.0028 UJ	<0.0023 U	<0.0023 U
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 UJ	<0.0041 UJ	<0.0028 UJ	<0.0023 U	<0.0023 U
Toluene	108-88-3	**0.7**	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 UJ	<0.0045 U	<0.0027 U	<0.0041 U	**1.2 J**	<0.0023 U	<0.0023 U
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	<0.0078 U	NA	NA	NA	<0.014 U	<0.014 U	<0.0082 U	<0.012 U	**1.7 J**	0.012 J	<0.0069 U
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0026 U	NA	NA	NA	<0.0047 U	<0.0045 U	<0.0027 U	<0.0041 U	<0.0028 UJ	<0.0023 U	<0.0023 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP37	EP37	EP37	EP37	EP38	EP39	EP40	EP41	EP42	EP43	EP44
				Sample Name	EP37_7.5_20220201	EP-37_6.5_20220214	EP37_5.5_20220222	EP37_4.5	EP38_7.5_20220201	EP39_7.5_20220201	EP40_7.5	EP41_7.5	EP42_7.5_20220207	EP43_7.5	EP44_7.5
				Sample Date	02/01/2022	02/14/2022	02/22/2022	02/25/2022	02/01/2022	02/01/2022	02/09/2022	02/09/2022	02/07/2022	03/10/2022	03/10/2022
				Sample Elevation	7.5	6.5	5.5	4.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds															
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS	mg/kg	<0.0999 U	NA	NA	NA	<0.11 U	<0.109 U	<0.0979 U	<0.0953 U	<0.452 U	<0.0909 U	<0.091 U
1,2-Diphenylhydrazine	122-66-7	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.0192 U	NA	NA	NA	<0.0198 U	<0.0192 UJ	<0.0198 U	<0.0187 U	<0.0196 U	<0.0187 U	<0.0198 U
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS	mg/kg	<0.0999 U	NA	NA	NA	<0.11 U	<0.109 U	<0.0979 U	<0.0953 U	<0.452 U	<0.0909 U	<0.091 U
2,4,5-Trichlorophenol	95-95-4	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
2,4,6-Trichlorophenol	88-06-2	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
2,4-Dichlorophenol	120-83-2	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
2,4-Dimethylphenol	105-67-9	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
2,4-Dinitrophenol	51-28-5	NS	NS	mg/kg	<0.0999 U	NA	NA	NA	<0.11 U	<0.109 U	<0.0979 U	<0.0953 U	<0.452 UJ	<0.0909 U	<0.091 U
2,4-Dinitrotoluene	121-14-2	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
2,6-Dinitrotoluene	606-20-2	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
2-Chloronaphthalene	91-58-7	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
2-Chlorophenol	95-57-8	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
2-Methylnaphthalene	91-57-6	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	0.0879 JD	0.0757 JD	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
2-Methylphenol (o-Cresol)	95-48-7	0.33	100	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
2-Nitroaniline	88-74-4	NS	NS	mg/kg	<0.0999 U	NA	NA	NA	<0.11 U	<0.109 U	<0.0979 U	<0.0953 U	<0.452 U	<0.0909 U	<0.091 U
2-Nitrophenol	88-75-5	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
3,3'-Dichlorobenzidine	91-94-1	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
3-Nitroaniline	99-09-2	NS	NS	mg/kg	<0.0999 U	NA	NA	NA	<0.11 U	<0.109 U	<0.0979 U	<0.0953 U	<0.452 U	<0.0909 U	<0.091 U
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS	mg/kg	<0.0999 U	NA	NA	NA	<0.11 U	<0.109 U	<0.0979 U	<0.0953 U	<0.452 U	<0.0909 U	<0.091 U
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
4-Chloro-3-Methylphenol	59-50-7	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
4-Chloroaniline	106-47-8	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
4-Nitroaniline	100-01-6	NS	NS	mg/kg	<0.0999 U	NA	NA	NA	<0.11 U	<0.109 U	<0.0979 U	<0.0953 U	<0.452 U	<0.0909 U	<0.091 U
4-Nitrophenol	100-02-7	NS	NS	mg/kg	<0.0999 U	NA	NA	NA	<0.11 U	<0.109 U	<0.0979 U	<0.0953 U	<0.452 U	<0.0909 U	<0.091 U
Acenaphthene	83-32-9	20	100	mg/kg	0.0998 JD	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Acenaphthylene	208-96-8	100	100	mg/kg	0.071 JD	NA	NA	NA	0.145 D	0.0835 JD	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Acetophenone	98-86-2	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS	mg/kg	<0.2 U	NA	NA	NA	<0.22 U	<0.218 U	<0.196 U	<0.191 U	<0.905 U	<0.182 U	<0.182 U
Anthracene	120-12-7	100	100	mg/kg	0.269 D	NA	NA	NA	0.152 D	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	0.0697 JD	<0.0456 U
Atrazine	1912-24-9	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Benzaldehyde	100-52-7	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Benzidine	92-87-5	NS	NS	mg/kg	<0.2 U	NA	NA	NA	<0.22 U	<0.218 U	<0.196 U	<0.191 U	<0.905 U	<0.182 U	<0.182 U
Benzo(a)anthracene	56-55-3	**1**	1	mg/kg	0.515 D	NA	NA	NA	0.262 D	0.145 D	<0.0491 U	<0.0478 U	<0.227 U	0.216 D	0.0728 JD
Benzo(a)pyrene	50-32-8	**1**	1	mg/kg	0.621 D	NA	NA	NA	0.302 D	0.155 D	<0.0491 U	<0.0478 U	0.231 JD	0.195 D	0.0684 JD
Benzo(b)fluoranthene	205-99-2	**1**	1	mg/kg	0.471 D	NA	NA	NA	0.292 D	0.158 D	<0.0491 U	<0.0478 U	<0.227 U	0.171 D	0.0604 JD
Benzo(g,h,i)Perylene	191-24-2	100	100	mg/kg	0.303 D	NA	NA	NA	0.146 D	0.0818 JD	<0.0491 U	<0.0478 U	<0.227 U	0.0966 D	<0.0456 U
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9	mg/kg	0.41 D	NA	NA	NA	0.249 D	0.106 JD	<0.0491 U	<0.0478 U	<0.227 U	0.149 D	0.0488 JD
Benzoic Acid	65-85-0	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Benzyl Alcohol	100-51-6	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Benzyl Butyl Phthalate	85-68-7	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Biphenyl (Diphenyl)	92-52-4	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Bis(2-chloroethoxy) methane	111-91-1	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	0.0924 JD	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Caprolactam	105-60-2	NS	NS	mg/kg	<0.0999 U	NA	NA	NA	<0.11 U	<0.109 U	<0.0979 U	<0.0953 U	<0.452 U	<0.0909 U	<0.091 U
Carbazole	86-74-8	NS	NS	mg/kg	0.0846 JD	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Chrysene	218-01-9	**1**	1 *	mg/kg	0.48 D	NA	NA	NA	0.254 D	0.158 D	<0.0491 U	<0.0478 U	<0.227 U	0.208 D	0.0728 JD
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33	mg/kg	0.114 D	NA	NA	NA	0.0571 JD	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Dibenzofuran	132-64-9	7	59	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Dibutyl phthalate	84-74-2	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Diethyl phthalate	84-66-2	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Dimethyl phthalate	131-11-3	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Dioctyl phthalate	117-84-0	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	0.065 JD	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Diphenylamine	122-39-4	NS	NS	mg/kg	<0.0999 U	NA	NA	NA	<0.11 U	<0.109 U	<0.0979 U	<0.0953 U	<0.452 U	<0.0909 U	<0.091 U
Fluoranthene	206-44-0	**100**	100	mg/kg	1.12 D	NA	NA	NA	0.346 D	0.209 D	<0.0491 U	<0.0478 U	0.361 JD	0.474 D	0.155 D
Fluorene	86-73-7	30	100	mg/kg	0.0942 JD	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Hexachlorobenzene	118-74-1	0.33	1.2	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Hexachlorocyclopentadiene	77-47-4	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Hexachloroethane	67-72-1	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5	mg/kg	0.362 D	NA	NA	NA	0.192 D	0.106 JD	<0.0491 U	<0.0478 U	<0.227 U	0.108 D	<0.0456 U
Isophorone	78-59-1	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Naphthalene	91-20-3	12	100	mg/kg	<0.0501 U	NA	NA	NA	0.0563 JD	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Nitrobenzene	98-95-3	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
n-Nitrosodimethylamine	62-75-9	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS	mg/kg	0.137 D	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
n-Nitrosodiphenylamine	86-30-6	NS	NS	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Pentachlorophenol	87-86-5	0.8	6.7	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Phenanthrene	85-01-8	100	100	mg/kg	0.881 D	NA	NA	NA	0.106 JD	0.134 D	<0.0491 U	<0.0478 U	<0.227 U	0.237 D	0.0669 JD
Phenol	108-95-2	0.33	100	mg/kg	<0.0501 U	NA	NA	NA	<0.0551 U	<0.0546 U	<0.0491 U	<0.0478 U	<0.227 U	<0.0455 U	<0.0456 U
Pyrene	129-00-0	**100**	100	mg/kg	0.881 D	NA	NA	NA	0.331 D	0.163 D	<0.0491 U	<0.0478 U	<0.452 U	0.399 D	0.139 D
Pyridine	110-86-1	NS	NS	mg/kg	<0.2 U	NA	NA	NA	<0.22 U	<0.218 U	<0.196 U	<0.191 U	<0.905 U	<0.182 U	<0.182 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP37	EP37	EP37	EP37	EP38	EP39	EP40	EP41	EP42	EP43	EP44
				Sample Name	EP37_7.5_20220201	EP-37_6.5_20220214	EP37_5.5_20220222	EP37_4.5	EP38_7.5_20220201	EP39_7.5_20220201	EP40_7.5	EP41_7.5	EP42_7.5_20220207	EP43_7.5	EP44_7.5
				Sample Date	02/01/2022	02/14/2022	02/22/2022	02/25/2022	02/01/2022	02/01/2022	02/09/2022	02/09/2022	02/07/2022	03/10/2022	03/10/2022
				Sample Elevation	7.5	6.5	5.5	4.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides															
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	**0.00464 D**	<0.00182 U	<0.00182 UJ
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	0.0214 J	<0.00182 U	<0.00182 UJ
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.04 U	NA	NA	NA	<0.0439 U	<0.0434 U	<0.0385 U	<0.0374 U	0.232 D	<0.0363 U	<0.0364 UJ
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Endrin	72-20-8	0.014	11	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	0.0189 D	<0.00182 U	<0.00182 UJ
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.002 U	NA	NA	NA	<0.0022 U	<0.00217 U	<0.00192 U	<0.00187 U	<0.00182 U	<0.00182 U	<0.00182 UJ
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.2 U	NA	NA	NA	<0.22 U	<0.217 U	<0.192 U	<0.187 U	<0.182 U	<0.182 U	<0.182 UJ
Herbicides															
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.0242 U	NA	NA	NA	<0.0265 U	<0.0262 U	<0.0236 U	<0.0228 U	<0.022 UJ	<0.0217 U	<0.022 U
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.0242 U	NA	NA	NA	<0.0265 U	<0.0262 U	<0.0236 U	<0.0228 U	<0.022 UJ	<0.0217 U	<0.022 U
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.0242 U	NA	NA	NA	<0.0265 U	<0.0262 U	<0.0236 U	<0.0228 U	<0.022 UJ	<0.0217 U	<0.022 U
Polychlorinated Biphenyl															
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.0202 U	NA	NA	NA	<0.0222 U	<0.0219 U	<0.0194 U	<0.0189 U	<0.0184 U	<0.0183 U	<0.0184 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.0202 U	NA	NA	NA	<0.0222 U	<0.0219 U	<0.0194 U	<0.0189 U	<0.0184 U	<0.0183 U	<0.0184 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.0202 U	NA	NA	NA	<0.0222 U	<0.0219 U	<0.0194 U	<0.0189 U	<0.0184 U	<0.0183 U	<0.0184 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.0202 U	NA	NA	NA	<0.0222 U	<0.0219 U	<0.0194 U	<0.0189 U	<0.0184 U	<0.0183 U	<0.0184 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.0202 U	NA	NA	NA	<0.0222 U	<0.0219 U	<0.0194 U	<0.0189 U	<0.0184 U	<0.0183 U	<0.0184 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.0202 U	NA	NA	NA	<0.0222 U	<0.0219 U	<0.0194 U	<0.0189 U	<0.0184 U	<0.0183 U	<0.0184 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.0202 U	NA	NA	NA	<0.0222 U	<0.0219 U	<0.0194 U	<0.0189 U	<0.0184 U	<0.0183 U	<0.0184 U
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.0202 U	NA	NA	NA	<0.0222 U	<0.0219 U	<0.0194 U	<0.0189 U	<0.0184 U	<0.0183 U	<0.0184 U
Metals															
Aluminum	7429-90-5	NS	NS	mg/kg	9,070	NA	NA	NA	9,690	7,270	7,210	5,800	8,400	3,310	2,830
Antimony	7440-36-0	NS	NS	mg/kg	4.33	NA	NA	NA	<3.37 U	<3.33 U	<2.96 U	<2.88 U	<2.77 U	<2.77 U	<2.77 U
Arsenic	7440-38-2	**13**	16	mg/kg	5.76	NA	NA	NA	6.11	8.88	6.45	4.12	3.2	3.89	<1.66 U
Barium	7440-39-3	**350**	400	mg/kg	113 J	NA	NA	NA	85.7 J	84.2 J	101	87.4	49.2	16.6	17.4
Beryllium	7440-41-7	7.2	72	mg/kg	<0.061 U	NA	NA	NA	<0.067 U	<0.067 U	<0.059 U	<0.058 U	<0.055 U	<0.055 U	<0.055 U
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	<0.365 U	NA	NA	NA	<0.405 U	0.491	<0.356 U	0.359	<0.333 U	<0.332 U	<0.332 U
Calcium	7440-70-2	NS	NS	mg/kg	6,270	NA	NA	NA	24,500	31,800	17,800 B	18,900 B	32,300 B	11,800	6,140
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.609 U	NA	NA	NA	<0.675 U	<0.666 U	<0.593 U	<0.575 UJ	<0.555 U	<0.554 U	<0.553 U
Chromium, Total	7440-47-3	NS	NS	mg/kg	65.9	NA	NA	NA	41.1	19.5	37.7	28.1	30.2	10.8	8.84
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	**65.9**	NA	NA	NA	**41.1**	19.5	**37.7**	28.1	**30.2**	10.8	8.84
Cobalt	7440-48-4	NS	NS	mg/kg	31.9 J	NA	NA	NA	19.1 J	9.85 J	14.4	10.2	9.96	4.37	3.08
Copper	7440-50-8	**50**	270	mg/kg	**79 J**	NA	NA	NA	40.4 J	**75.5 J**	**53.2**	41.5	**88.5**	9.99 J	7.38 J
Cyanide	57-12-5	27	27	mg/kg	<0.609 U	NA	NA	NA	<0.675 U	<0.666 U	<0.593 U	<0.575 U	<0.555 U	<0.554 U	<0.553 U
Iron	7439-89-6	NS	NS	mg/kg	25,900	NA	NA	NA	17,600	16,400	17,500	15,600	24,100	10,700	9,540
Lead	7439-92-1	**63**	400	mg/kg	**113**	NA	NA	NA	**82.7**	**95.9**	**205**	**152**	45.6	24.1	18.3
Magnesium	7439-95-4	NS	NS	mg/kg	21,400	NA	NA	NA	8,740	5,620	11,500	7,220	8,350	5,500	1,890
Manganese	7439-96-5	1600	2000	mg/kg	230 J	NA	NA	NA	374 J	210 J	343	243	274	95.2	88.5
Mercury	7439-97-6	**0.18**	0.81	mg/kg	0.0458	NA	NA	NA	0.141	**0.204**	**0.336**	**0.258**	0.0981	0.114	<0.0332 U
Nickel	7440-02-0	**30**	310	mg/kg	446 J	435 J	563	**109 J**	**231 J**	**72.2 J**	**163 J**	**85.9 J**	**60.6**	22.6	12.8
Potassium	7440-09-7	NS	NS	mg/kg	1,200 B	NA	NA	NA	962 B	858 B	865	850	759 B	838 B	717 B
Selenium	7782-49-2	3.9	180	mg/kg	<3.04 U	NA	NA	NA	<3.37 U	<3.33 U	<2.96 U	<2.88 U	<2.77 U	<2.77 U	<2.77 U
Silver	7440-22-4	2	180	mg/kg	<0.609 U	NA	NA	NA	<0.675 U	<0.666 U	<0.593 U	<0.575 U	<0.555 U	<0.554 U	<0.553 U
Sodium	7440-23-5	NS	NS	mg/kg	263	NA	NA	NA	216	215	426	399	591	331	255
Thallium	7440-28-0	NS	NS	mg/kg	<3.04 U	NA	NA	NA	<3.37 U	<3.33 U	<2.96 U	<2.88 U	<2.77 U	<2.77 U	<2.77 U
Vanadium	7440-62-2	NS	NS	mg/kg	30.8	NA	NA	NA	27.1	22.6	27	36.3	31.6	12.2	9.98
Zinc	7440-66-6	**109**	10000	mg/kg	**414**	NA	NA	NA	109	**149**	**139 B**	**140 B**	57.1 J	27.1	24.2
General Chemistry															
Solids, Percent	SOLID	NS	NS	Percent	82.1	72.9	80.4	87.9	74.1	75.1	84.3	86.9	90.1	90.3	90.4

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP37	EP37	EP37	EP37	EP38	EP39	EP40	EP41	EP42	EP43	EP44
				Sample Name	EP37_7.5_20220201	EP-37_6.5_20220214	EP37_5.5_20220222	EP37_4.5	EP38_7.5_20220201	EP39_7.5_20220201	EP40_7.5	EP41_7.5	EP42_7.5_20220207	EP43_7.5	EP44_7.5
				Sample Date	02/01/2022	02/14/2022	02/22/2022	02/25/2022	02/01/2022	02/01/2022	02/09/2022	02/09/2022	02/07/2022	03/10/2022	03/10/2022
				Sample Elevation	7.5	6.5	5.5	4.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids															
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 UJ	<0.000268 U	<0.000269 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	0.000301	NA	NA	NA	0.000493	0.000762	<0.000275 U	0.000409	<0.000264 U	<0.000268 U	0.000273
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	<0.000294 U	NA	NA	NA	0.000659	0.000549	0.000376	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000294 U	NA	NA	NA	<0.000317 U	<0.000322 U	<0.000275 U	<0.000264 U	<0.000264 U	<0.000268 U	<0.000269 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP45	EP46	EP47	EP48	EP49	EP49	EP50	EP50	EP50	EP51	EP51	EP51
				Sample Name	EP45_7.5	EP46_7.5	EP47_7.5	EP48_7.5	EP49_7.5	DUP01_2222	EP50_7.5	EP50_6.5_20220217	EP50_5.5_20220222	EP51_7.5	EP51_6.5_20220217	EP51_5.5_20220222
				Sample Date	03/10/2022	02/25/2022	02/03/2022	02/02/2022	02/02/2022	02/02/2022	02/09/2022	02/17/2022	02/22/2022	02/09/2022	02/17/2022	02/22/2022
				Sample Elevation	7.5	7.5	7.5	7.5	7.5	7.5	7.5	6.5	5.5	7.5	6.5	5.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 UJ	NA	NA	<0.0048 UJ	NA	NA
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 UJ	NA	NA	<0.0048 UJ	NA	NA
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 UJ	NA	NA	<0.0048 UJ	NA	NA
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.043 U	<0.063 UJ	<0.049 U	<0.057 U	<0.057 UJ	<0.079 U	<0.064 U	NA	NA	<0.096 U	NA	NA
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Acetone	67-64-1	**0.05**	100	mg/kg	0.0099	0.038 J	0.013	0.013	**0.054 J**	0.016 J	<0.0064 U	NA	NA	<0.0096 U	NA	NA
Acrolein	107-02-8	NS	NS	mg/kg	<0.0043 U	<0.0063 UJ	<0.0049 U	<0.0057 U	<0.0057 UJ	<0.0079 U	<0.0064 U	NA	NA	<0.0096 U	NA	NA
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Bromoform	75-25-2	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Chloroform	67-66-3	0.37	49	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Cyclohexane	110-82-7	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Ethylbenzene	100-41-4	1	41	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 UJ	NA	NA	<0.0048 UJ	NA	NA
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
M,P-Xylene	179601-23-1	NS	NS	mg/kg	<0.0043 U	<0.0063 UJ	<0.0049 U	<0.0057 U	<0.0057 UJ	<0.0079 U	<0.0064 U	NA	NA	<0.0096 U	NA	NA
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	<0.0022 U	0.0079 J	0.0025 J	<0.0029 U	0.013 J	<0.004 UJ	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 UJ	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Methylcyclohexane	108-87-2	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	<0.0043 U	<0.0063 UJ	<0.0049 U	<0.0057 U	<0.0057 UJ	<0.0079 U	0.011 J	NA	NA	0.011 J	NA	NA
n-Butylbenzene	104-51-8	12	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
n-Propylbenzene	103-65-1	3.9	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Sec-Butylbenzene	135-98-8	11	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Styrene	100-42-5	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 UJ	NA	NA	<0.0048 UJ	NA	NA
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 UJ	NA	NA	<0.0048 UJ	NA	NA
Toluene	108-88-3	**0.7**	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	<0.0065 U	<0.0095 UJ	<0.0074 U	<0.0086 U	<0.0085 UJ	<0.012 U	<0.0096 U	NA	NA	<0.014 U	NA	NA
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0022 U	<0.0032 UJ	<0.0025 U	<0.0029 U	<0.0028 UJ	<0.004 U	<0.0032 U	NA	NA	<0.0048 U	NA	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs		Location	EP45	EP46	EP47	EP48	EP49	EP49	EP50	EP50	EP50	EP51	EP51	EP51
					Sample Name	EP45_7.5	EP46_7.5	EP47_7.5	EP48_7.5	EP49_7.5	DUP01_2222	EP50_7.5	EP50_6.5_20220217	EP50_5.5_20220222	EP51_7.5	EP51_6.5_20220217	EP51_5.5_20220222
					Sample Date	03/10/2022	02/25/2022	02/03/2022	02/02/2022	02/02/2022	02/02/2022	02/09/2022	02/17/2022	02/22/2022	02/09/2022	02/17/2022	02/22/2022
					Sample Elevation	7.5	7.5	7.5	7.5	7.5	7.5	7.5	6.5	5.5	7.5	6.5	5.5
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds																	
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS		mg/kg	<0.0958 U	<0.102 UJ	<0.101 U	<0.103 U	<0.0933 U	<0.094 U	<0.0985 U	NA	NA	<0.0933 U	NA	NA
1,2-Diphenylhydrazine	122-66-7	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13		mg/kg	<0.0183 U	<0.0187 U	<0.0196 U	<0.0196 U	<0.0194 U	<0.0194 U	<0.0183 U	NA	NA	<0.0196 U	NA	NA
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS		mg/kg	<0.0958 U	<0.102 U	<0.101 U	<0.103 U	<0.0933 U	<0.094 U	<0.0985 U	NA	NA	<0.0933 U	NA	NA
2,4,5-Trichlorophenol	95-95-4	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
2,4,6-Trichlorophenol	88-06-2	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
2,4-Dichlorophenol	120-83-2	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
2,4-Dimethylphenol	105-67-9	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
2,4-Dinitrophenol	51-28-5	NS	NS		mg/kg	<0.0958 U	<0.102 U	<0.101 UJ	<0.103 U	<0.0933 U	<0.094 U	<0.0985 U	NA	NA	<0.0933 U	NA	NA
2,4-Dinitrotoluene	121-14-2	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
2,6-Dinitrotoluene	606-20-2	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
2-Chloronaphthalene	91-58-7	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
2-Chlorophenol	95-57-8	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
2-Methylnaphthalene	91-57-6	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	0.0519 JD	0.0567 JD	0.0601 JD	<0.0494 U	NA	NA	<0.0468 U	NA	NA
2-Methylphenol (o-Cresol)	95-48-7	0.33	100		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
2-Nitroaniline	88-74-4	NS	NS		mg/kg	<0.0958 U	<0.102 U	<0.101 U	<0.103 U	<0.0933 U	<0.094 U	<0.0985 U	NA	NA	<0.0933 U	NA	NA
2-Nitrophenol	88-75-5	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
3,3'-Dichlorobenzidine	91-94-1	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
3-Nitroaniline	99-09-2	NS	NS		mg/kg	<0.0958 U	<0.102 UJ	<0.101 U	<0.103 U	<0.0933 U	<0.094 U	<0.0985 U	NA	NA	<0.0933 U	NA	NA
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS		mg/kg	<0.0958 U	<0.102 U	<0.101 UJ	<0.103 U	<0.0933 U	<0.094 U	<0.0985 U	NA	NA	<0.0933 U	NA	NA
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
4-Chloro-3-Methylphenol	59-50-7	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
4-Chloroaniline	106-47-8	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
4-Nitroaniline	100-01-6	NS	NS		mg/kg	<0.0958 U	<0.102 U	<0.101 U	<0.103 U	<0.0933 U	<0.094 U	<0.0985 U	NA	NA	<0.0933 U	NA	NA
4-Nitrophenol	100-02-7	NS	NS		mg/kg	<0.0958 U	<0.102 U	<0.101 U	<0.103 U	<0.0933 U	<0.094 U	<0.0985 U	NA	NA	<0.0933 U	NA	NA
Acenaphthene	83-32-9	20	100		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Acenaphthylene	208-96-8	100	100		mg/kg	0.072 JD	<0.0511 UJ	0.0583 JD	0.123 D	0.0813 JD	0.0601 JD	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Acetophenone	98-86-2	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS		mg/kg	<0.192 U	<0.204 U	<0.203 U	<0.206 U	<0.187 U	<0.188 U	<0.197 U	NA	NA	<0.187 U	NA	NA
Anthracene	120-12-7	100	100		mg/kg	0.0842 JD	0.0628 JD	0.0737 JD	0.156 D	0.0507 JD	0.0609 JD	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Atrazine	1912-24-9	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Benzaldehyde	100-52-7	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Benzidine	92-87-5	NS	NS		mg/kg	<0.192 U	<0.204 U	<0.203 U	<0.206 U	<0.187 U	<0.188 U	<0.197 U	NA	NA	<0.187 U	NA	NA
Benzo(a)anthracene	56-55-3	**1**	1		mg/kg	0.237 D	0.227 D	0.228 D	0.319 D	0.134 D	0.153 D	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Benzo(a)pyrene	50-32-8	**1**	1		mg/kg	0.207 D	0.183 J	0.217 D	0.366 D	0.163 D	0.16 D	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Benzo(b)fluoranthene	205-99-2	**1**	1		mg/kg	0.162 D	0.121 D	0.173 D	0.352 D	0.119 D	0.123 D	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Benzo(g,h,i)Perylene	191-24-2	100	100		mg/kg	0.0773 JD	0.0913 JD	0.152 D	0.237 D	0.107 D	0.0977 D	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9		mg/kg	0.171 D	0.158 D	0.175 D	0.283 D	0.116 D	0.113 D	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Benzoic Acid	65-85-0	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 UJ	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Benzyl Alcohol	100-51-6	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Benzyl Butyl Phthalate	85-68-7	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Biphenyl (Diphenyl)	92-52-4	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Bis(2-chloroethoxy) methane	111-91-1	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	0.105 D	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Caprolactam	105-60-2	NS	NS		mg/kg	<0.0958 U	<0.102 U	<0.101 U	<0.103 U	<0.0933 U	<0.094 U	<0.0985 U	NA	NA	<0.0933 U	NA	NA
Carbazole	86-74-8	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Chrysene	218-01-9	**1**	1	*	mg/kg	0.218 D	0.213 D	0.241 D	0.32 D	0.131 D	0.143 D	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Dibenzofuran	132-64-9	7	59		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	0.0667 JD	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Dibutyl phthalate	84-74-2	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Diethyl phthalate	84-66-2	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Dimethyl phthalate	131-11-3	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Dioctyl phthalate	117-84-0	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Diphenylamine	122-39-4	NS	NS		mg/kg	<0.0958 U	<0.102 U	<0.101 U	<0.103 U	<0.0933 U	<0.094 U	<0.0985 U	NA	NA	<0.0933 U	NA	NA
Fluoranthene	206-44-0	**100**	100		mg/kg	0.534 D	0.467 J	0.45 D	0.596 D	0.207 D	0.222 D	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Fluorene	86-73-7	30	100		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	0.0989 JD	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Hexachlorobenzene	118-74-1	0.33	1.2		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Hexachlorobutadiene	87-68-3	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Hexachlorocyclopentadiene	77-47-4	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 UJ	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Hexachloroethane	67-72-1	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5		mg/kg	0.111 D	0.0987 JD	0.128 D	0.29 D	0.118 D	0.11 D	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Isophorone	78-59-1	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Naphthalene	91-20-3	12	100		mg/kg	<0.048 U	0.0554 JD	0.0632 JD	0.0964 JD	0.0686 JD	0.0827 JD	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Nitrobenzene	98-95-3	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
n-Nitrosodimethylamine	62-75-9	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS		mg/kg	<0.048 U	<0.0511 UJ	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
n-Nitrosodiphenylamine	86-30-6	NS	NS		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Pentachlorophenol	87-86-5	0.8	6.7		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Phenanthrene	85-01-8	100	100		mg/kg	0.33 D	0.204 D	0.276 D	0.355 D	0.16 D	0.199 D	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Phenol	108-95-2	0.33	100		mg/kg	<0.048 U	<0.0511 U	<0.0508 U	<0.0517 U	<0.0468 U	<0.0471 U	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Pyrene	129-00-0	**100**	100		mg/kg	0.402 D	0.48 D	0.422 D	0.528 D	0.216 D	0.247 D	<0.0494 U	NA	NA	<0.0468 U	NA	NA
Pyridine	110-86-1	NS	NS		mg/kg	<0.192 U	<0.204 U	<0.203 U	<0.206 U	<0.187 U	<0.188 U	<0.197 U	NA	NA	<0.187 U	NA	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP45	EP46	EP47	EP48	EP49	EP49	EP50	EP50	EP50	EP51	EP51	EP51
				Sample Name	EP45_7.5	EP46_7.5	EP47_7.5	EP48_7.5	EP49_7.5	DUP01_2222	EP50_7.5	EP50_6.5_20220217	EP50_5.5_20220222	EP51_7.5	EP51_6.5_20220217	EP51_5.5_20220222
				Sample Date	03/10/2022	02/25/2022	02/03/2022	02/02/2022	02/02/2022	02/02/2022	02/09/2022	02/17/2022	02/22/2022	02/09/2022	02/17/2022	02/22/2022
				Sample Elevation	7.5	7.5	7.5	7.5	7.5	7.5	7.5	6.5	5.5	7.5	6.5	5.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides																
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.0384 U	<0.04 U	<0.0397 U	<0.0409 U	<0.037 U	<0.0374 U	<0.0385 U	NA	NA	<0.0369 UJ	NA	NA
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Endrin	72-20-8	0.014	11	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.00192 U	<0.002 U	<0.00199 U	<0.00205 U	<0.00185 U	<0.00187 U	<0.00192 U	NA	NA	<0.00185 UJ	NA	NA
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.192 U	<0.2 U	<0.199 U	<0.205 U	<0.185 U	<0.187 U	<0.192 U	NA	NA	<0.185 UJ	NA	NA
Herbicides																
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.0233 U	<0.0245 U	<0.0242 U	<0.0248 U	<0.0221 U	<0.0226 U	<0.0235 U	NA	NA	<0.0225 UJ	NA	NA
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.0233 U	<0.0245 U	<0.0242 U	<0.0248 U	<0.0221 U	<0.0226 U	<0.0235 U	NA	NA	<0.0225 UJ	NA	NA
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.0233 U	<0.0245 U	<0.0242 U	<0.0248 U	<0.0221 U	<0.0226 U	<0.0235 U	NA	NA	<0.0225 UJ	NA	NA
Polychlorinated Biphenyl																
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.0194 U	<0.0202 U	<0.0201 U	<0.0207 U	<0.0187 U	<0.0189 U	<0.0194 U	NA	NA	<0.0186 U	NA	NA
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.0194 U	<0.0202 U	<0.0201 U	<0.0207 U	<0.0187 U	<0.0189 U	<0.0194 U	NA	NA	<0.0186 U	NA	NA
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.0194 U	<0.0202 U	<0.0201 U	<0.0207 U	<0.0187 U	<0.0189 U	<0.0194 U	NA	NA	<0.0186 U	NA	NA
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.0194 U	<0.0202 U	<0.0201 U	<0.0207 U	<0.0187 U	<0.0189 U	<0.0194 U	NA	NA	<0.0186 U	NA	NA
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.0194 U	<0.0202 U	<0.0201 U	<0.0207 U	<0.0187 U	<0.0189 U	<0.0194 U	NA	NA	<0.0186 U	NA	NA
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.0194 U	<0.0202 U	<0.0201 U	<0.0207 U	<0.0187 U	<0.0189 U	<0.0194 U	NA	NA	<0.0186 U	NA	NA
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.0194 U	<0.0202 U	<0.0201 U	<0.0207 U	<0.0187 U	<0.0189 U	<0.0194 U	NA	NA	<0.0186 U	NA	NA
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.0194 U	<0.0202 U	<0.0201 U	<0.0207 U	<0.0187 U	<0.0189 U	<0.0194 U	NA	NA	<0.0186 U	NA	NA
Metals																
Aluminum	7429-90-5	NS	NS	mg/kg	4,180	6,200	6,820	4,530 J	6,690	5,050	6,670	NA	NA	6,900	NA	NA
Antimony	7440-36-0	NS	NS	mg/kg	<2.92 U	4.22	<3.05 U	13.9 J	3.12	<2.86 U	<2.97 U	NA	NA	<2.83 U	NA	NA
Arsenic	7440-38-2	**13**	16	mg/kg	2.58	2.79	3.04	4.91 J	3.91	3.98	7.39	NA	NA	6.42	NA	NA
Barium	7440-39-3	**350**	400	mg/kg	41.5	65.1	58.6 J	83.7 J	81.3 J	58.6 J	**351**	NA	NA	82.1	NA	NA
Beryllium	7440-41-7	7.2	72	mg/kg	<0.058 U	<0.061 U	<0.061 U	<0.063 U	<0.057 U	<0.057 U	<0.059 U	NA	NA	<0.057 U	NA	NA
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	<0.35 U	1.01	<0.366 U	<0.376 U	1.61 J	<0.343 UJ	1.19	NA	NA	<0.34 U	NA	NA
Calcium	7440-70-2	NS	NS	mg/kg	3,440	8,930 B	15,700 B	4,080 J	9,000 J	3,550 J	30,600 B	NA	NA	18,700 B	NA	NA
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.584 U	<0.614 U	<0.61 U	<0.626 UJ	<0.569 U	<0.571 U	<0.595 U	NA	NA	<0.567 U	NA	NA
Chromium, Total	7440-47-3	NS	NS	mg/kg	17.4	26.5	21.2	26.1 J	17	16	36.2	NA	NA	48	NA	NA
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	17.4	26.5	21.2	26.1	17	16	**36.2**	NA	NA	**48**	NA	NA
Cobalt	7440-48-4	NS	NS	mg/kg	9.34	10.7	12 J	10.9 J	10.4 J	8.69 J	10.8	NA	NA	23	NA	NA
Copper	7440-50-8	**50**	270	mg/kg	32.3 J	**61.4**	**52.2**	**51.4 J**	45 J	**55.5 J**	**57.6**	NA	NA	44.5	NA	NA
Cyanide	57-12-5	27	27	mg/kg	<0.584 U	<0.614 U	<0.61 U	<0.626 U	<0.569 U	0.572	<0.595 U	NA	NA	<0.567 U	NA	NA
Iron	7439-89-6	NS	NS	mg/kg	10,200	12,200	11,600	12,900 J	27,400 J	10,900 J	17,500	NA	NA	21,300	NA	NA
Lead	7439-92-1	**63**	400	mg/kg	**102**	**115**	**102**	**146**	**122**	**107**	746	453	53.5 J	**210**	NA	NA
Magnesium	7439-95-4	NS	NS	mg/kg	3,070	5,010	9,390	5,840 J	2,720 B	3,060 B	8,640	NA	NA	17,500	NA	NA
Manganese	7439-96-5	1600	2000	mg/kg	192	144	147	206 J	199 J	84.2 J	343	NA	NA	336	NA	NA
Mercury	7439-97-6	**0.18**	0.81	mg/kg	**0.555**	**0.23**	**0.465**	**0.311**	**0.277**	**0.3**	**0.25**	NA	NA	**0.211**	NA	NA
Nickel	7440-02-0	**30**	310	mg/kg	**56.6**	**89.1 J**	**82.8 J**	**139 J**	**55 J**	**71.4 J**	**111 J**	NA	NA	312 J	364 J	**220 J**
Potassium	7440-09-7	NS	NS	mg/kg	684 B	792	709	720 J	784 B	570 B	945	NA	NA	910	NA	NA
Selenium	7782-49-2	3.9	180	mg/kg	<2.92 U	<3.07 U	<3.05 U	<3.13 U	<2.84 U	<2.86 U	<2.97 U	NA	NA	<2.83 U	NA	NA
Silver	7440-22-4	2	180	mg/kg	<0.584 U	<0.614 U	<0.61 U	<0.626 U	<0.569 U	<0.571 U	<0.595 U	NA	NA	<0.567 U	NA	NA
Sodium	7440-23-5	NS	NS	mg/kg	231	349	674	217	465	293	256	NA	NA	286	NA	NA
Thallium	7440-28-0	NS	NS	mg/kg	<2.92 U	<3.07 U	<3.05 U	<3.13 U	<2.84 U	<2.86 U	<2.97 U	NA	NA	<2.83 U	NA	NA
Vanadium	7440-62-2	NS	NS	mg/kg	16.8	21.7	26.1	17.9 J	28.8	25.5	27.4	NA	NA	26.7	NA	NA
Zinc	7440-66-6	**109**	10000	mg/kg	48	**470**	46.7	**142 J**	**415 J**	61.8 J	**412 B**	NA	NA	**125 B**	NA	NA
General Chemistry																
Solids, Percent	SOLID	NS	NS	Percent	85.7	81.5	82	79.9	87.9	87.5	84.1	83.3	83.1	88.2	83	83.2

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP45	EP46	EP47	EP48	EP49	EP49	EP50	EP50	EP50	EP51	EP51	EP51
				Sample Name	EP45_7.5	EP46_7.5	EP47_7.5	EP48_7.5	EP49_7.5	DUP01_2222	EP50_7.5	EP50_6.5_20220217	EP50_5.5_20220222	EP51_7.5	EP51_6.5_20220217	EP51_5.5_20220222
				Sample Date	03/10/2022	02/25/2022	02/03/2022	02/02/2022	02/02/2022	02/02/2022	02/09/2022	02/17/2022	02/22/2022	02/09/2022	02/17/2022	02/22/2022
				Sample Elevation	7.5	7.5	7.5	7.5	7.5	7.5	7.5	6.5	5.5	7.5	6.5	5.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids																
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000281 U	0.00051	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	**0.00091**	NA	NA	<0.000279 U	NA	NA
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	0.000285	**0.0008**	0.000635	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 U	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000281 U	<0.000299 U	<0.000278 U	<0.000273 UJ	<0.000266 U	<0.000278 U	<0.000275 U	NA	NA	<0.000279 U	NA	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP52	EP52	EP53	EP54	EP55	EP56	EP56	EP57	EP58	EP59
				Sample Name	EP52_7.5_20220207	EP52_6.5_20220217	EP53_4.0	EP54_7.5	EP55_0.5	EP56_7.5	EP56_6.5	EP57_0.5	EP58_0.5	EP59_7.5
				Sample Date	02/07/2022	02/17/2022	02/24/2022	03/10/2022	03/22/2022	02/25/2022	03/04/2022	03/31/2022	03/31/2022	02/03/2022
				Sample Elevation	7.5	6.5	4	7.5	0.5	7.5	6.5	0.5	0.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds														
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.047 U	NA	<0.047 U	<0.038 U	<0.039 U	<0.073 UJ	NA	<0.041 U	<0.04 U	<0.048 U
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Acetone	67-64-1	**0.05**	100	mg/kg	<0.0047 U	NA	<0.0047 U	<0.0038 U	0.013 J	0.011 J	NA	0.032	0.0066 J	0.013
Acrolein	107-02-8	NS	NS	mg/kg	<0.0047 U	NA	<0.0047 U	<0.0038 U	<0.0039 UJ	<0.0073 UJ	NA	<0.0041 U	<0.004 U	<0.0048 U
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Bromoform	75-25-2	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 UJ	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Chloroform	67-66-3	0.37	49	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 UJ	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Cyclohexane	110-82-7	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 UJ	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Ethylbenzene	100-41-4	1	41	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
M,P-Xylene	179601-23-1	NS	NS	mg/kg	<0.0047 U	NA	<0.0047 U	<0.0038 U	<0.0039 U	<0.0073 UJ	NA	<0.0041 U	<0.004 U	<0.0048 U
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	0.0039	<0.0036 UJ	NA	0.0082	<0.002 U	<0.0024 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 UJ
Methylcyclohexane	108-87-2	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	<0.0047 U	NA	0.011	<0.0038 U	0.0086	<0.0073 UJ	NA	<0.0041 U	0.0071 J	<0.0048 U
n-Butylbenzene	104-51-8	12	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
n-Propylbenzene	103-65-1	3.9	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Sec-Butylbenzene	135-98-8	11	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Styrene	100-42-5	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0023 UJ	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 U	<0.0036 UJ	NA	<0.0021 UJ	<0.002 UJ	<0.0024 U
Toluene	108-88-3	**0.7**	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	<0.007 U	NA	<0.007 U	<0.0057 U	<0.0058 U	<0.011 UJ	NA	<0.0062 U	<0.0061 U	<0.0071 U
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 U	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0023 U	NA	<0.0023 U	<0.0019 UJ	<0.0019 U	<0.0036 UJ	NA	<0.0021 U	<0.002 U	<0.0024 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP52	EP52	EP53	EP54	EP55	EP56	EP56	EP57	EP58	EP59
				Sample Name	EP52_7.5_20220207	EP52_6.5_20220217	EP53_4.0	EP54_7.5	EP55_0.5	EP56_7.5	EP56_6.5	EP57_0.5	EP58_0.5	EP59_7.5
				Sample Date	02/07/2022	02/17/2022	02/24/2022	03/10/2022	03/22/2022	02/25/2022	03/04/2022	03/31/2022	03/31/2022	02/03/2022
				Sample Elevation	7.5	6.5	4	7.5	0.5	7.5	6.5	0.5	0.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds														
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS	mg/kg	<0.482 U	NA	<0.0925 U	<0.0927 U	<0.0926 U	<0.121 UJ	NA	<0.105 U	<0.0933 U	<0.0899 U
1,2-Diphenylhydrazine	122-66-7	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.0189 U	NA	<0.0185 U	<0.0183 U	<0.019 UJ	<0.0187 U	NA	<0.0198 U	<0.0198 U	<0.0194 U
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS	mg/kg	<0.482 U	NA	<0.0925 U	<0.0927 U	<0.0926 U	<0.121 U	NA	<0.105 U	<0.0933 U	<0.0899 U
2,4,5-Trichlorophenol	95-95-4	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
2,4,6-Trichlorophenol	88-06-2	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
2,4-Dichlorophenol	120-83-2	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
2,4-Dimethylphenol	105-67-9	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
2,4-Dinitrophenol	51-28-5	NS	NS	mg/kg	<0.482 UJ	NA	<0.0925 U	<0.0927 U	<0.0926 UJ	<0.121 U	NA	<0.105 U	<0.0933 U	<0.0899 UJ
2,4-Dinitrotoluene	121-14-2	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
2,6-Dinitrotoluene	606-20-2	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
2-Chloronaphthalene	91-58-7	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
2-Chlorophenol	95-57-8	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
2-Methylnaphthalene	91-57-6	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	0.0909 JD	NA	<0.0526 U	<0.0468 U	<0.0451 U
2-Methylphenol (o-Cresol)	95-48-7	0.33	100	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
2-Nitroaniline	88-74-4	NS	NS	mg/kg	<0.482 U	NA	<0.0925 U	<0.0927 U	<0.0926 U	<0.121 U	NA	<0.105 U	<0.0933 U	<0.0899 U
2-Nitrophenol	88-75-5	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
3,3'-Dichlorobenzidine	91-94-1	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
3-Nitroaniline	99-09-2	NS	NS	mg/kg	<0.482 U	NA	<0.0925 U	<0.0927 U	<0.0926 U	<0.121 UJ	NA	<0.105 U	<0.0933 U	<0.0899 U
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS	mg/kg	<0.482 U	NA	<0.0925 U	<0.0927 U	<0.0926 U	<0.121 U	NA	<0.105 U	<0.0933 U	<0.0899 UJ
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
4-Chloro-3-Methylphenol	59-50-7	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
4-Chloroaniline	106-47-8	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
4-Nitroaniline	100-01-6	NS	NS	mg/kg	<0.482 U	NA	<0.0925 U	<0.0927 U	<0.0926 U	<0.121 U	NA	<0.105 U	<0.0933 U	<0.0899 U
4-Nitrophenol	100-02-7	NS	NS	mg/kg	<0.482 U	NA	<0.0925 U	<0.0927 U	<0.0926 U	<0.121 U	NA	<0.105 U	<0.0933 U	<0.0899 U
Acenaphthene	83-32-9	20	100	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Acenaphthylene	208-96-8	100	100	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	0.137 J	NA	<0.0526 U	<0.0468 U	<0.0451 U
Acetophenone	98-86-2	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS	mg/kg	<0.966 U	NA	<0.185 U	<0.186 U	<0.185 U	<0.242 U	NA	<0.21 U	<0.187 U	<0.18 U
Anthracene	120-12-7	100	100	mg/kg	0.274 JD	NA	<0.0464 U	0.0726 JD	<0.0464 U	0.148 D	NA	<0.0526 U	<0.0468 U	<0.0451 U
Atrazine	1912-24-9	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Benzaldehyde	100-52-7	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Benzidine	92-87-5	NS	NS	mg/kg	<0.966 U	NA	<0.185 U	<0.186 U	<0.185 UJ	<0.242 U	NA	<0.21 U	<0.187 U	<0.18 U
Benzo(a)anthracene	56-55-3	**1**	1	mg/kg	1.1 D	0.27 D	<0.0464 U	0.428 D	<0.0464 U	0.947 D	NA	<0.0526 U	<0.0468 U	0.103 D
Benzo(a)pyrene	50-32-8	**1**	1	mg/kg	1.26 D	0.27 D	<0.0464 U	0.414 D	<0.0464 U	0.919 J	NA	<0.0526 U	<0.0468 U	0.0999 D
Benzo(b)fluoranthene	205-99-2	**1**	1	mg/kg	1.03 D	0.197 D	<0.0464 U	0.283 D	<0.0464 U	0.707 D	NA	<0.0526 U	<0.0468 U	0.0639 JD
Benzo(g,h,i)Perylene	191-24-2	100	100	mg/kg	0.76 D	NA	<0.0464 U	0.187 D	<0.0464 U	0.847 D	NA	<0.0526 U	<0.0468 U	0.0625 JD
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9	mg/kg	**0.895 D**	NA	<0.0464 U	0.271 D	<0.0464 U	0.7 D	NA	<0.0526 U	<0.0468 U	0.0683 JD
Benzoic Acid	65-85-0	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 UJ	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 UJ
Benzyl Alcohol	100-51-6	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Benzyl Butyl Phthalate	85-68-7	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Biphenyl (Diphenyl)	92-52-4	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
Bis(2-chloroethoxy) methane	111-91-1	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Caprolactam	105-60-2	NS	NS	mg/kg	<0.482 U	NA	<0.0925 U	<0.0927 U	<0.0926 UJ	<0.121 U	NA	<0.105 U	<0.0933 U	<0.0899 U
Carbazole	86-74-8	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Chrysene	218-01-9	**1**	1 *	mg/kg	1.03 D	0.26 D	<0.0464 U	0.417 D	<0.0464 U	1.04 D	<0.0459 U	<0.0526 U	<0.0468 U	0.106 D
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33	mg/kg	<0.242 U	NA	<0.0464 U	0.0637 JD	<0.0464 U	0.142 D	NA	<0.0526 U	<0.0468 U	<0.0451 U
Dibenzofuran	132-64-9	7	59	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	0.0628 J	NA	<0.0526 U	<0.0468 U	<0.0451 U
Dibutyl phthalate	84-74-2	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Diethyl phthalate	84-66-2	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
Dimethyl phthalate	131-11-3	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
Dioctyl phthalate	117-84-0	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
Diphenylamine	122-39-4	NS	NS	mg/kg	<0.482 U	NA	<0.0925 U	<0.0927 U	<0.0926 U	<0.121 U	NA	<0.105 U	<0.0933 U	<0.0899 U
Fluoranthene	206-44-0	**100**	100	mg/kg	2.18 D	NA	<0.0464 U	0.64 D	0.0614 JD	1.25 J	NA	<0.0526 U	<0.0468 U	0.133 D
Fluorene	86-73-7	30	100	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Hexachlorobenzene	118-74-1	0.33	1.2	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 UJ	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
Hexachlorocyclopentadiene	77-47-4	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 UJ	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 UJ
Hexachloroethane	67-72-1	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5	mg/kg	0.926 D	0.161 D	<0.0464 U	0.214 D	<0.0464 U	0.809 D	<0.0459 U	<0.0526 U	<0.0468 U	0.0474 JD
Isophorone	78-59-1	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Naphthalene	91-20-3	12	100	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	0.145 D	NA	<0.0526 U	<0.0468 U	0.0467 JD
Nitrobenzene	98-95-3	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
n-Nitrosodimethylamine	62-75-9	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 UJ	NA	<0.0526 U	<0.0468 U	<0.0451 U
n-Nitrosodiphenylamine	86-30-6	NS	NS	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Pentachlorophenol	87-86-5	0.8	6.7	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 UJ	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Phenanthrene	85-01-8	100	100	mg/kg	1.1 D	NA	<0.0464 U	0.227 D	<0.0464 U	0.557 D	NA	<0.0526 U	<0.0468 U	0.106 D
Phenol	108-95-2	0.33	100	mg/kg	<0.242 U	NA	<0.0464 U	<0.0465 U	<0.0464 U	<0.0606 U	NA	<0.0526 U	<0.0468 U	<0.0451 U
Pyrene	129-00-0	**100**	100	mg/kg	1.91 D	NA	<0.0464 U	0.768 D	0.054 JD	1.99 D	NA	<0.0526 U	<0.0468 U	0.165 D
Pyridine	110-86-1	NS	NS	mg/kg	<0.966 U	NA	<0.185 U	<0.186 U	<0.185 UJ	<0.242 U	NA	<0.21 U	<0.187 U	<0.18 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP52	EP52	EP53	EP54	EP55	EP56	EP56	EP57	EP58	EP59
				Sample Name	EP52_7.5_20220207	EP52_6.5_20220217	EP53_4.0	EP54_7.5	EP55_0.5	EP56_7.5	EP56_6.5	EP57_0.5	EP58_0.5	EP59_7.5
				Sample Date	02/07/2022	02/17/2022	02/24/2022	03/10/2022	03/22/2022	02/25/2022	03/04/2022	03/31/2022	03/31/2022	02/03/2022
				Sample Elevation	7.5	6.5	4	7.5	0.5	7.5	6.5	0.5	0.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides														
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.0381 U	NA	<0.0367 U	<0.0748 UJ	<0.0366 U	<0.0488 U	NA	<0.041 U	<0.0375 U	<0.0359 U
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Endrin	72-20-8	0.014	11	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 UJ	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00374 UJ	<0.00183 U	<0.00244 U	NA	<0.00205 U	<0.00188 U	<0.0018 U
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.19 U	NA	<0.184 U	<0.374 UJ	<0.183 U	<0.244 U	NA	<0.205 U	<0.188 U	<0.18 U
Herbicides														
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.0231 U	NA	<0.0222 U	<0.0225 U	<0.0219 U	<0.0294 U	NA	<0.0247 U	<0.0224 U	<0.0218 U
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.0231 U	NA	<0.0222 U	<0.0225 U	<0.0219 U	<0.0294 U	NA	<0.0247 U	<0.0224 U	<0.0218 U
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.0231 U	NA	<0.0222 U	<0.0225 U	<0.0219 U	<0.0294 U	NA	<0.0247 U	<0.0224 U	<0.0218 U
Polychlorinated Biphenyl														
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.0192 U	NA	<0.0185 U	<0.0378 U	<0.0185 U	<0.0246 U	NA	<0.0207 U	<0.0189 U	<0.0181 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.0192 U	NA	<0.0185 U	<0.0378 U	<0.0185 U	<0.0246 U	NA	<0.0207 U	<0.0189 U	<0.0181 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.0192 U	NA	<0.0185 U	<0.0378 U	<0.0185 U	<0.0246 U	NA	<0.0207 U	<0.0189 U	<0.0181 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.0192 U	NA	<0.0185 U	<0.0378 U	<0.0185 U	<0.0246 U	NA	<0.0207 U	<0.0189 U	<0.0181 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.0192 U	NA	<0.0185 U	<0.0378 U	<0.0185 U	<0.0246 U	NA	<0.0207 U	<0.0189 U	<0.0181 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.0192 U	NA	<0.0185 U	<0.0378 U	<0.0185 U	<0.0246 U	NA	<0.0207 U	<0.0189 U	<0.0181 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.0192 U	NA	<0.0185 U	<0.0378 U	<0.0185 U	<0.0246 U	NA	<0.0207 U	<0.0189 U	<0.0181 U
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.0192 U	NA	<0.0185 U	<0.0378 U	<0.0185 U	<0.0246 U	NA	<0.0207 U	<0.0189 U	<0.0181 U
Metals														
Aluminum	7429-90-5	NS	NS	mg/kg	9,300	NA	8,960	11,700	3,750	12,600	NA	8,690	3,830	3,860
Antimony	7440-36-0	NS	NS	mg/kg	<2.93 U	NA	3.36	3.29	4.37	5.3	NA	6.08	3.48	<2.77 U
Arsenic	7440-38-2	**13**	16	mg/kg	6.47	NA	<1.68 U	1.97	<1.68 U	**15**	NA	<1.89 U	<1.71 U	1.73
Barium	7440-39-3	**350**	400	mg/kg	129	NA	64.7	56.2	22.8	181	NA	47.3	27.2	54.5 J
Beryllium	7440-41-7	7.2	72	mg/kg	<0.059 U	NA	<0.056 U	<0.057 U	0.074	<0.074 U	NA	<0.063 U	<0.057 U	<0.055 U
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	<0.352 U	NA	<0.335 U	<0.342 U	<0.336 U	<0.445 U	NA	<0.379 U	<0.342 U	<0.332 U
Calcium	7440-70-2	NS	NS	mg/kg	14,600 B	NA	2,040	8,570	1,270 B	7,110 B	NA	967	961	4,790 B
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.586 U	NA	<0.558 U	<0.571 U	<0.561 U	<0.742 U	NA	<0.631 U	<0.57 U	<0.553 U
Chromium, Total	7440-47-3	NS	NS	mg/kg	28.9	NA	22.3	32.1	64.3	47.4	NA	53.8	16	13.1
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	28.9	NA	22.3	**32.1**	**64.3**	**47.4**	NA	**53.8**	16	13.1
Cobalt	7440-48-4	NS	NS	mg/kg	14.4	NA	9.25	14.3	15.9	17	NA	30	6.71	7.16 J
Copper	7440-50-8	**50**	270	mg/kg	**146**	NA	**169**	**84.4 J**	19.7	**261**	NA	21.8	16.2	35.3
Cyanide	57-12-5	27	27	mg/kg	<0.586 U	NA	<0.558 U	<0.571 UJ	<0.561 U	0.772	NA	<0.631 U	<0.57 UJ	<0.553 U
Iron	7439-89-6	NS	NS	mg/kg	18,300	NA	17,700	17,800	20,200	28,700	NA	17,900	10,400	7,240
Lead	7439-92-1	**63**	400	mg/kg	418	**124**	5.16	**103**	5.95	794	5.72	36	3.46	**76.6**
Magnesium	7439-95-4	NS	NS	mg/kg	7,200	NA	4,150 B	9,630	4,970	10,100	NA	3,310	1,940	2,520
Manganese	7439-96-5	1600	2000	mg/kg	427	NA	259 B	251	236	212	NA	204	171	70.9
Mercury	7439-97-6	**0.18**	0.81	mg/kg	**0.442**	NA	<0.0335 U	**0.351**	0.0584	1.6	<0.0331 U	<0.0379 U	<0.0342 U	0.155
Nickel	7440-02-0	**30**	310	mg/kg	**114**	NA	**125**	**130**	**186 J**	**209 J**	NA	**212 J**	**62.6 J**	**45.4 J**
Potassium	7440-09-7	NS	NS	mg/kg	1,370 B	NA	1,340	1,040 B	743	1,520	NA	682 B	657 B	489
Selenium	7782-49-2	3.9	180	mg/kg	<2.93 U	NA	<2.79 U	<2.85 U	<2.8 UJ	<3.71 U	NA	<3.16 U	<2.85 U	<2.77 U
Silver	7440-22-4	2	180	mg/kg	<0.586 U	NA	<0.558 U	<0.571 U	<0.561 U	<0.742 U	NA	<0.631 U	<0.57 U	<0.553 U
Sodium	7440-23-5	NS	NS	mg/kg	420	NA	168	1,230	112	591	NA	205	74.6	271
Thallium	7440-28-0	NS	NS	mg/kg	<2.93 U	NA	<2.79 U	<2.85 U	<2.8 U	<3.71 U	NA	<3.16 U	<2.85 U	<2.77 U
Vanadium	7440-62-2	NS	NS	mg/kg	30.4	NA	26.2	46.1	15.5	36.1	NA	26.2	15.5	26.4
Zinc	7440-66-6	**109**	10000	mg/kg	**240 B**	NA	28.7	54.8	18.4	**481**	NA	28	15.1	30.9
General Chemistry														
Solids, Percent	SOLID	NS	NS	Percent	85.3	86.2	89.5	87.6	89.2	67.4	90.7	79.2	87.6	90.4

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP52	EP52	EP53	EP54	EP55	EP56	EP56	EP57	EP58	EP59
				Sample Name	EP52_7.5_20220207	EP52_6.5_20220217	EP53_4.0	EP54_7.5	EP55_0.5	EP56_7.5	EP56_6.5	EP57_0.5	EP58_0.5	EP59_7.5
				Sample Date	02/07/2022	02/17/2022	02/24/2022	03/10/2022	03/22/2022	02/25/2022	03/04/2022	03/31/2022	03/31/2022	02/03/2022
				Sample Elevation	7.5	6.5	4	7.5	0.5	7.5	6.5	0.5	0.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids														
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000288 UJ	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	0.00037	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	**0.000977**	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	**0.000875**	NA	<0.000265 U	0.000558	<0.000278 U	**0.00212**	NA	<0.000297 U	<0.000277 U	0.000483
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 UJ	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000288 U	NA	<0.000265 U	<0.000278 U	<0.000278 U	<0.000367 U	NA	<0.000297 U	<0.000277 U	<0.000255 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP60	EP60	EP60	EP60	EP60	EP61	EP61	EP61	EP61	EP62	EP62	EP63	EP63	EP64
				Sample Name	EP60_7.5	DUP06_04212022	EP60_6.5	EP60_5.5	EP60_4.5	EP61_7.5	EP61_6.5	EP61_5.5	EP61_4.5	EP62_7.5	EP62_6.5	EP63_7.5	EP63_6.5	EP64_7.5
				Sample Date	04/21/2022	04/21/2022	04/28/2022	05/04/2022	05/11/2022	04/21/2022	04/28/2022	05/04/2022	05/11/2022	04/29/2022	05/05/2022	04/29/2022	05/05/2022	08/10/2022
				Sample Elevation	7.5	7.5	6.5	5.5	4.5	7.5	6.5	5.5	4.5	7.5	6.5	7.5	6.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																		
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0022 UJ	<0.0023 UJ	NA	NA	NA	<0.0022 UJ	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0022 UJ	<0.0023 UJ	NA	NA	NA	<0.0022 UJ	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0022 UJ	<0.0023 UJ	NA	NA	NA	<0.0022 UJ	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	<0.0022 UJ	<0.0023 UJ	NA	NA	NA	<0.0022 UJ	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	0.0026 J
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.043 UJ	<0.046 UJ	NA	NA	NA	<0.044 UJ	NA	NA	NA	<0.065 U	NA	<0.049 U	NA	<0.042 U
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Acetone	67-64-1	**0.05**	100	mg/kg	0.0052 J	0.0048 J	NA	NA	NA	0.0079 J	NA	NA	NA	0.011 J	NA	0.015	NA	<0.0042 UJ
Acrolein	107-02-8	NS	NS	mg/kg	<0.0043 UJ	<0.0046 UJ	NA	NA	NA	<0.0044 UJ	NA	NA	NA	<0.0065 U	NA	<0.0049 U	NA	<0.0042 U
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Bromoform	75-25-2	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0022 UJ	<0.0023 UJ	NA	NA	NA	<0.0022 UJ	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0022 UJ	<0.0023 UJ	NA	NA	NA	<0.0022 UJ	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0022 UJ	<0.0023 UJ	NA	NA	NA	<0.0022 UJ	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Chloroform	67-66-3	0.37	49	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Cyclohexane	110-82-7	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0022 UJ	<0.0023 UJ	NA	NA	NA	<0.0022 UJ	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0022 UJ	<0.0023 UJ	NA	NA	NA	<0.0022 UJ	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Ethylbenzene	100-41-4	1	41	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
M,P-Xylene	179601-23-1	NS	NS	mg/kg	<0.0043 U	<0.0046 U	NA	NA	NA	<0.0044 U	NA	NA	NA	<0.0065 U	NA	<0.0049 U	NA	<0.0042 U
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Methylcyclohexane	108-87-2	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	<0.0043 U	<0.0046 U	NA	NA	NA	<0.0087 U	NA	NA	NA	<0.0065 U	NA	<0.0049 U	NA	<0.0042 U
n-Butylbenzene	104-51-8	12	100	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
n-Propylbenzene	103-65-1	3.9	100	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Sec-Butylbenzene	135-98-8	11	100	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Styrene	100-42-5	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Toluene	108-88-3	**0.7**	100	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	<0.0065 U	<0.0069 U	NA	NA	NA	<0.0065 U	NA	NA	NA	<0.0098 U	NA	<0.0074 U	NA	<0.0062 U
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0022 UJ	<0.0023 UJ	NA	NA	NA	<0.0022 UJ	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0022 UJ	<0.0023 UJ	NA	NA	NA	<0.0022 UJ	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0022 U	<0.0023 U	NA	NA	NA	<0.0022 U	NA	NA	NA	<0.0033 U	NA	<0.0025 U	NA	<0.0021 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs		Location	EP60	EP60	EP60	EP60	EP60	EP61	EP61	EP61	EP61	EP62	EP62	EP63	EP63	EP64
					Sample Name	EP60_7.5	DUP06_04212022	EP60_6.5	EP60_5.5	EP60_4.5	EP61_7.5	EP61_6.5	EP61_5.5	EP61_4.5	EP62_7.5	EP62_6.5	EP63_7.5	EP63_6.5	EP64_7.5
					Sample Date	04/21/2022	04/21/2022	04/28/2022	05/04/2022	05/11/2022	04/21/2022	04/28/2022	05/04/2022	05/11/2022	04/29/2022	05/05/2022	04/29/2022	05/05/2022	08/10/2022
					Sample Elevation	7.5	7.5	6.5	5.5	4.5	7.5	6.5	5.5	4.5	7.5	6.5	7.5	6.5	7.5
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds																			
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS		mg/kg	<0.0987 UJ	<0.0984 U	NA	NA	NA	<0.0986 UJ	NA	NA	NA	<0.0975 U	NA	<0.0984 U	NA	<0.0926 U
1,2-Diphenylhydrazine	122-66-7	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13		mg/kg	<0.0198 UJ	<0.0198 UJ	NA	NA	NA	<0.0187 UJ	NA	NA	NA	<0.019 U	NA	<0.0192 U	NA	<0.0196 U
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS		mg/kg	<0.0987 U	<0.0984 U	NA	NA	NA	<0.0986 U	NA	NA	NA	<0.0975 U	NA	<0.0984 U	NA	<0.0926 U
2,4,5-Trichlorophenol	95-95-4	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
2,4,6-Trichlorophenol	88-06-2	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
2,4-Dichlorophenol	120-83-2	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
2,4-Dimethylphenol	105-67-9	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
2,4-Dinitrophenol	51-28-5	NS	NS		mg/kg	<0.0987 UJ	<0.0984 UJ	NA	NA	NA	<0.0986 UJ	NA	NA	NA	<0.0975 U	NA	<0.0984 U	NA	<0.0926 U
2,4-Dinitrotoluene	121-14-2	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
2,6-Dinitrotoluene	606-20-2	NS	NS		mg/kg	<0.0495 UJ	<0.0493 UJ	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
2-Chloronaphthalene	91-58-7	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
2-Chlorophenol	95-57-8	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
2-Methylnaphthalene	91-57-6	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	0.124 D	NA	<0.0464 U
2-Methylphenol (o-Cresol)	95-48-7	0.33	100		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
2-Nitroaniline	88-74-4	NS	NS		mg/kg	<0.0987 UJ	<0.0984 U	NA	NA	NA	<0.0986 UJ	NA	NA	NA	<0.0975 U	NA	<0.0984 U	NA	<0.0926 U
2-Nitrophenol	88-75-5	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
3,3'-Dichlorobenzidine	91-94-1	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
3-Nitroaniline	99-09-2	NS	NS		mg/kg	<0.0987 UJ	<0.0984 U	NA	NA	NA	<0.0986 UJ	NA	NA	NA	<0.0975 U	NA	<0.0984 U	NA	<0.0926 U
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS		mg/kg	<0.0987 UJ	<0.0984 UJ	NA	NA	NA	<0.0986 UJ	NA	NA	NA	<0.0975 U	NA	<0.0984 U	NA	<0.0926 U
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
4-Chloro-3-Methylphenol	59-50-7	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
4-Chloroaniline	106-47-8	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
4-Nitroaniline	100-01-6	NS	NS		mg/kg	<0.0987 UJ	<0.0984 U	NA	NA	NA	<0.0986 UJ	NA	NA	NA	<0.0975 U	NA	<0.0984 U	NA	<0.0926 U
4-Nitrophenol	100-02-7	NS	NS		mg/kg	<0.0987 U	<0.0984 U	NA	NA	NA	<0.0986 U	NA	NA	NA	<0.0975 UJ	NA	<0.0984 UJ	NA	<0.0926 U
Acenaphthene	83-32-9	20	100		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	0.112 D	NA	<0.0464 U
Acenaphthylene	208-96-8	100	100		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	0.0851 JD	NA	NA	NA	0.0896 JD	NA	0.907 D	NA	<0.0464 U
Acetophenone	98-86-2	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS		mg/kg	<0.198 UJ	<0.197 UJ	NA	NA	NA	<0.197 UJ	NA	NA	NA	<0.195 U	NA	<0.197 U	NA	<0.185 U
Anthracene	120-12-7	100	100		mg/kg	0.0821 JD	<0.0493 U	NA	NA	NA	0.173 D	NA	NA	NA	0.0662 JD	NA	0.829 D	NA	<0.0464 U
Atrazine	1912-24-9	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Benzaldehyde	100-52-7	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Benzidine	92-87-5	NS	NS		mg/kg	<0.198 U	<0.197 UJ	NA	NA	NA	<0.197 U	NA	NA	NA	<0.195 U	NA	<0.197 U	NA	<0.185 U
Benzo(a)anthracene	56-55-3	**1**	1		mg/kg	0.361 J	0.131 J	NA	NA	NA	0.579 D	NA	NA	NA	0.268 D	NA	3.9 D	0.102 D	0.0947 D
Benzo(a)pyrene	50-32-8	**1**	1		mg/kg	0.389 J	0.126 J	NA	NA	NA	0.679 D	NA	NA	NA	0.318 D	NA	6 D	0.0936 D	0.111 D
Benzo(b)fluoranthene	205-99-2	**1**	1		mg/kg	0.297 J	0.096 J	NA	NA	NA	0.631 D	NA	NA	NA	0.298 D	NA	2.81 D	0.0685 JD	0.0755 JD
Benzo(g,h,i)Perylene	191-24-2	100	100		mg/kg	0.227 D	0.119 D	NA	NA	NA	0.475 D	NA	NA	NA	0.0561 JD	NA	5.56 D	NA	0.0947 D
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9		mg/kg	0.255 D	0.106 D	NA	NA	NA	0.527 D	NA	NA	NA	0.238 D	NA	**3.06 D**	NA	0.0755 JD
Benzoic Acid	65-85-0	NS	NS		mg/kg	<0.0495 UJ	<0.0493 UJ	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Benzyl Alcohol	100-51-6	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Benzyl Butyl Phthalate	85-68-7	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Biphenyl (Diphenyl)	92-52-4	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Bis(2-chloroethoxy) methane	111-91-1	NS	NS		mg/kg	<0.0495 U	<0.0493 UJ	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS		mg/kg	<0.0495 UJ	<0.0493 UJ	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS		mg/kg	<0.0495 UJ	<0.0493 UJ	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Caprolactam	105-60-2	NS	NS		mg/kg	<0.0987 U	<0.0984 UJ	NA	NA	NA	<0.0986 U	NA	NA	NA	<0.0975 U	NA	<0.0984 U	NA	<0.0926 U
Carbazole	86-74-8	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	0.0544 JD	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Chrysene	218-01-9	**1**	1	*	mg/kg	0.318 D	0.139 D	NA	NA	NA	0.62 D	NA	NA	NA	0.267 D	NA	3.36 D	0.0987 D	0.116 D
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33		mg/kg	0.0805 JD	<0.0493 U	NA	NA	NA	0.156 D	NA	NA	NA	0.0826 JD	NA	1.09 D	<0.0462 U	<0.0464 U
Dibenzofuran	132-64-9	7	59		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Dibutyl phthalate	84-74-2	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Diethyl phthalate	84-66-2	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Dimethyl phthalate	131-11-3	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Dioctyl phthalate	117-84-0	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Diphenylamine	122-39-4	NS	NS		mg/kg	<0.0987 UJ	<0.0984 U	NA	NA	NA	<0.0986 UJ	NA	NA	NA	<0.0975 U	NA	<0.0984 U	NA	<0.0926 U
Fluoranthene	206-44-0	**100**	100		mg/kg	0.691 J	0.288 J	NA	NA	NA	1.28 J	NA	NA	NA	0.499 D	NA	4.62 D	NA	0.124 D
Fluorene	86-73-7	30	100		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	0.0528 JD	NA	NA	NA	<0.0489 U	NA	0.113 D	NA	<0.0464 U
Hexachlorobenzene	118-74-1	0.33	1.2		mg/kg	<0.0495 UJ	<0.0493 UJ	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Hexachlorobutadiene	87-68-3	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Hexachlorocyclopentadiene	77-47-4	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Hexachloroethane	67-72-1	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5		mg/kg	0.299 J	0.106 J	NA	NA	NA	0.61 J	1.04 D	0.51 D	<0.0526 U	0.322 D	NA	4.69 D	0.0479 JD	0.0859 JD
Isophorone	78-59-1	NS	NS		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Naphthalene	91-20-3	12	100		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	0.205 D	NA	<0.0464 U
Nitrobenzene	98-95-3	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
n-Nitrosodimethylamine	62-75-9	NS	NS		mg/kg	<0.0495 UJ	<0.0493 UJ	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
n-Nitrosodiphenylamine	86-30-6	NS	NS		mg/kg	<0.0495 UJ	<0.0493 U	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Pentachlorophenol	87-86-5	0.8	6.7		mg/kg	<0.0495 UJ	<0.0493 UJ	NA	NA	NA	<0.0494 UJ	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Phenanthrene	85-01-8	100	100		mg/kg	0.336 D	0.216 D	NA	NA	NA	0.779 D	NA	NA	NA	0.187 D	NA	2.13 D	NA	0.0562 JD
Phenol	108-95-2	0.33	100		mg/kg	<0.0495 U	<0.0493 U	NA	NA	NA	<0.0494 U	NA	NA	NA	<0.0489 U	NA	<0.0493 U	NA	<0.0464 U
Pyrene	129-00-0	**100**	100		mg/kg	0.606 J	0.249 J	NA	NA	NA	1.11 D	NA	NA	NA	0.431 D	NA	8.25 D	NA	0.154 D
Pyridine	110-86-1	NS	NS		mg/kg	<0.198 UJ	<0.197 UJ	NA	NA	NA	<0.197 UJ	NA	NA	NA	<0.195 U	NA	<0.197 U	NA	<0.185 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP60	EP60	EP60	EP60	EP60	EP61	EP61	EP61	EP61	EP62	EP62	EP63	EP63	EP64
				Sample Name	EP60_7.5	DUP06_04212022	EP60_6.5	EP60_5.5	EP60_4.5	EP61_7.5	EP61_6.5	EP61_5.5	EP61_4.5	EP62_7.5	EP62_6.5	EP63_7.5	EP63_6.5	EP64_7.5
				Sample Date	04/21/2022	04/21/2022	04/28/2022	05/04/2022	05/11/2022	04/21/2022	04/28/2022	05/04/2022	05/11/2022	04/29/2022	05/05/2022	04/29/2022	05/05/2022	08/10/2022
				Sample Elevation	7.5	7.5	6.5	5.5	4.5	7.5	6.5	5.5	4.5	7.5	6.5	7.5	6.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides																		
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	**0.00754 D**	NA	0.00206 D	NA	<0.00183 U
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	0.00289 D	NA	**0.00335 D**	NA	<0.00183 U
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	**0.275 D**	NA	**0.0188 D**	NA	<0.00183 U
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.0386 U	<0.0392 U	NA	NA	NA	<0.0386 U	NA	NA	NA	<0.0386 U	NA	<0.0392 U	NA	<0.0366 U
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Endrin	72-20-8	0.014	11	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.00193 UJ	<0.00196 UJ	NA	NA	NA	<0.00193 UJ	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.00193 U	<0.00196 U	NA	NA	NA	<0.00193 U	NA	NA	NA	<0.00193 U	NA	<0.00196 U	NA	<0.00183 U
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.193 U	<0.196 U	NA	NA	NA	<0.193 U	NA	NA	NA	<0.193 U	NA	<0.196 U	NA	<0.183 U
Herbicides																		
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.0235 U	<0.0241 U	NA	NA	NA	<0.0233 U	NA	NA	NA	<0.0235 U	NA	<0.0235 U	NA	<0.0222 U
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.0235 U	<0.0241 U	NA	NA	NA	<0.0233 U	NA	NA	NA	<0.0235 U	NA	<0.0235 U	NA	<0.0222 U
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.0235 U	<0.0241 U	NA	NA	NA	<0.0233 U	NA	NA	NA	<0.0235 U	NA	<0.0235 U	NA	<0.0222 U
Polychlorinated Biphenyl																		
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.0195 U	<0.0198 U	NA	NA	NA	<0.0195 U	NA	NA	NA	<0.0195 U	NA	<0.0198 U	NA	<0.0185 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.0195 U	<0.0198 U	NA	NA	NA	<0.0195 U	NA	NA	NA	<0.0195 U	NA	<0.0198 U	NA	<0.0185 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.0195 U	<0.0198 U	NA	NA	NA	<0.0195 U	NA	NA	NA	<0.0195 U	NA	<0.0198 U	NA	<0.0185 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.0195 U	<0.0198 U	NA	NA	NA	<0.0195 U	NA	NA	NA	<0.0195 U	NA	<0.0198 U	NA	<0.0185 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.0195 U	<0.0198 U	NA	NA	NA	<0.0195 U	NA	NA	NA	<0.0195 U	NA	<0.0198 U	NA	<0.0185 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.0195 U	<0.0198 U	NA	NA	NA	<0.0195 U	NA	NA	NA	<0.0195 U	NA	<0.0198 U	NA	<0.0185 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.0195 U	<0.0198 U	NA	NA	NA	<0.0195 U	NA	NA	NA	<0.0195 U	NA	<0.0198 U	NA	<0.0185 U
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.0195 U	<0.0198 U	NA	NA	NA	<0.0195 U	NA	NA	NA	<0.0195 U	NA	<0.0198 U	NA	<0.0185 U
Metals																		
Aluminum	7429-90-5	NS	NS	mg/kg	7,080 J	4,890 J	NA	NA	NA	4,640 J	NA	NA	NA	7,590	NA	7,380 J	NA	7,170
Antimony	7440-36-0	NS	NS	mg/kg	<2.98 U	<3.03 U	NA	NA	NA	<2.98 U	NA	NA	NA	<2.99 U	NA	<2.98 UJ	NA	4.58 J
Arsenic	7440-38-2	**13**	16	mg/kg	9.68	10.4	NA	NA	NA	6.12	NA	NA	NA	5.35	NA	5.62	NA	3.35
Barium	7440-39-3	**350**	400	mg/kg	224	269	NA	NA	NA	196	NA	NA	NA	266	NA	160 J	NA	52.2
Beryllium	7440-41-7	7.2	72	mg/kg	0.124 J	0.252 J	NA	NA	NA	0.14	NA	NA	NA	0.105	NA	<0.06 U	NA	<0.058 U
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	4.32 J	1.07 J	0.998	NA	NA	1.84	NA	NA	NA	<0.359 U	NA	0.601 J	NA	<0.347 U
Calcium	7440-70-2	NS	NS	mg/kg	5,700 J	6,280 J	NA	NA	NA	7,830 J	NA	NA	NA	8,100	NA	9,200 J	NA	2,510 J
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.596 U	<0.606 U	NA	NA	NA	<0.595 U	NA	NA	NA	**4.59**	NA	<0.596 U	NA	<0.559 U
Chromium, Total	7440-47-3	NS	NS	mg/kg	50 B	33.9 B	NA	NA	NA	29.3 B	NA	NA	NA	31.9 B	NA	34.1 J	NA	36.6 J
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	**50**	**33.9**	NA	NA	NA	29.3	NA	NA	NA	27.3	NA	**34.1**	NA	**36.6**
Cobalt	7440-48-4	NS	NS	mg/kg	15.3	18.3	NA	NA	NA	11	NA	NA	NA	22.1	NA	15.8 J	NA	16.8
Copper	7440-50-8	**50**	270	mg/kg	**141**	**94.5**	NA	NA	NA	**74.1**	NA	NA	NA	**73.9**	NA	**88.3 J**	NA	34.2 J
Cyanide	57-12-5	27	27	mg/kg	<0.596 U	<0.606 U	NA	NA	NA	<0.595 U	NA	NA	NA	<0.598 U	NA	<0.596 U	NA	<0.559 U
Iron	7439-89-6	NS	NS	mg/kg	39,900 J	17,900 J	NA	NA	NA	15,500 J	NA	NA	NA	21,800	NA	21,200 J	NA	21,000
Lead	7439-92-1	**63**	400	mg/kg	568	714	413	411	**370**	832	1,110	**371 J**	NA	587	**123 J**	**349 J**	NA	**87.1 J**
Magnesium	7439-95-4	NS	NS	mg/kg	7,250 J	10,700 J	NA	NA	NA	6,700 J	NA	NA	NA	26,500	NA	11,900 J	NA	5,920
Manganese	7439-96-5	1600	2000	mg/kg	342	555	NA	NA	NA	309	NA	NA	NA	346	NA	228 J	NA	335
Mercury	7439-97-6	**0.18**	0.81	mg/kg	3.23 J	5.68 J	4.04	18	0.13	3.03	**0.614**	NA	NA	0.964	0.139	**0.688**	NA	**0.263**
Nickel	7440-02-0	**30**	310	mg/kg	**180**	**206**	NA	NA	NA	**139**	NA	NA	NA	440 J	**98.7 J**	**184 J**	NA	**207 J**
Potassium	7440-09-7	NS	NS	mg/kg	1,050 J	737 J	NA	NA	NA	743 J	NA	NA	NA	1,180 B	NA	933 J	NA	983 J
Selenium	7782-49-2	3.9	180	mg/kg	<2.98 U	<3.03 U	NA	NA	NA	<2.98 U	NA	NA	NA	<2.99 U	NA	<2.98 U	NA	<2.89 U
Silver	7440-22-4	2	180	mg/kg	0.742	1.33	NA	NA	NA	<0.595 U	NA	NA	NA	<0.598 U	NA	<0.596 UJ	NA	<0.578 UJ
Sodium	7440-23-5	NS	NS	mg/kg	367 J	273 J	NA	NA	NA	295 J	NA	NA	NA	304	NA	402 J	NA	226 J
Thallium	7440-28-0	NS	NS	mg/kg	<2.98 U	<3.03 U	NA	NA	NA	<2.98 U	NA	NA	NA	<2.99 U	NA	<2.98 U	NA	<2.89 U
Vanadium	7440-62-2	NS	NS	mg/kg	21.1	28.7	NA	NA	NA	25.5	NA	NA	NA	31.2	NA	28 J	NA	24.4
Zinc	7440-66-6	**109**	10000	mg/kg	**1,530 J**	**603 J**	NA	NA	NA	**498**	NA	NA	NA	**360**	NA	**484 J**	NA	**122 J**
General Chemistry																		
Solids, Percent	SOLID	NS	NS	Percent	83.9	82.5	87.8	84	84.4	84	80.5	85.7	78.4	83.6	86.3	83.9	89.9	89.5

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP60	EP60	EP60	EP60	EP60	EP61	EP61	EP61	EP61	EP62	EP62	EP63	EP63	EP64
				Sample Name	EP60_7.5	DUP06_04212022	EP60_6.5	EP60_5.5	EP60_4.5	EP61_7.5	EP61_6.5	EP61_5.5	EP61_4.5	EP62_7.5	EP62_6.5	EP63_7.5	EP63_6.5	EP64_7.5
				Sample Date	04/21/2022	04/21/2022	04/28/2022	05/04/2022	05/11/2022	04/21/2022	04/28/2022	05/04/2022	05/11/2022	04/29/2022	05/05/2022	04/29/2022	05/05/2022	08/10/2022
				Sample Elevation	7.5	7.5	6.5	5.5	4.5	7.5	6.5	5.5	4.5	7.5	6.5	7.5	6.5	7.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids																		
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	0.000435	NA	NA	NA	0.000645	NA	0.00044	NA	<0.000273 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	0.000307	NA	<0.000273 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	**0.00132**	**0.00141**	NA	NA	NA	**0.00185**	NA	NA	NA	**0.00308**	NA	**0.002**	NA	<0.000273 U
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	0.000564	0.000537	NA	NA	NA	**0.00109**	NA	NA	NA	**0.000777**	NA	<0.000296 U	NA	<0.000273 U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 U	NA	<0.000296 U	NA	<0.000273 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 UJ	NA	<0.000296 UJ	NA	<0.000273 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000277 U	<0.000296 U	NA	NA	NA	<0.000289 U	NA	NA	NA	<0.000281 UJ	NA	<0.000296 UJ	NA	<0.000273 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP65	EP66	EP67	EP68	EP69	EP69	EP70	EP71	EP71	EP71	EP72	EP72
				Sample Name	EP65_-5.5	EP66_-1.5	EP67_-1.5	EP68_-5.5	EP69_7.5	EP69_6.5	EP70_-5.5	EP71_7.5	EP71_6.5	EP71_5.5	EP72_7.5	EP72_6.5
				Sample Date	05/26/2022	05/03/2022	05/03/2022	08/15/2022	04/21/2022	04/28/2022	05/26/2022	05/03/2022	05/11/2022	05/17/2022	05/03/2022	05/11/2022
				Sample Elevation	-5.5	-1.5	-1.5	-5.5	7.5	6.5	-5.5	7.5	6.5	5.5	7.5	6.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 UJ	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 UJ	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 UJ	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 UJ	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.043 U	<0.038 U	<0.038 U	<0.049 U	<0.053 UJ	NA	<0.035 U	<0.039 U	NA	NA	<0.039 U	NA
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Acetone	67-64-1	**0.05**	100	mg/kg	0.0059 J	0.004 J	0.0066 J	0.0082 J	0.0094 J	NA	0.0047 J	0.0046 J	NA	NA	0.0067 J	NA
Acrolein	107-02-8	NS	NS	mg/kg	<0.0043 U	<0.0038 U	<0.0038 U	<0.0049 U	<0.0053 UJ	NA	<0.0035 U	<0.0039 U	NA	NA	<0.0039 U	NA
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Bromoform	75-25-2	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 UJ	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 UJ	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 UJ	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Chloroform	67-66-3	0.37	49	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Cyclohexane	110-82-7	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 UJ	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 UJ	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Ethylbenzene	100-41-4	1	41	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
M,P-Xylene	179601-23-1	NS	NS	mg/kg	<0.0043 U	<0.0038 U	<0.0038 U	<0.0049 U	<0.0053 U	NA	<0.0035 U	<0.0039 U	NA	NA	<0.0039 U	NA
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Methylcyclohexane	108-87-2	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	0.028	0.034	0.035	<0.0049 U	<0.0053 U	NA	0.029	0.02	NA	NA	0.024	NA
n-Butylbenzene	104-51-8	12	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
n-Propylbenzene	103-65-1	3.9	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Sec-Butylbenzene	135-98-8	11	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Styrene	100-42-5	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Toluene	108-88-3	**0.7**	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	<0.0065 U	<0.0057 U	<0.0057 U	<0.0073 U	<0.0079 U	NA	<0.0052 U	<0.0059 U	NA	NA	<0.0059 U	NA
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 UJ	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 UJ	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0022 U	<0.0019 U	<0.0019 U	<0.0024 U	<0.0026 U	NA	<0.0017 U	<0.002 U	NA	NA	<0.002 U	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs		Location	EP65	EP66	EP67	EP68	EP69	EP69	EP70	EP71	EP71	EP71	EP72	EP72
					Sample Name	EP65_-5.5	EP66_-1.5	EP67_-1.5	EP68_-5.5	EP69_7.5	EP69_6.5	EP70_-5.5	EP71_7.5	EP71_6.5	EP71_5.5	EP72_7.5	EP72_6.5
					Sample Date	05/26/2022	05/03/2022	05/03/2022	08/15/2022	04/21/2022	04/28/2022	05/26/2022	05/03/2022	05/11/2022	05/17/2022	05/03/2022	05/11/2022
					Sample Elevation	-5.5	-1.5	-1.5	-5.5	7.5	6.5	-5.5	7.5	6.5	5.5	7.5	6.5
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds																	
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS		mg/kg	<0.0938 U	<0.0958 U	<0.0992 U	<0.0944 U	<0.0925 U	NA	<0.0928 U	<0.0913 U	NA	NA	<0.0923 U	NA
1,2-Diphenylhydrazine	122-66-7	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13		mg/kg	<0.0196 U	<0.0192 U	<0.0187 U	<0.0192 U	<0.0187 UJ	NA	<0.0198 U	<0.0196 U	NA	NA	<0.0185 U	NA
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS		mg/kg	<0.0938 U	<0.0958 U	<0.0992 U	<0.0944 U	<0.0925 U	NA	<0.0928 U	<0.0913 U	NA	NA	<0.0923 U	NA
2,4,5-Trichlorophenol	95-95-4	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
2,4,6-Trichlorophenol	88-06-2	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
2,4-Dichlorophenol	120-83-2	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
2,4-Dimethylphenol	105-67-9	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
2,4-Dinitrophenol	51-28-5	NS	NS		mg/kg	<0.0938 U	<0.0958 U	<0.0992 U	<0.0944 U	<0.0925 UJ	NA	<0.0928 U	<0.0913 U	NA	NA	<0.0923 U	NA
2,4-Dinitrotoluene	121-14-2	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
2,6-Dinitrotoluene	606-20-2	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 UJ	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
2-Chloronaphthalene	91-58-7	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
2-Chlorophenol	95-57-8	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
2-Methylnaphthalene	91-57-6	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
2-Methylphenol (o-Cresol)	95-48-7	0.33	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
2-Nitroaniline	88-74-4	NS	NS		mg/kg	<0.0938 U	<0.0958 U	<0.0992 U	<0.0944 U	<0.0925 U	NA	<0.0928 U	<0.0913 U	NA	NA	<0.0923 U	NA
2-Nitrophenol	88-75-5	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
3,3'-Dichlorobenzidine	91-94-1	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
3-Nitroaniline	99-09-2	NS	NS		mg/kg	<0.0938 U	<0.0958 U	<0.0992 U	<0.0944 U	<0.0925 U	NA	<0.0928 U	<0.0913 U	NA	NA	<0.0923 U	NA
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS		mg/kg	<0.0938 U	<0.0958 U	<0.0992 U	<0.0944 U	<0.0925 UJ	NA	<0.0928 U	<0.0913 U	NA	NA	<0.0923 U	NA
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
4-Chloro-3-Methylphenol	59-50-7	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
4-Chloroaniline	106-47-8	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
4-Nitroaniline	100-01-6	NS	NS		mg/kg	<0.0938 U	<0.0958 U	<0.0992 U	<0.0944 U	<0.0925 U	NA	<0.0928 U	<0.0913 U	NA	NA	<0.0923 U	NA
4-Nitrophenol	100-02-7	NS	NS		mg/kg	<0.0938 U	<0.0958 U	<0.0992 U	<0.0944 U	<0.0925 U	NA	<0.0928 U	<0.0913 U	NA	NA	<0.0923 U	NA
Acenaphthene	83-32-9	20	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	0.286 D	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Acenaphthylene	208-96-8	100	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	0.085 JD	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Acetophenone	98-86-2	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS		mg/kg	<0.188 U	<0.192 U	<0.199 U	<0.189 U	<0.185 UJ	NA	<0.186 U	<0.183 U	NA	NA	<0.185 U	NA
Anthracene	120-12-7	100	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	0.771 D	NA	<0.0465 U	0.214 D	NA	NA	<0.0463 U	NA
Atrazine	1912-24-9	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Benzaldehyde	100-52-7	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Benzidine	92-87-5	NS	NS		mg/kg	<0.188 U	<0.192 U	<0.199 U	<0.189 U	<0.185 UJ	NA	<0.186 U	<0.183 U	NA	NA	<0.185 U	NA
Benzo(a)anthracene	56-55-3	**1**	1		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	1.33 D	<0.305 U	<0.0465 U	0.484 D	NA	NA	<0.0463 U	NA
Benzo(a)pyrene	50-32-8	**1**	1		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	1.16 D	<0.305 UJ	<0.0465 U	0.449 D	NA	NA	<0.0463 U	NA
Benzo(b)fluoranthene	205-99-2	**1**	1		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	0.916 D	NA	<0.0465 U	0.384 D	NA	NA	<0.0463 U	NA
Benzo(g,h,i)Perylene	191-24-2	100	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	0.67 D	NA	<0.0465 U	0.218 D	NA	NA	<0.0463 U	NA
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	**1.02 D**	NA	<0.0465 U	0.362 D	NA	NA	<0.0463 U	NA
Benzoic Acid	65-85-0	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 UJ	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Benzyl Alcohol	100-51-6	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Benzyl Butyl Phthalate	85-68-7	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	0.0488 JD	NA	<0.0465 U	0.092 D	NA	NA	<0.0463 U	NA
Biphenyl (Diphenyl)	92-52-4	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Bis(2-chloroethoxy) methane	111-91-1	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 UJ	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 UJ	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 UJ	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0925 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Caprolactam	105-60-2	NS	NS		mg/kg	<0.0938 U	<0.0958 U	<0.0992 U	<0.0944 U	<0.0925 UJ	NA	<0.0928 U	<0.0913 U	NA	NA	<0.0923 U	NA
Carbazole	86-74-8	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	0.271 D	NA	<0.0465 U	0.131 D	NA	NA	<0.0463 U	NA
Chrysene	218-01-9	**1**	1	*	mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	1.31 D	<0.305 U	<0.0465 U	0.458 D	NA	NA	<0.0463 U	NA
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	0.268 D	NA	<0.0465 U	0.0891 JD	NA	NA	<0.0463 U	NA
Dibenzofuran	132-64-9	7	59		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Dibutyl phthalate	84-74-2	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	0.466 D	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Diethyl phthalate	84-66-2	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Dimethyl phthalate	131-11-3	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Dioctyl phthalate	117-84-0	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Diphenylamine	122-39-4	NS	NS		mg/kg	<0.0938 U	<0.0958 U	<0.0992 U	<0.0944 U	<0.0925 U	NA	<0.0928 U	<0.0913 U	NA	NA	<0.0923 U	NA
Fluoranthene	206-44-0	**100**	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	2.85 D	NA	<0.0465 U	1.22 D	NA	NA	0.0516 JD	NA
Fluorene	86-73-7	30	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	0.29 D	NA	<0.0465 U	0.0803 JD	NA	NA	<0.0463 U	NA
Hexachlorobenzene	118-74-1	0.33	1.2		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 UJ	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Hexachlorobutadiene	87-68-3	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Hexachlorocyclopentadiene	77-47-4	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Hexachloroethane	67-72-1	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	0.75 J	<0.305 U	<0.0465 U	0.269 D	NA	NA	<0.0463 U	NA
Isophorone	78-59-1	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 UJ	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Naphthalene	91-20-3	12	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Nitrobenzene	98-95-3	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
n-Nitrosodimethylamine	62-75-9	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 UJ	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
n-Nitrosodiphenylamine	86-30-6	NS	NS		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Pentachlorophenol	87-86-5	0.8	6.7		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 UJ	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Phenanthrene	85-01-8	100	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	2.84 D	NA	<0.0465 U	0.989 D	NA	NA	<0.0463 U	NA
Phenol	108-95-2	0.33	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	<0.0463 U	NA	<0.0465 U	<0.0458 U	NA	NA	<0.0463 U	NA
Pyrene	129-00-0	**100**	100		mg/kg	<0.047 U	<0.048 U	<0.0497 U	<0.0473 U	2.64 D	NA	<0.0465 U	1.02 D	NA	NA	0.0539 JD	NA
Pyridine	110-86-1	NS	NS		mg/kg	<0.188 U	<0.192 U	<0.199 U	<0.189 U	<0.185 UJ	NA	<0.186 U	<0.183 U	NA	NA	<0.185 U	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP65	EP66	EP67	EP68	EP69	EP69	EP70	EP71	EP71	EP71	EP72	EP72
				Sample Name	EP65_-5.5	EP66_-1.5	EP67_-1.5	EP68_-5.5	EP69_7.5	EP69_6.5	EP70_-5.5	EP71_7.5	EP71_6.5	EP71_5.5	EP72_7.5	EP72_6.5
				Sample Date	05/26/2022	05/03/2022	05/03/2022	08/15/2022	04/21/2022	04/28/2022	05/26/2022	05/03/2022	05/11/2022	05/17/2022	05/03/2022	05/11/2022
				Sample Elevation	-5.5	-1.5	-1.5	-5.5	7.5	6.5	-5.5	7.5	6.5	5.5	7.5	6.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides																
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	**0.00674 D**	NA	NA	0.00284 D	NA
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.0369 U	<0.0379 U	<0.0387 U	<0.0374 U	<0.0367 U	NA	<0.0362 U	<0.0365 U	NA	NA	<0.0362 U	NA
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Endrin	72-20-8	0.014	11	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 UJ	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.00184 U	<0.0019 U	<0.00194 U	<0.00187 U	<0.00184 U	NA	<0.00181 U	<0.00182 U	NA	NA	<0.00181 U	NA
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.184 U	<0.19 U	<0.194 U	<0.187 U	<0.184 U	NA	<0.181 U	<0.182 U	NA	NA	<0.181 U	NA
Herbicides																
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.0227 U	<0.0231 U	<0.0236 U	<0.0226 U	<0.022 U	NA	<0.0223 U	<0.0222 U	NA	NA	<0.0222 U	NA
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.0227 U	<0.0231 U	<0.0236 U	<0.0226 U	<0.022 U	NA	<0.0223 U	<0.0222 U	NA	NA	<0.0222 U	NA
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.0227 U	<0.0231 U	<0.0236 U	<0.0226 U	<0.022 U	NA	<0.0223 U	<0.0222 U	NA	NA	<0.0222 U	NA
Polychlorinated Biphenyl																
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.0186 U	<0.0191 U	<0.0196 U	<0.0189 U	<0.0185 U	NA	<0.0183 U	<0.0184 U	NA	NA	<0.0183 U	NA
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.0186 U	<0.0191 U	<0.0196 U	<0.0189 U	<0.0185 U	NA	<0.0183 U	<0.0184 U	NA	NA	<0.0183 U	NA
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.0186 U	<0.0191 U	<0.0196 U	<0.0189 U	<0.0185 U	NA	<0.0183 U	<0.0184 U	NA	NA	<0.0183 U	NA
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.0186 U	<0.0191 U	<0.0196 U	<0.0189 U	<0.0185 U	NA	<0.0183 U	<0.0184 U	NA	NA	<0.0183 U	NA
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.0186 U	<0.0191 U	<0.0196 U	<0.0189 U	<0.0185 U	NA	<0.0183 U	<0.0184 U	NA	NA	<0.0183 U	NA
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.0186 U	<0.0191 U	<0.0196 U	<0.0189 U	<0.0185 U	NA	<0.0183 U	<0.0184 U	NA	NA	<0.0183 U	NA
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.0186 U	<0.0191 U	<0.0196 U	<0.0189 U	<0.0185 U	NA	<0.0183 U	<0.0184 U	NA	NA	<0.0183 U	NA
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.0186 U	<0.0191 U	<0.0196 U	<0.0189 U	0.0504	NA	<0.0183 U	<0.0184 U	NA	NA	<0.0183 U	NA
Metals																
Aluminum	7429-90-5	NS	NS	mg/kg	3,130	6,100	8,660	5,000	8,430 J	NA	5,090 J	7,280	NA	NA	7,300	NA
Antimony	7440-36-0	NS	NS	mg/kg	<2.86 U	<2.92 U	<3.01 U	<3 U	5.69	NA	<2.8 UJ	<2.79 U	NA	NA	<2.82 U	NA
Arsenic	7440-38-2	**13**	16	mg/kg	<1.71 U	1.78	<1.81 U	<1.8 U	3.24	NA	<1.68 U	8.57	NA	NA	3.45	NA
Barium	7440-39-3	**350**	400	mg/kg	22.1	40	46.1	36.9	122 J	NA	39.2 J	171	NA	NA	92.8	NA
Beryllium	7440-41-7	7.2	72	mg/kg	0.109	<0.058 U	<0.06 U	<0.06 U	0.209 J	NA	0.201 J	<0.056 U	NA	NA	<0.056 U	NA
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	<0.343 U	<0.35 U	<0.362 U	<0.36 U	5.75 J	<0.446 U	<0.336 U	0.846	NA	NA	<0.339 U	NA
Calcium	7440-70-2	NS	NS	mg/kg	919	1,290	1,070	1,340 B	2,580 J	NA	1,250	14,500	NA	NA	5,540	NA
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.571 U	<0.584 U	<0.603 U	<0.57 U	<0.565 UJ	NA	<0.56 U	<0.558 U	NA	NA	<0.564 U	NA
Chromium, Total	7440-47-3	NS	NS	mg/kg	12.3	21.9	34.2	24.5	24.3 J	NA	21.5	55.7	NA	NA	32.2	NA
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	12.3	21.9	**34.2**	24.5	24.3	NA	21.5	**55.7**	NA	NA	**32.2**	NA
Cobalt	7440-48-4	NS	NS	mg/kg	5.64	9.44	12.6	10.3	9.41 J	NA	8.1	12.1	NA	NA	12.7	NA
Copper	7440-50-8	**50**	270	mg/kg	18.8	27.1 J	30.2 J	21.9	43 J	NA	26.3	**89.3 J**	NA	NA	41.2 J	NA
Cyanide	57-12-5	27	27	mg/kg	<0.571 U	<0.584 U	<0.603 UJ	<0.57 U	<0.565 U	NA	<0.56 U	<0.558 U	NA	NA	<0.564 U	NA
Iron	7439-89-6	NS	NS	mg/kg	9,760	14,200	16,900	13,100	15,800 J	NA	13,800 J	31,300	NA	NA	17,500	NA
Lead	7439-92-1	**63**	400	mg/kg	2.55	4.8	5.91	18.9	**120 J**	NA	5.88	415	1,690	**204**	**188**	NA
Magnesium	7439-95-4	NS	NS	mg/kg	4,030	4,570	3,190	5,270	4,490 J	NA	3,360 J	10,300	NA	NA	7,290	NA
Manganese	7439-96-5	1600	2000	mg/kg	154	245	279	214	448 J	NA	333	335	NA	NA	253	NA
Mercury	7439-97-6	**0.18**	0.81	mg/kg	<0.0343 U	<0.035 U	<0.0362 U	<0.0342 U	0.118 J	NA	<0.0336 U	1.25	**0.522**	NA	0.921	**0.795**
Nickel	7440-02-0	**30**	310	mg/kg	**65.2**	**117 J**	**146 J**	**145 J**	**34.8 J**	NA	**84.2**	**134 J**	NA	NA	**172 J**	NA
Potassium	7440-09-7	NS	NS	mg/kg	670	1,350 B	1,150 B	613 B	1,210 J	NA	998 J	1,300 B	NA	NA	1,180 B	NA
Selenium	7782-49-2	3.9	180	mg/kg	<2.86 U	<2.92 U	<3.01 U	<3 U	<2.83 U	NA	<2.8 U	<2.79 U	NA	NA	<2.82 U	NA
Silver	7440-22-4	2	180	mg/kg	<0.571 U	<0.584 U	<0.603 U	<0.6 U	<0.565 U	NA	<0.56 UJ	<0.558 U	NA	NA	<0.564 U	NA
Sodium	7440-23-5	NS	NS	mg/kg	109	135	122	<60 U	218 J	NA	141 J	393	NA	NA	269	NA
Thallium	7440-28-0	NS	NS	mg/kg	<2.86 U	<2.92 U	<3.01 U	<3 U	<2.83 U	NA	<2.8 U	<2.79 U	NA	NA	<2.82 U	NA
Vanadium	7440-62-2	NS	NS	mg/kg	13.5	20	27.7	20.9	21	NA	19.6	26	NA	NA	23.9	NA
Zinc	7440-66-6	**109**	10000	mg/kg	16.3	26.6	27.8	22.4	**146 J**	NA	22.5	**313**	NA	NA	**118**	NA
General Chemistry																
Solids, Percent	SOLID	NS	NS	Percent	87.5	85.6	83	87.7	88.4	67.3	89.3	89.5	83.5	76.5	88.6	88.3

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP65	EP66	EP67	EP68	EP69	EP69	EP70	EP71	EP71	EP71	EP72	EP72
				Sample Name	EP65_-5.5	EP66_-1.5	EP67_-1.5	EP68_-5.5	EP69_7.5	EP69_6.5	EP70_-5.5	EP71_7.5	EP71_6.5	EP71_5.5	EP72_7.5	EP72_6.5
				Sample Date	05/26/2022	05/03/2022	05/03/2022	08/15/2022	04/21/2022	04/28/2022	05/26/2022	05/03/2022	05/11/2022	05/17/2022	05/03/2022	05/11/2022
				Sample Elevation	-5.5	-1.5	-1.5	-5.5	7.5	6.5	-5.5	7.5	6.5	5.5	7.5	6.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids																
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	0.000679	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	0.000707	NA	NA	0.000614	NA
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	0.000274	NA	NA	<0.000276 U	NA
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 UJ	NA	NA	<0.000276 U	NA
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000276 U	<0.000283 U	<0.000282 U	<0.000277 U	<0.000278 U	NA	<0.000262 U	<0.000258 U	NA	NA	<0.000276 U	NA

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP73	EP73	EP74	EP75	EP76	EP77	SW01	SW02	SW03
				Sample Name	EP73_7.5	EP73_6.5	EP74_-5.5	EP75_-5.5	EP76_4.5	EP77_0.5	SW01_4.5	SW02_4.5	SW03_4.5
				Sample Date	08/10/2022	08/18/2022	08/15/2022	03/30/2022	02/24/2022	03/04/2022	02/24/2022	02/24/2022	02/24/2022
				Sample Elevation	7.5	6.5	-5.5	-5.5	4.5	0.5	4.5	4.5	4.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds													
1,1,1,2-Tetrachloroethane	630-20-6	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,1,1-Trichloroethane	71-55-6	0.68	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,1,2-Trichloroethane	79-00-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,1-Dichloroethane	75-34-3	0.27	26	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,1-Dichloroethene	75-35-4	0.33	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,2,3-Trichlorobenzene	87-61-6	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,2,3-Trichloropropane	96-18-4	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,2,4-Trichlorobenzene	120-82-1	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,2,4-Trimethylbenzene	95-63-6	3.6	52	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	0.0081	<0.002 U
1,2-Dibromo-3-Chloropropane	96-12-8	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,2-Dichlorobenzene	95-50-1	1.1	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,2-Dichloroethane	107-06-2	0.02	3.1	mg/kg	0.0032 J	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,2-Dichloropropane	78-87-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	0.0021 J	<0.002 U
1,3-Dichlorobenzene	541-73-1	2.4	49	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,4-Dichlorobenzene	106-46-7	1.8	13	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13	mg/kg	<0.05 U	NA	<0.037 U	<0.067 U	<0.046 U	<0.038 U	<0.047 U	<0.04 U	<0.039 U
2-Hexanone (MBK)	591-78-6	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Acetone	67-64-1	**0.05**	100	mg/kg	<0.005 UJ	NA	0.01	0.0074 J	0.0098	0.017	<0.0047 U	0.0042 J	<0.0039 U
Acrolein	107-02-8	NS	NS	mg/kg	<0.005 U	NA	<0.0037 U	<0.0067 U	<0.0046 U	<0.0038 U	<0.0047 U	<0.004 U	<0.0039 U
Acrylonitrile	107-13-1	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Benzene	71-43-2	**0.06**	4.8	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Bromochloromethane	74-97-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Bromodichloromethane	75-27-4	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Bromoform	75-25-2	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Bromomethane	74-83-9	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Carbon Disulfide	75-15-0	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Carbon Tetrachloride	56-23-5	0.76	2.4	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Chlorobenzene	108-90-7	1.1	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Chloroethane	75-00-3	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Chloroform	67-66-3	0.37	49	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Chloromethane	74-87-3	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Cis-1,2-Dichloroethene	156-59-2	0.25	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Cis-1,3-Dichloropropene	10061-01-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Cyclohexane	110-82-7	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Dibromochloromethane	124-48-1	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Dibromomethane	74-95-3	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Dichlorodifluoromethane	75-71-8	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Ethylbenzene	100-41-4	1	41	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Hexachlorobutadiene	87-68-3	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
M,P-Xylene	179601-23-1	NS	NS	mg/kg	<0.005 U	NA	<0.0037 U	<0.0067 U	<0.0046 U	<0.0038 U	<0.0047 U	<0.004 U	<0.0039 U
Methyl Acetate	79-20-9	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	0.0036 J	<0.0023 U	<0.002 U	<0.002 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Methylcyclohexane	108-87-2	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Methylene Chloride	75-09-2	**0.05**	100	mg/kg	<0.005 U	NA	0.0037 J	<0.0067 U	0.0085 J	0.0088	0.0086 J	0.0086	0.0075 J
n-Butylbenzene	104-51-8	12	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
n-Propylbenzene	103-65-1	3.9	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Sec-Butylbenzene	135-98-8	11	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Styrene	100-42-5	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
T-Butylbenzene	98-06-6	5.9	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Tert-Butyl Alcohol	75-65-0	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Tetrachloroethene (PCE)	127-18-4	1.3	19	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 UJ	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Toluene	108-88-3	**0.7**	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Total Xylenes	1330-20-7	**0.26**	100	mg/kg	<0.0075 U	NA	<0.0055 U	<0.01 U	<0.0068 U	<0.0057 U	<0.007 U	<0.006 U	<0.0059 U
Trans-1,2-Dichloroethene	156-60-5	0.19	100	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Trans-1,3-Dichloropropene	10061-02-6	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Trichloroethene (TCE)	79-01-6	0.47	21	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Trichlorofluoromethane	75-69-4	NS	NS	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U
Vinyl Chloride	75-01-4	0.02	0.9	mg/kg	<0.0025 U	NA	<0.0018 U	<0.0034 U	<0.0023 U	<0.0019 U	<0.0023 U	<0.002 U	<0.002 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs		Location	EP73	EP73	EP74	EP75	EP76	EP77	SW01	SW02	SW03
					Sample Name	EP73_7.5	EP73_6.5	EP74_-5.5	EP75_-5.5	EP76_4.5	EP77_0.5	SW01_4.5	SW02_4.5	SW03_4.5
					Sample Date	08/10/2022	08/18/2022	08/15/2022	03/30/2022	02/24/2022	03/04/2022	02/24/2022	02/24/2022	02/24/2022
					Sample Elevation	7.5	6.5	-5.5	-5.5	4.5	0.5	4.5	4.5	4.5
					Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Semi-Volatile Organic Compounds														
1,2,4,5-Tetrachlorobenzene	95-94-3	NS	NS		mg/kg	<0.0939 U	NA	<0.0951 U	<0.1 U	<0.0894 UJ	<0.0973 U	<0.0934 UJ	<0.0906 UJ	<0.0876 UJ
1,2-Diphenylhydrazine	122-66-7	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13		mg/kg	<0.0196 U	NA	<0.0187 U	<0.0192 U	<0.0187 U	<0.0196 U	<0.0189 U	<0.0192 U	<0.0187 U
2,3,4,6-Tetrachlorophenol	58-90-2	NS	NS		mg/kg	<0.0939 U	NA	<0.0951 U	<0.1 U	<0.0894 UJ	<0.0973 U	<0.0934 U	<0.0906 U	<0.0876 U
2,4,5-Trichlorophenol	95-95-4	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
2,4,6-Trichlorophenol	88-06-2	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
2,4-Dichlorophenol	120-83-2	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
2,4-Dimethylphenol	105-67-9	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
2,4-Dinitrophenol	51-28-5	NS	NS		mg/kg	<0.0939 U	NA	<0.0951 U	<0.1 U	<0.0894 UJ	<0.0973 UJ	<0.0934 U	<0.0906 U	<0.0876 U
2,4-Dinitrotoluene	121-14-2	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
2,6-Dinitrotoluene	606-20-2	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
2-Chloronaphthalene	91-58-7	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
2-Chlorophenol	95-57-8	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
2-Methylnaphthalene	91-57-6	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.0599 J	<0.0468 U	<0.0454 U	<0.0439 U
2-Methylphenol (o-Cresol)	95-48-7	0.33	100		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
2-Nitroaniline	88-74-4	NS	NS		mg/kg	<0.0939 U	NA	<0.0951 U	<0.1 U	<0.0894 UJ	<0.0973 U	<0.0934 U	<0.0906 U	<0.0876 U
2-Nitrophenol	88-75-5	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
3,3'-Dichlorobenzidine	91-94-1	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
3-Nitroaniline	99-09-2	NS	NS		mg/kg	<0.0939 U	NA	<0.0951 U	<0.1 U	<0.0894 UJ	<0.0973 U	<0.0934 UJ	<0.0906 UJ	<0.0876 UJ
4,6-Dinitro-2-Methylphenol	534-52-1	NS	NS		mg/kg	<0.0939 U	NA	<0.0951 U	<0.1 U	<0.0894 UJ	<0.0973 U	<0.0934 U	<0.0906 U	<0.0876 U
4-Bromophenyl Phenyl Ether	101-55-3	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
4-Chloro-3-Methylphenol	59-50-7	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
4-Chloroaniline	106-47-8	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
4-Chlorophenyl Phenyl Ether	7005-72-3	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
4-Nitroaniline	100-01-6	NS	NS		mg/kg	<0.0939 U	NA	<0.0951 U	<0.1 U	<0.0894 UJ	<0.0973 U	<0.0934 U	<0.0906 U	<0.0876 U
4-Nitrophenol	100-02-7	NS	NS		mg/kg	<0.0939 U	NA	<0.0951 U	<0.1 U	<0.0894 UJ	<0.0973 U	<0.0934 U	<0.0906 U	<0.0876 U
Acenaphthene	83-32-9	20	100		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.17 J	<0.0468 U	<0.0454 U	<0.0439 U
Acenaphthylene	208-96-8	100	100		mg/kg	0.0473 JD	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.201 J	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
Acetophenone	98-86-2	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
Aniline (Phenylamine, Aminobenzene)	62-53-3	NS	NS		mg/kg	<0.188 U	NA	<0.19 U	<0.201 U	<0.179 UJ	<0.195 U	<0.187 U	<0.181 U	<0.175 U
Anthracene	120-12-7	100	100		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.549 J	<0.0468 U	0.0514 JD	<0.0439 U
Atrazine	1912-24-9	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Benzaldehyde	100-52-7	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Benzidine	92-87-5	NS	NS		mg/kg	<0.188 U	NA	<0.19 U	<0.201 U	<0.179 UJ	<0.195 U	<0.187 U	<0.181 U	<0.175 U
Benzo(a)anthracene	56-55-3	**1**	1		mg/kg	0.19 D	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.781 J	<0.0468 U	0.156 D	<0.0439 U
Benzo(a)pyrene	50-32-8	**1**	1		mg/kg	0.22 D	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.649 D	<0.0468 UJ	0.123 J	<0.0439 UJ
Benzo(b)fluoranthene	205-99-2	**1**	1		mg/kg	0.143 D	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.476 J	<0.0468 U	0.104 D	<0.0439 U
Benzo(g,h,i)Perylene	191-24-2	100	100		mg/kg	0.176 D	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.415 D	<0.0468 U	0.0775 JD	<0.0439 U
Benzo(k)fluoranthene	207-08-9	**0.8**	3.9		mg/kg	0.162 D	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.587 J	<0.0468 U	0.112 D	<0.0439 U
Benzoic Acid	65-85-0	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Benzyl Alcohol	100-51-6	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Benzyl Butyl Phthalate	85-68-7	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Biphenyl (Diphenyl)	92-52-4	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
Bis(2-chloroethoxy) methane	111-91-1	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
Bis(2-chloroethyl) ether (2-chloroethyl ether)	111-44-4	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
Bis(2-chloroisopropyl) ether	108-60-1	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
Bis(2-ethylhexyl) phthalate	117-81-7	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Caprolactam	105-60-2	NS	NS		mg/kg	<0.0939 U	NA	<0.0951 U	<0.1 U	<0.0894 UJ	<0.0973 U	<0.0934 U	<0.0906 U	<0.0876 U
Carbazole	86-74-8	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.0731 J	<0.0468 U	<0.0454 U	<0.0439 U
Chrysene	218-01-9	**1**	1	*	mg/kg	0.188 D	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.804 J	<0.0468 U	0.152 D	<0.0439 U
Dibenz(a,h)anthracene	53-70-3	**0.33**	0.33		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.124 J	<0.0468 U	<0.0454 U	<0.0439 U
Dibenzofuran	132-64-9	7	59		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
Dibutyl phthalate	84-74-2	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Diethyl phthalate	84-66-2	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
Dimethyl phthalate	131-11-3	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
Dioctyl phthalate	117-84-0	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
Diphenylamine	122-39-4	NS	NS		mg/kg	<0.0939 U	NA	<0.0951 U	<0.1 U	<0.0894 UJ	<0.0973 U	<0.0934 U	<0.0906 U	<0.0876 U
Fluoranthene	206-44-0	**100**	100		mg/kg	0.295 D	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	2.09 J	<0.0468 UJ	0.36 J	<0.0439 UJ
Fluorene	86-73-7	30	100		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.199 J	<0.0468 U	<0.0454 U	<0.0439 U
Hexachlorobenzene	118-74-1	0.33	1.2		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Hexachlorobutadiene	87-68-3	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
Hexachlorocyclopentadiene	77-47-4	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 UJ	<0.0468 U	<0.0454 U	<0.0439 U
Hexachloroethane	67-72-1	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5		mg/kg	0.17 D	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.372 D	<0.0468 U	0.106 D	<0.0439 U
Isophorone	78-59-1	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 UJ	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Naphthalene	91-20-3	12	100		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	0.237 J	<0.0468 U	<0.0454 U	<0.0439 U
Nitrobenzene	98-95-3	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
n-Nitrosodimethylamine	62-75-9	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
n-Nitrosodi-N-Propylamine	621-64-7	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 UJ	<0.0454 UJ	<0.0439 UJ
n-Nitrosodiphenylamine	86-30-6	NS	NS		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Pentachlorophenol	87-86-5	0.8	6.7		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Phenanthrene	85-01-8	100	100		mg/kg	0.113 D	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	1.36 J	<0.0468 U	0.304 D	<0.0439 U
Phenol	108-95-2	0.33	100		mg/kg	<0.0471 U	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	<0.0488 U	<0.0468 U	<0.0454 U	<0.0439 U
Pyrene	129-00-0	**100**	100		mg/kg	0.291 D	NA	<0.0477 U	<0.0503 U	<0.0448 UJ	1.78 J	<0.0468 U	0.313 D	<0.0439 U
Pyridine	110-86-1	NS	NS		mg/kg	<0.188 U	NA	<0.19 U	<0.201 U	<0.179 UJ	<0.195 U	<0.187 U	<0.181 U	<0.175 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP73	EP73	EP74	EP75	EP76	EP77	SW01	SW02	SW03
				Sample Name	EP73_7.5	EP73_6.5	EP74_-5.5	EP75_-5.5	EP76_4.5	EP77_0.5	SW01_4.5	SW02_4.5	SW03_4.5
				Sample Date	08/10/2022	08/18/2022	08/15/2022	03/30/2022	02/24/2022	03/04/2022	02/24/2022	02/24/2022	02/24/2022
				Sample Elevation	7.5	6.5	-5.5	-5.5	4.5	0.5	4.5	4.5	4.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Pesticides													
4,4'-DDD	72-54-8	**0.0033**	13	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
4,4'-DDE	72-55-9	**0.0033**	8.9	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
4,4'-DDT	50-29-3	**0.0033**	7.9	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Aldrin	309-00-2	0.005	0.097	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Alpha BHC (Alpha Hexachlorocyclohexane)	319-84-6	0.02	0.48	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Alpha Chlordane	5103-71-9	0.094	4.2	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Alpha Endosulfan	959-98-8	2.4	24	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Beta Endosulfan	33213-65-9	2.4	24	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Chlordane (alpha and gamma)	57-74-9	NS	NS	mg/kg	<0.0379 U	NA	<0.0369 U	<0.0396 U	<0.0358 U	<0.038 U	<0.037 U	<0.036 U	<0.0351 U
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Dieldrin	60-57-1	0.005	0.2	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Endosulfan Sulfate	1031-07-8	2.4	24	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Endrin	72-20-8	0.014	11	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Endrin Aldehyde	7421-93-4	NS	NS	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Endrin Ketone	53494-70-5	NS	NS	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Gamma Bhc (Lindane)	58-89-9	0.1	1.3	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Gamma-Chlordane	5566-34-7	NS	NS	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Heptachlor	76-44-8	0.042	2.1	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Heptachlor Epoxide	1024-57-3	NS	NS	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Methoxychlor	72-43-5	NS	NS	mg/kg	<0.0019 U	NA	<0.00184 U	<0.00198 U	<0.00179 U	<0.0019 U	<0.00185 U	<0.0018 U	<0.00176 U
Toxaphene	8001-35-2	NS	NS	mg/kg	<0.19 U	NA	<0.184 U	<0.198 U	<0.179 U	<0.19 U	<0.185 U	<0.18 U	<0.176 U
Herbicides													
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	NS	NS	mg/kg	<0.023 U	NA	<0.0224 U	<0.0241 U	<0.0219 U	<0.0233 U	<0.022 U	<0.0216 U	<0.0212 U
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	NS	NS	mg/kg	<0.023 U	NA	<0.0224 U	<0.0241 U	<0.0219 U	<0.0233 U	<0.022 U	<0.0216 U	<0.0212 U
Silvex (2,4,5-Tp)	93-72-1	3.8	100	mg/kg	<0.023 U	NA	<0.0224 U	<0.0241 U	<0.0219 U	<0.0233 U	<0.022 U	<0.0216 U	<0.0212 U
Polychlorinated Biphenyl													
PCB-1016 (Aroclor 1016)	12674-11-2	NS	NS	mg/kg	<0.0191 U	NA	<0.0186 U	<0.02 U	<0.0181 U	<0.0192 U	<0.0187 U	<0.0182 U	<0.0177 U
PCB-1221 (Aroclor 1221)	11104-28-2	NS	NS	mg/kg	<0.0191 U	NA	<0.0186 U	<0.02 U	<0.0181 U	<0.0192 U	<0.0187 U	<0.0182 U	<0.0177 U
PCB-1232 (Aroclor 1232)	11141-16-5	NS	NS	mg/kg	<0.0191 U	NA	<0.0186 U	<0.02 U	<0.0181 U	<0.0192 U	<0.0187 U	<0.0182 U	<0.0177 U
PCB-1242 (Aroclor 1242)	53469-21-9	NS	NS	mg/kg	<0.0191 U	NA	<0.0186 U	<0.02 U	<0.0181 U	<0.0192 U	<0.0187 U	<0.0182 U	<0.0177 U
PCB-1248 (Aroclor 1248)	12672-29-6	NS	NS	mg/kg	<0.0191 U	NA	<0.0186 U	<0.02 U	<0.0181 U	<0.0192 U	<0.0187 U	<0.0182 U	<0.0177 U
PCB-1254 (Aroclor 1254)	11097-69-1	NS	NS	mg/kg	<0.0191 U	NA	<0.0186 U	<0.02 U	<0.0181 U	<0.0192 U	<0.0187 U	<0.0182 U	<0.0177 U
PCB-1260 (Aroclor 1260)	11096-82-5	NS	NS	mg/kg	<0.0191 U	NA	<0.0186 U	<0.02 U	<0.0181 U	<0.0192 U	<0.0187 U	<0.0182 U	<0.0177 U
Total PCBs	1336-36-3	0.1	1	mg/kg	<0.0191 U	NA	<0.0186 U	<0.02 U	<0.0181 U	<0.0192 U	<0.0187 U	<0.0182 U	<0.0177 U
Metals													
Aluminum	7429-90-5	NS	NS	mg/kg	11,600 J	NA	5,580	4,500	5,220	7,490	6,460	8,920	6,900
Antimony	7440-36-0	NS	NS	mg/kg	3.5 J	NA	<3.02 U	12.9	<2.75 U	<2.93 UJ	<2.81 U	2.76	2.82 J
Arsenic	7440-38-2	**13**	16	mg/kg	8.97 J	NA	<1.81 U	<1.82 U	<1.65 U	1.94 J	<1.69 U	<1.65 U	<1.61 U
Barium	7440-39-3	**350**	400	mg/kg	953 J	28.9	35.7	28.6	39.1	47.8 J	37.1	81.4	40.7
Beryllium	7440-41-7	7.2	72	mg/kg	<0.059 U	NA	<0.06 U	<0.061 U	<0.055 U	<0.059 UJ	<0.056 U	<0.055 U	<0.054 U
Cadmium	7440-43-9	**2.5**	4.3	mg/kg	<0.353 U	NA	<0.362 U	<0.363 U	<0.33 U	<0.351 UJ	<0.337 U	<0.329 U	<0.322 U
Calcium	7440-70-2	NS	NS	mg/kg	12,100 J	NA	1,240 B	1,080	2,220 B	5,580 J	2,060 B	1,920 B	1,970 B
Chromium, Hexavalent	18540-29-9	**1**	110	mg/kg	<0.578 U	NA	<0.574 U	<0.606 U	<0.55 U	<0.586 U	<0.562 U	<0.549 U	<0.537 U
Chromium, Total	7440-47-3	NS	NS	mg/kg	32.5 J	NA	21.2	164	15.3	32.8 J	28.3	21.5	16.1 J
Chromium, Trivalent	16065-83-1	**30**	180	mg/kg	**32.5**	NA	21.2	**164**	15.3	**32.8**	28.3	21.5	16.1
Cobalt	7440-48-4	NS	NS	mg/kg	12.8	NA	13.2	67.2	7.55	12.9 J	11.2	10.7	7.59
Copper	7440-50-8	**50**	270	mg/kg	**60.8 J**	NA	21.4	20.1	22.4	25.6 J	27.9	36.8	29.5
Cyanide	57-12-5	27	27	mg/kg	<0.578 U	NA	<0.574 U	<0.606 U	<0.55 U	<0.586 U	<0.562 U	<0.549 UJ	<0.537 U
Iron	7439-89-6	NS	NS	mg/kg	16,100	NA	12,600	39,000	14,000	16,100	15,600	20,300	14,400
Lead	7439-92-1	**63**	400	mg/kg	452 B	27.8	11.3	0.674	14.2	23.8 J	10.8	13.5	8.72 J
Magnesium	7439-95-4	NS	NS	mg/kg	9,430 B	NA	3,520	89,700	3,980	3,840	7,560	6,450	4,070
Manganese	7439-96-5	1600	2000	mg/kg	203 J	NA	152	701	238	464	208	194	266
Mercury	7439-97-6	**0.18**	0.81	mg/kg	**0.585**	NA	<0.0344 U	<0.0363 U	<0.033 U	0.0385	<0.0337 U	0.0368	<0.0322 U
Nickel	7440-02-0	**30**	310	mg/kg	**133 J**	NA	**155 J**	1,910 J	**59.7**	**129 J**	**134**	**117**	**56.3 J**
Potassium	7440-09-7	NS	NS	mg/kg	889	NA	1,040 B	683	1,150 B	1,080 J	1,090	1,330	1,450
Selenium	7782-49-2	3.9	180	mg/kg	<2.94 U	NA	<3.02 U	<3.03 U	<2.75 U	<2.93 UJ	<2.81 U	<2.74 U	<2.69 U
Silver	7440-22-4	2	180	mg/kg	<0.588 U	NA	<0.604 U	<0.606 U	<0.55 U	<0.586 UJ	<0.562 U	<0.549 U	<0.537 UJ
Sodium	7440-23-5	NS	NS	mg/kg	877 J	NA	<60.4 U	112	144	176 J	132	130	190 J
Thallium	7440-28-0	NS	NS	mg/kg	<2.94 U	NA	<3.02 U	<3.03 U	<2.75 U	<2.93 UJ	<2.81 U	<2.74 U	<2.69 U
Vanadium	7440-62-2	NS	NS	mg/kg	34.1	NA	17	15	19.6	22.6 J	21.1	28.9	26.6
Zinc	7440-66-6	**109**	10000	mg/kg	**292**	NA	22.9	29.8	24.8	36.8 J	25.3	49	29.1 J
General Chemistry													
Solids, Percent	SOLID	NS	NS	Percent	86.5	91.8	87.1	82.5	90.9	85.4	89	91.1	93.1

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	Location	EP73	EP73	EP74	EP75	EP76	EP77	SW01	SW02	SW03
				Sample Name	EP73_7.5	EP73_6.5	EP74_-5.5	EP75_-5.5	EP76_4.5	EP77_0.5	SW01_4.5	SW02_4.5	SW03_4.5
				Sample Date	08/10/2022	08/18/2022	08/15/2022	03/30/2022	02/24/2022	03/04/2022	02/24/2022	02/24/2022	02/24/2022
				Sample Elevation	7.5	6.5	-5.5	-5.5	4.5	0.5	4.5	4.5	4.5
				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result
Perfluorooctanoic acids													
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA	2355-31-9	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorobutanoic acid (PFBA)	375-22-4	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorodecanoic Acid (PFDA)	335-76-2	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorododecanoic Acid (PFDoA)	307-55-1	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluoroheptanoic acid (PFHpA)	375-85-9	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorohexanoic Acid (PFHxA)	307-24-4	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorononanoic Acid (PFNA)	375-95-1	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorooctanesulfonamide (FOSA)	754-91-6	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	**0.00088**	0.044	mg/kg	**0.0018**	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorooctanoic Acid (PFOA)	335-67-1	**0.00066**	0.033	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	39108-34-4	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	27619-97-2	NS	NS	mg/kg	<0.000284 U	NA	<0.000283 U	<0.000292 U	<0.000261 U	<0.000278 U	<0.000269 U	<0.000266 U	<0.00026 U

Table 2A
Site Management Plan
Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Notes:

CAS - Chemical Abstract Service
NS - No standard
mg/kg - milligram per kilogram
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Soil sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use and Restricted Use Restricted-Residential Soil Cleanup Objectives (SCO).
Soil sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Part 375 Remedial Programs Guidelines for Sampling and Analysis of Per- and Polyfluoroalkyl Substances (PFAS) Unrestricted Use, Restricted Use Restricted-Residential, and Protection of Groundwater Guidance Values (June 2021).
Criterion comparisons for 3- & 4-methylphenol (m&p cresol) are provided for reference. Promulgated SCOs are for 3-methylphenol (m-cresol) and 4-methylphenol (p-cresol).

* Results were compared to restricted-residential SCOs and the lower of the restricted residential SCOs and/or protection of groundwater SCOs for contaminants found in site groundwater above standard

Qualifiers:

D - The concentration reported is a result of a diluted sample.

B - The analyte was found in the associated analysis batch blank.
J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ - The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.
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.

Exceedance Summary:

10 - Result exceeds Unrestricted Use SCOs
10 - Result exceeds Restricted Use Restricted-Residential SCOs

Table 2B
Site Management Plan
Underground Storage Tank Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs		Location	UST1_BOTTOM	UST1_SW_E	UST1_SW_S	UST1_SW_W	UST7_BOTTOM	UST7_SW_E
					Sample Name	UST1_BOTTOM_3.5_20220203	UST1_SW_E_3.5_20220203	UST1_SW_S_3.5_20220203	UST1_SW_W_3.5_20220203	UST7_BOTTOM_3.5	UST7_SW_E_3.5
					Sample Date	02/03/2022	02/03/2022	02/03/2022	02/03/2022	04/26/2022	04/26/2022
					Sample Elevation	3.5	3.5	3.5	3.5	3.5	3.5
					Unit	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,2,4-Trimethylbenzene	95-63-6	**3.6**	52		mg/kg	0.018	<0.0027 U	<0.0023 U	0.022	**3.8 D**	3.3 D
1,3,5-Trimethylbenzene (Mesitylene	108-67-8	8.4	52		mg/kg	0.0077 J	<0.0027 U	<0.0023 U	0.0098	1.4 D	5 D
Benzene	71-43-2	0.06	4.8		mg/kg	<0.0041 U	<0.0027 U	<0.0023 U	<0.0028 U	<0.2 U	<0.22 U
Ethylbenzene	100-41-4	1	41		mg/kg	<0.0041 U	<0.0027 U	<0.0023 U	<0.0028 U	0.24 JD	<0.22 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS		mg/kg	<0.0041 U	<0.0027 U	<0.0023 U	<0.0028 U	0.21 JD	<0.22 U
M,P-Xylene	179601-23-1	NS	NS		mg/kg	0.01 J	<0.0054 U	<0.0047 U	0.015	1.8 D	1.1 D
Naphthalene	91-20-3	12	100		mg/kg	<0.0041 U	<0.0027 U	<0.0023 U	<0.0028 U	3.6 D	0.96 D
n-Butylbenzene	104-51-8	12	100		mg/kg	<0.0041 U	<0.0027 U	<0.0023 U	<0.0028 U	0.79 D	2.1 D
n-Propylbenzene	103-65-1	3.9	100		mg/kg	<0.0041 U	<0.0027 U	<0.0023 U	<0.0028 U	0.36 JD	<0.22 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS		mg/kg	0.0075 J	<0.0027 U	<0.0023 U	0.011	1.2 D	2.4 D
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS		mg/kg	<0.0041 U	<0.0027 U	<0.0023 U	<0.0028 U	0.38 JD	1.3 D
Sec-Butylbenzene	135-98-8	11	100		mg/kg	<0.0041 U	<0.0027 U	<0.0023 U	<0.0028 U	0.51 D	1.3 D
T-Butylbenzene	98-06-6	5.9	100		mg/kg	<0.0041 U	<0.0027 U	<0.0023 U	<0.0028 U	<0.2 U	<0.22 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	100		mg/kg	<0.0041 U	<0.0027 U	<0.0023 U	<0.0028 U	<0.2 U	<0.22 U
Toluene	108-88-3	0.7	100		mg/kg	<0.0041 U	<0.0027 U	<0.0023 U	<0.0028 U	0.29 JD	<0.22 U
Total Xylenes	1330-20-7	**0.26**	100		mg/kg	0.018 J	<0.0081 U	<0.007 U	0.026	**3 D**	**3.4 D**
Semi-Volatile Organic Compounds											
Acenaphthene	83-32-9	20	100		mg/kg	<0.292 U	<0.0509 U	<0.0525 U	<0.0544 U	<0.0479 U	0.636 D
Acenaphthylene	208-96-8	100	100		mg/kg	<0.292 U	<0.0509 U	<0.0525 U	<0.0544 U	<0.0479 U	<0.0481 U
Anthracene	120-12-7	100	100		mg/kg	<0.292 U	<0.0509 U	<0.0525 U	0.0547 JD	0.0795 JD	0.581 D
Benzo(a)anthracene	56-55-3	1	1		mg/kg	<0.292 U	0.082 JD	<0.0525 U	0.275 D	0.0993 D	0.978 D
Benzo(a)pyrene	50-32-8	1	1		mg/kg	<0.292 U	0.0877 JD	0.0595 JD	0.317 D	0.0986 J	0.857 J
Benzo(b)fluoranthene	205-99-2	1	1		mg/kg	<0.292 U	<0.0509 U	<0.0525 U	0.219 D	0.0802 J	0.752 J
Benzo(g,h,i)Perylene	191-24-2	100	100		mg/kg	<0.292 U	0.052 JD	<0.0525 U	0.198 D	0.068 JD	0.58 D
Benzo(k)fluoranthene	207-08-9	0.8	3.9		mg/kg	<0.292 U	0.0625 JD	<0.0525 U	0.232 D	0.0734 J	0.654 J
Chrysene	218-01-9	1	1	*	mg/kg	<0.292 U	0.0861 JD	<0.0525 U	0.282 D	0.102 D	0.931 D
Dibenz(a,h)anthracene	53-70-3	0.33	0.33		mg/kg	<0.292 U	<0.0509 U	<0.0525 U	<0.0544 U	<0.0479 U	0.134 D
Fluoranthene	206-44-0	100	100		mg/kg	<0.292 U	0.11 D	0.0896 JD	0.534 D	0.163 D	2.03 D
Fluorene	86-73-7	30	100		mg/kg	<0.292 U	<0.0509 U	<0.0525 U	<0.0544 U	0.374 D	1.37 D
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5		mg/kg	<0.292 U	<0.0509 U	<0.0525 U	0.163 D	0.0726 JD	0.674 D
Naphthalene	91-20-3	12	100		mg/kg	<0.292 U	<0.0509 U	<0.0525 U	<0.0544 U	1.1 J	<0.0481 UJ
Phenanthrene	85-01-8	100	100		mg/kg	<0.292 U	<0.0509 U	<0.0525 U	0.252 D	1.08 D	4.99 D
Pyrene	129-00-0	100	100		mg/kg	0.321 JD	0.153 D	0.0863 JD	0.518 D	0.31 D	2.9 D
General Chemistry											
Solids, Percent	SOLID	NS	NS		Percent	77.9	79.7	79.3	76.6	85.8	85.7

Table 2B
Site Management Plan
Underground Storage Tank Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs		Location	UST7_SW_N	UST7_SW_S	UST7_SW_W	UST7_SW_E	UST 5-6_SW_E	UST5-6_BOTTOM	UST5-6_BOTTOM2	UST5-6_SW_N
					Sample Name	UST7_SW_N_3.5	UST7_SW_S_3.5	UST7_SW_W_3.5	UST7_SW_E_2.5	UST 5-6_SW_E_0.0	UST5-6_BOTTOM_0.0	UST5-6_BOTTOM2_-2.0	UST5-6_SW_N_-1.0
					Sample Date	04/26/2022	04/26/2022	04/26/2022	05/17/2022	06/29/2022	06/24/2022	07/07/2022	07/08/2022
					Sample Elevation	3.5	3.5	3.5	2.5	0	0	-2	-1
					Unit	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds													
1,2,4-Trimethylbenzene	95-63-6	**3.6**	52		mg/kg	0.029	0.034	**6 D**	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
1,3,5-Trimethylbenzene (Mesitylene	108-67-8	8.4	52		mg/kg	0.023	0.055	2.6 D	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
Benzene	71-43-2	0.06	4.8		mg/kg	<0.0029 U	<0.0024 U	<0.26 U	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
Ethylbenzene	100-41-4	1	41		mg/kg	0.003 J	<0.0024 U	0.27 JD	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS		mg/kg	<0.0029 U	0.0056	0.36 JD	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
M,P-Xylene	179601-23-1	NS	NS		mg/kg	0.017	0.015	2.7 D	NA	<0.0046 U	<0.005 U	<0.0053 U	<0.005 U
Naphthalene	91-20-3	12	100		mg/kg	0.013	0.019	4.7 D	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
n-Butylbenzene	104-51-8	12	100		mg/kg	0.0072	0.022	1.4 D	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
n-Propylbenzene	103-65-1	3.9	100		mg/kg	0.0035 J	0.0056	0.53 D	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS		mg/kg	0.022	0.055	2.1 D	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS		mg/kg	0.0051 J	0.013	0.71 D	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
Sec-Butylbenzene	135-98-8	11	100		mg/kg	0.0058	0.017	0.92 D	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
T-Butylbenzene	98-06-6	5.9	100		mg/kg	<0.0029 U	<0.0024 U	<0.26 U	NA	<0.0023 UJ	<0.0025 U	<0.0026 U	<0.0025 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	100		mg/kg	<0.0029 U	<0.0024 U	<0.26 U	NA	<0.0023 U	<0.0025 U	<0.0026 U	<0.0025 U
Toluene	108-88-3	0.7	100		mg/kg	<0.0029 U	<0.0024 U	0.29 JD	NA	<0.0023 UJ	<0.0025 U	<0.0026 U	<0.0025 U
Total Xylenes	1330-20-7	**0.26**	100		mg/kg	0.039	0.07	**4.8 D**	NA	<0.0069 U	<0.0075 U	<0.0079 U	<0.0075 U
Semi-Volatile Organic Compounds													
Acenaphthene	83-32-9	20	100		mg/kg	<0.0483 U	<0.0468 U	0.183 D	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Acenaphthylene	208-96-8	100	100		mg/kg	<0.0483 U	<0.0468 U	0.0674 JD	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Anthracene	120-12-7	100	100		mg/kg	<0.0483 U	0.0471 JD	0.3 D	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Benzo(a)anthracene	56-55-3	1	1		mg/kg	0.1 D	0.166 D	0.528 D	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Benzo(a)pyrene	50-32-8	1	1		mg/kg	0.0763 J	0.149 J	0.414 J	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Benzo(b)fluoranthene	205-99-2	1	1		mg/kg	0.0686 J	0.132 J	0.363 J	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Benzo(g,h,i)Perylene	191-24-2	100	100		mg/kg	0.054 JD	0.105 D	0.234 D	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Benzo(k)fluoranthene	207-08-9	0.8	3.9		mg/kg	0.0663 J	0.124 J	0.324 J	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Chrysene	218-01-9	1	1	*	mg/kg	0.0879 JD	0.15 D	0.497 D	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Dibenz(a,h)anthracene	53-70-3	0.33	0.33		mg/kg	<0.0483 U	<0.0468 U	0.0719 JD	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Fluoranthene	206-44-0	100	100		mg/kg	0.15 D	0.248 D	0.889 D	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Fluorene	86-73-7	30	100		mg/kg	0.054 JD	0.0613 JD	0.19 D	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5		mg/kg	0.0532 JD	0.132 D	0.282 D	<0.0534 U	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Naphthalene	91-20-3	12	100		mg/kg	0.0987 J	<0.0468 UJ	0.137 J	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Phenanthrene	85-01-8	100	100		mg/kg	0.203 D	0.229 D	1.17 D	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
Pyrene	129-00-0	100	100		mg/kg	0.174 D	0.294 D	1.07 D	NA	<0.0484 U	<0.0502 U	<0.0493 U	<0.0501 U
General Chemistry													
Solids, Percent	SOLID	NS	NS		Percent	84.8	88.1	87.8	78	85.5	82.8	83.3	81.2

Table 2B
Site Management Plan
Underground Storage Tank Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs		Location	UST5-6_SW_S	UST5-6_SW_W	UST5-6_SW2_E	UST5-6_SW2_N	UST5-6_SW2_S	UST5-6_SW2_W
					Sample Name	UST5-6_SW_S_0.0	UST5-6_SW_W_4.5	UST5-6_SW2_E_0.0	UST5-6_SW2_N_0.5	UST5-6_SW2_S_0.5	UST5-6_SW2_W_2.0
					Sample Date	07/05/2022	07/11/2022	07/07/2022	07/11/2022	07/12/2022	07/11/2022
					Sample Elevation	0	4.5	0	0.5	0.5	2
					Unit	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,2,4-Trimethylbenzene	95-63-6	**3.6**	52		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	<0.0023 U
1,3,5-Trimethylbenzene (Mesitylene	108-67-8	8.4	52		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	<0.0023 U
Benzene	71-43-2	0.06	4.8		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	<0.0023 U
Ethylbenzene	100-41-4	1	41		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	<0.0023 U
Isopropylbenzene (Cumene)	98-82-8	NS	NS		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	0.0033 J
M,P-Xylene	179601-23-1	NS	NS		mg/kg	<0.0045 U	<0.0043 U	<0.0048 U	<0.0043 U	<0.0048 U	<0.0046 U
Naphthalene	91-20-3	12	100		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	<0.0023 U
n-Butylbenzene	104-51-8	12	100		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	<0.0023 U
n-Propylbenzene	103-65-1	3.9	100		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	<0.0023 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	NS	NS		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	<0.0023 U
p-Cymene (p-Isopropyltoluene)	CYMP	NS	NS		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	<0.0023 U
Sec-Butylbenzene	135-98-8	11	100		mg/kg	<0.0023 U	0.0033 J	<0.0024 U	<0.0022 U	<0.0024 U	0.0036 J
T-Butylbenzene	98-06-6	5.9	100		mg/kg	<0.0023 U	<0.0022 U	<0.0024 UJ	<0.0022 U	<0.0024 U	<0.0023 U
Tert-Butyl Methyl Ether	1634-04-4	0.93	100		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	<0.0023 U
Toluene	108-88-3	0.7	100		mg/kg	<0.0023 U	<0.0022 U	<0.0024 U	<0.0022 U	<0.0024 U	<0.0023 U
Total Xylenes	1330-20-7	**0.26**	100		mg/kg	<0.0068 U	<0.0065 U	<0.0072 U	<0.0065 U	<0.0072 U	<0.0069 U
Semi-Volatile Organic Compounds											
Acenaphthene	83-32-9	20	100		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Acenaphthylene	208-96-8	100	100		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Anthracene	120-12-7	100	100		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Benzo(a)anthracene	56-55-3	1	1		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Benzo(a)pyrene	50-32-8	1	1		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Benzo(b)fluoranthene	205-99-2	1	1		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Benzo(g,h,i)Perylene	191-24-2	100	100		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Benzo(k)fluoranthene	207-08-9	0.8	3.9		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Chrysene	218-01-9	1	1	*	mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Dibenz(a,h)anthracene	53-70-3	0.33	0.33		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Fluoranthene	206-44-0	100	100		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Fluorene	86-73-7	30	100		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Indeno(1,2,3-cd)pyrene	193-39-5	**0.5**	0.5		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Naphthalene	91-20-3	12	100		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	0.0642 JD	<0.0476 U
Phenanthrene	85-01-8	100	100		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
Pyrene	129-00-0	100	100		mg/kg	<0.0491 U	<0.0477 U	<0.0494 U	<0.0509 U	<0.0503 U	<0.0476 U
General Chemistry											
Solids, Percent	SOLID	NS	NS		Percent	84.5	86.4	83.8	80	80.9	87.6

Table 2B
Site Management Plan
Underground Storage Tank Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Notes:

CAS - Chemical Abstract Service
NS - No standard
mg/kg - milligram per kilogram
NA - Not analyzed
RL - Reporting limit
<RL - Not detected

Soil sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Unrestricted Use and Restricted Use Restricted-Residential Soil Cleanup Objectives (SCO).

Soil sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Part 375 Remedial Programs Guidelines for Sampling and Analysis of Per- and Polyfluoroalkyl Substances (PFAS) Unrestricted Use, Restricted Use Restricted-Residential, and Protection of Groundwater Guidance Values (June 2021).

Criterion comparisons for 3- & 4-methylphenol (m&p cresol) are provided for reference. Promulgated SCOs are for 3-methylphenol (m-cresol) and 4-methylphenol (p-cresol).

* Results were compared to restricted-residential SCOs and the lower of the restricted residential SCOs and/or protection of groundwater SCOs for contaminants found in site groundwater above standard

Qualifiers:

D - The concentration reported is a result of a diluted sample.
J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ - The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.

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.

Exceedance Summary:

10 - Result exceeds Unrestricted Use SCOs
10 - Result exceeds Restricted Use Restricted-Residential SCOs

Table 2C
Site Management Plan
Hazardous Lead Removal Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	Location	SB107_BASE	SB107_SW_E	SB107_SW_N	SB107_SW_S	SB107_SW_W
					Sample Name	SB107_BASE_4.0_20220216	SB107_SW_E_4.0_20220216	SB107_SW_N_4.0_20220216	SB107_SW_S_4.0_20220216	SB107_SW_W_4.0_20220216
					Sample Date	02/16/2022	02/16/2022	02/16/2022	02/16/2022	02/16/2022
					Elevation	4	4	4	4	4
					Unit	Result	Result	Result	Result	Result
Metals - Total										
Lead	7439-92-1	**63**	400	NS	mg/kg	46.7	**211**	13.5	**288**	**490**
Metals - TCLP										
Lead	7439-92-1	NS	NS	5	mg/l	0.355 B	1.74 B	0.18 B	0.249 B	0.699 B

Table 2C
Site Management Plan
Hazardous Lead Removal Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Analyte	CAS Number	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	RCRA Characteristics of Hazardous Waste	SB107_SW_W	WC11A_BASE	WC11A_SW_E	WC11A_SW_N	WC11A_SW_S	WC11A_SW_W
					SB107_SW_W_3.0	WC11A_BASE_4.0_20220216	WC11A_SW_E_4.0_20220216	WC11A_SW_N_4.0_20220216	WC11A_SW_S_4.0_20220216	WC11A_SW_W_4.0_20220216
					02/24/2022	02/16/2022	02/16/2022	02/16/2022	02/16/2022	02/16/2022
					3	4	4	4	4	4
					Result	Result	Result	Result	Result	Result
Metals - Total										
Lead	7439-92-1	**63**	400	NS	4.28	**205**	16.2	53.7	34.2	43.2
Metals - TCLP										
Lead	7439-92-1	NS	NS	5	NA	0.28 B	<0.125 U	<0.125 U	<0.125 U	<0.125 U

Table 2C
Site Management Plan
Hazardous Lead Removal Confirmation Soil Sample Results

475 Bay Street and 31 Wave Street
Staten Island, New York
Langan Project No.: 170610601
BCP Site No.: C243044

Notes:
TCLP - Toxicity Characteristic Leaching Procedure
CAS - Chemical Abstract Service
NS - No standard
mg/kg - milligram per kilogram
mg/l - milligram per liter
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Soil sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use, and Restricted Use Restricted-Residential Soil Cleanup Objectives (SCO).
Soil sample analytical results are compared to the 6 New York Codes, Rules and Regulations (NYCRR) Part 371.3 and 40 CFR 261 Subpart C and Table 1 of 40 CFR 261.24 - Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) Characteristics of Hazardous Waste.

Qualifiers:
B - The analyte was found in the associated analysis batch blank.
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.

Exceedance Summary:
10 - Result exceeds Unrestricted Use SCOs
10 - Result exceeds Restricted Use Restricted-Residential SCOs
10 - Result exceeds the RCRA Maximum Concentration of Contaminants for the Toxicity Characteristic

APPENDIX A

ENVIRONMENTAL EASEMENT

OFFICE OF THE RICHMOND COUNTY CLERK
130 STUYVESANT PLACE
STATEN ISLAND, NY 10301
HON. STEPHEN J. FIALA
COUNTY CLERK

RCC-215479-270448

RECORDING ENDORSEMENT PAGE

THIS ENDORSEMENT PAGE IS PART OF THE INSTRUMENT PRESENTED FOR RECORDING. THE ENDORSEMENT PAGE AND THE DOCUMENT RECORDED WITH IT HAVE BEEN PREPARED BY THE PARTIES TO THE TRANSACTION AND/OR THEIR AGENTS. THEY ARE SOLELY RESPONSIBLE FOR THE CONTENTS THEREOF. ANY QUESTIONS ABOUT THE CONTENTS SHOULD BE ADDRESSED TO THE PARTIES AND/OR THEIR AGENTS. THE PARTIES AND/OR THEIR AGENTS REQUEST THAT THIS DOCUMENT BE INDEXED ACCORDING TO THE INFORMATION THEY ARE PROVIDING ON THIS ENDORSEMENT PAGE.

DOCUMENT SUBMITTED	SUBMITTED FOR RECORDING BY:	RECORD AND RETURN TO:
EASEMENT	CTSY 989 EXPRESS ABSTRACT SERVICES, INC... 2047 VICTORY BOULEVARD SUITE 201 STATEN ISLAND, NY 10314	KEVIN A. ROGERS, ESQ. SIVE PAGET RIESEL 560 LEXINGTON AVENUE 15TH FLOOR NEW YORK, NY10022

PROPERTY DATA **BLOCKS:** 1 **LOTS:** 2

BLOCK	LOT	BLOCK	LOT	BLOCK	LOT	BLOCK	LOT
488	9	488	164				

PARTIES

NAME	COMPANY	PARTY	NAME	COMPANY	PARTY
	475 BAY STREET HOUSING DEVELOPMENT FUND CORP...	GRANTOR		PEOPLE OF THE STATE OF NEW YORK	GRANTEE
	475 BAY STREET LLC	GRANTOR			
	475 BAY STREET RETAIL OWNER LLC	GRANTOR			

INDEXING NOTICE

THE OFFICE OF THE RICHMOND COUNTY CLERK WILL RELY UPON THE INFORMATION PROVIDED ON THIS ENDORSEMENT PAGE (INCLUDING THE SPELLING OF PARTIES' NAMES) FOR INDEXING THIS INSTRUMENT.

THIS ENDORSEMENT PAGE WILL CONTROL IN THE EVENT OF A CONFLICT BETWEEN THE ENDORSEMENT PAGE AND OTHER PARTS OF THE DOCUMENT.

PAYMENT DETAILS (NO PERSONAL CHECKS)

RECORDING FEES:	$62.00	PAYABLE TO "RICHMOND COUNTY CLERK"
NYS RETT:	$0.00	PAYABLE TO "RICHMOND COUNTY CLERK"
NYC RPT:	$0.00	PAYABLE TO "COMMISSIONER OF FINANCE"
MORTGAGE TAX:	$0.00	PAYABLE TO "RICHMOND COUNTY CLERK"

TOTAL CHECK PAYMENTS TO A PAYEE IN EXCESS OF $20,000.00 MUST BE CERTIFIED

REVIEWED BY: 07 DEC 2022

SUPERVISOR (IF REQUIRED):

FOR OFFICE USE ONLY:

LAND DOC# 909639
Easement
RETT: 3248 $0.00
RPT: 3248 $0.00
12/07/2022 02:53:58 PM
Receipt: 31900 Fee: $62.00
Richmond County Clerk

RECORDED IN RICHMOND COUNTY
FEES PAID
COUNTY CLERK

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this 3rd day of November, 2022 between Owner(s), 475 Bay Street Housing Development Fund Corporation, (the "Grantor Fee Owner") having an office at c/o Settlement Housing Fund, Inc., 247 West 37th Street, 4th Floor, County of New York, State of New York, and 475 Bay Street LLC, (the "Grantor Beneficial Owner"), having an office at 150 Myrtle Avenue, Suite 2, County of Kings, State of New York and 475 Bay Street Retail Owner LLC (the "Grantor Retail Tenant"), having an office at 150 Myrtle Avenue, Suite 2, County of Kings, State of New York (collectively, the "Grantor"), and The People of the State of New York (the "Grantee"), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor Fee Owner, is the owner of the fee interest in the real property located at the address of 475 Bay Street and 31 Wave Street in the City of New York, County of Richmond and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 488 Lots 9 and p/o 164, being the same as that property conveyed to Grantor by deed dated December 16, 2021 and recorded in the Richmond County Clerk's Office as Land Document 887590. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 1.31 +/- acres, and is hereinafter more fully described in the Land Title Survey dated May 26, 2022 prepared by Vincent M. Teutonico (reg. no. 050307) of Meridian Layout Inc., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, Grantor Beneficial Owner is the owner of the beneficial interest in the Controlled Property being the same as a portion of that beneficial interest conveyed to Grantor Beneficial Owner by means of a Declaration of Interest and Nominee Agreement dated December 16, 2021 and recorded in the Richmond County Clerk's Office as Land Document 887951 and

WHEREAS, Grantor Retail Tenant is the holder of a master lease interest in the Controlled Property, pursuant to a Master Lease dated December 16, 2021; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of BCA Index No.Number: C243044-10-20, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without

necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property,

including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C243044
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor Fee Owner has caused this instrument to be signed in its name.

475 Bay Street Housing Development Fund Corporation:

By: _____

Print Name: Alexa Sewell

Title: President Date: 10/20/22

Grantor Fee Owner's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF New York)

On the 20th day of October, in the year 20 22, before me, the undersigned, personally appeared Alexa Sewell, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

FAZEELA SIDDIQUI
Notary Public, State of New York
No.02SI6288650
Qualified in Kings County
Commission Expires Nov. 27, 2025

IN WITNESS WHEREOF, Grantor Beneficial Owner has caused this instrument to be signed in its name.

475 Bay Street LLC

By: _____

Print Name: DONALD CAPOCCIA

Title: Authorized Signatory Date: 10/20/22

Grantor Beneficial Owner's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF Kings)

On the 20th day of October, in the year 2022, before me, the undersigned, personally appeared DONALD CAPOCCIA, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

KEVIN E. FULLINGTON
Notary Public, State of New York
Reg. No. 02FU6402906
Qualified in Kings County
Commission Expires 01/13/2024

IN WITNESS WHEREOF, Grantor Retail Tenant has caused this instrument to be signed in its name.

475 Bay Street Retail Owner LLC

By: _____

Print Name: DONALD CAPOCCIA

Title: Authorized Signatory Date: 10/20/22

Grantor Retail Tenant's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF Kings)

On the 20th day of October, in the year 2022 before me, the undersigned, personally appeared DONALD CAPOCCIA, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York
KEVIN E. FULLINGTON
Notary Public, State of New York
Reg. No. 02FU6402906
Qualified in Kings County
Commission Expires 01/13/2024

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Andrew O. Guglielmi, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 3rd day of November, in the year 2022 before me, the undersigned, personally appeared Andrew O. Guglielmi, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

JENNIFER ANDALORO
Notary Public, State of New York
No. 02AN6098246
Qualified in Albany County
Commission Expires January 14, 2024

SCHEDULE "A" PROPERTY DESCRIPTION

Legal Description of Environmental Easement Area:
475 Bay Street & 31 Wave Street - C243044 – Parcel A

PARCEL A:

BOROUGH OF STATEN ISLAND, BLOCK: 488, LOT: 9 AND WESTERLY PART OF LOT 164 (OR TENTATIVE LOT 9)

ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough of Staten Island, County of Richmond, City and State of New York, more particularly bounded and described as follows:

BEGINNING at a point on the easterly side of Bay Street, distant 166.50 feet northerly from the corner formed by the intersection of the easterly side of Bay Street and the northerly side of Wave Street;

RUNNING THENCE north 7 degrees 48 minutes 16 seconds west along the easterly side of Bay Street, 19.09 feet (U.S. standard) 18.94 feet (deed);

THENCE north 12 degrees 46 minutes 12 seconds east still along the easterly side of Bay Street, 160.23 feet (U.S. standard and deed);

THENCE south 77 degrees 36 minutes 05 seconds east, 280.06 feet (U.S. standard and deed) to land of the Staten Island Rapid Transit;

THENCE southerly along the westerly side of land of the Staten Island Rapid Transit on a curve to the left with a radius of 1462.69 feet, a distance of 187.46 feet (U.S. standard) 187.40 feet (deed);

THENCE north 76 degrees 48 minutes 48 seconds west 133.65 feet to a point parallel to Wave Street;

THENCE south 07 degrees 48 minutes 16 seconds east 101.05 feet to a point on the northerly side of Wave Street;

THENCE south 82 degrees 14 minutes 57 seconds west 30 feet along the northerly side of Wave Street;

THENCE north 07 degrees 48 minutes 16 seconds 112.53 feet to a point;

THENCE north 76 degrees 48 minutes 48 seconds west 151.02 feet to the easterly side of Bay Street to the point or place of BEGINNING.

Area of Parcel A = 57,124.49 sq. ft. or 1.31 acres

OFFICE OF THE RICHMOND COUNTY CLERK
130 STUYVESANT PLACE
STATEN ISLAND, NY 10301
HON. STEPHEN J. FIALA
COUNTY CLERK

RCC-215490-270459

RECORDING ENDORSEMENT PAGE

THIS ENDORSEMENT PAGE IS PART OF THE INSTRUMENT PRESENTED FOR RECORDING. THE ENDORSEMENT PAGE AND THE DOCUMENT RECORDED WITH IT HAVE BEEN PREPARED BY THE PARTIES TO THE TRANSACTION AND/OR THEIR AGENTS. THEY ARE SOLELY RESPONSIBLE FOR THE CONTENTS THEREOF. ANY QUESTIONS ABOUT THE CONTENTS SHOULD BE ADDRESSED TO THE PARTIES AND/OR THEIR AGENTS. THE PARTIES AND/OR THEIR AGENTS REQUEST THAT THIS DOCUMENT BE INDEXED ACCORDING TO THE INFORMATION THEY ARE PROVIDING ON THIS ENDORSEMENT PAGE.

DOCUMENT SUBMITTED	SUBMITTED FOR RECORDING BY:	RECORD AND RETURN TO:
EASEMENT	CTSY 990 EXPRESS ABSTRACT SERVICES, INC... 2047 VICTORY BOULEVARD SUITE 201 STATEN ISLAND, NY 10314	KEVIN A. ROGERS, ESQ. SIVE PAGET RIESEL 560 LEXINGTON AVENUE 15TH FLOOR NEW YORK, NY10022

PROPERTY DATA **BLOCKS:** 1 **LOTS:** 3

BLOCK	LOT	BLOCK	LOT	BLOCK	LOT	BLOCK	LOT
488	157	488	162	488	164		

PARTIES

NAME	COMPANY	PARTY	NAME	COMPANY	PARTY
	BFC 475 RESIDENTIAL LLC	GRANTOR		PEOPLE OF THE STATE OF NEW YORK	GRANTEE

INDEXING NOTICE

THE OFFICE OF THE RICHMOND COUNTY CLERK WILL RELY UPON THE INFORMATION PROVIDED ON THIS ENDORSEMENT PAGE (INCLUDING THE SPELLING OF PARTIES' NAMES) FOR INDEXING THIS INSTRUMENT.

THIS ENDORSEMENT PAGE WILL CONTROL IN THE EVENT OF A CONFLICT BETWEEN THE ENDORSEMENT PAGE AND OTHER PARTS OF THE DOCUMENT.

PAYMENT DETAILS (NO PERSONAL CHECKS)

RECORDING FEES:	$61.00	PAYABLE TO "RICHMOND COUNTY CLERK"
NYS RETT:	$0.00	PAYABLE TO "RICHMOND COUNTY CLERK"
NYC RPT:	$0.00	PAYABLE TO "COMMISSIONER OF FINANCE"
MORTGAGE TAX:	$0.00	PAYABLE TO "RICHMOND COUNTY CLERK"

TOTAL CHECK PAYMENTS TO A PAYEE IN EXCESS OF $20,000.00 MUST BE CERTIFIED

REVIEWED BY: 07 DEC 2022

SUPERVISOR (IF REQUIRED):

FOR OFFICE USE ONLY:

RECORDED IN RICHMOND COUNTY
FEES PAID
COUNTY CLERK

LAND DOC# 909636
Easement
RETT: 3246 $0.00
RPT: 3246 $0.00
12/07/2022 02:53:03 PM
Receipt: 31898 Fee: $61.00
Richmond County Clerk

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this 3rd day of November, 2022, between Owner, BFC 475 Residential LLC, having an office at 150 Myrtle Avenue, Suite 2, County of Kings, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee"), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 31 Wave Street and Wave Street in the City of Staten Island, County of Richmond and State of New York, known and designated on the tax map of the County Clerk of Richmond as tax map parcel numbers: Block 488 Lots p/o 164, 157 and 162, being the same as that property conveyed to Grantor by deed dated May 20, 2020 and recorded in the Office of the Richmond County Clerk as Land Document Number 790968. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately .24 +/- acres, and is hereinafter more fully described in the Land Title Survey dated May 26, 2022 prepared by Vincent M. Teutonico (reg. no. 050307) of Meridian Layout Inc., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of BCA Index No.Number: C243044-10-20, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Richmond County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an

interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:	Site Number: C243044 Office of General Counsel NYSDEC 625 Broadway Albany New York 12233-5500
With a copy to:	Site Control Section Division of Environmental Remediation NYSDEC 625 Broadway Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

BFC 475 Residential LLC:

By: _____

Print Name: DONALD CAPOCCIA

Title: Authorized Signatory Date: 10/20/22

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF Kings)

On the 20th day of October, in the year 2022, before me, the undersigned, personally appeared DONALD CAPOCCIA, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

KEVIN E. FULLINGTON
Notary Public, State of New York
Reg. No. 02FU6402906
Qualified in Kings County
Commission Expires 01/13/2024

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting by and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Andrew O. Guglielmi, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 3rd day of November, in the year 2022 before me, the undersigned, personally appeared Andrew O. Guglielmi, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

JENNIFER ANDALORO
Notary Public, State of New York
No. 02AN6098246
Qualified in Albany County
Commission Expires January 14, 2024

SCHEDULE "A" PROPERTY DESCRIPTION

PARCEL B:

BOROUGH OF STATEN ISLAND, BLOCK: 488, LOT: 157, 162 AND EASTERLY PART OF LOT 164 (OR TENTATIVE LOT 157)

ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough of Staten Island, County of Richmond, City and State of New York, more particularly bounded and described as follows:

BEGINNING at the point on the northerly side of Wave Street, distant 171.0 feet easterly from the corner formed by the intersection of the northerly side of Wave Street and the easterly side of Bay Street;

RUNNING THENCE north 07 degrees 48 minutes 16 seconds west 101.05 feet to a point;

RUNNING THENCE south 76 degrees 48 minutes 48 seconds east 149.76 feet to a point;

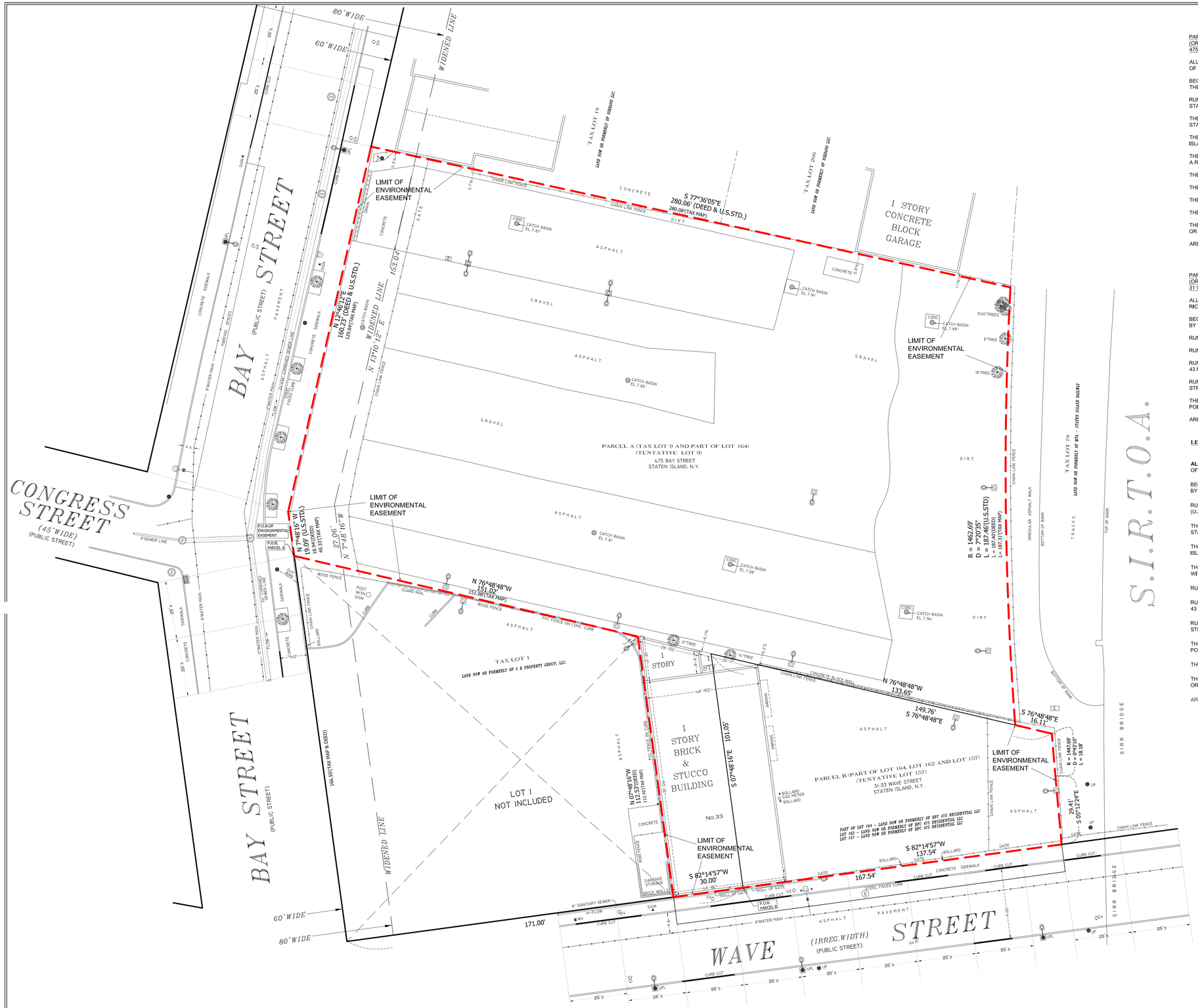
RUNNING THENCE southerly along a curve to the left having a radius of 1447.69 feet, a central angle of 0 degrees 43 minutes 10 seconds, an arc length of 18.18 feet to a point;

RUNNING THENCE south 05 degrees 12 minutes 24 seconds east 29.41 feet to a point on the northerly side of Wave Street, and running

THENCE along the northerly side of Wave Street, south 82 degrees 14 minutes 57 seconds west 137.54 feet to a point or place of BEGINNING.

Area of Parcel B = 10,330.81 sq. ft. or 0.24 acres

ADDRESSES:
475 BAY STREET
31 WAVE STREET
STATEN ISLAND, N.Y.



LEGAL DESCRIPTIONS

PARCEL A (LOT 9 AND WESTERLY PART OF LOT 164, TO BE KNOWN AS LOT 9)
(OR TENTATIVE LOT 9)
475 BAY STREET, STATEN ISLAND, N.Y.

ALL THAT CERTAIN PLOT, PIECE OR PARCEL OF LAND, SITUATE, LYING AND BEING IN THE BOROUGH OF STATEN ISLAND, COUNTY OF RICHMOND, CITY AND STATE OF NEW YORK, MORE PARTICULARLY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE EASTERLY SIDE OF BAY STREET, DISTANT 166.50 FEET NORTHERLY FROM THE CORNER FORMED BY THE INTERSECTION OF THE EASTERLY SIDE OF BAY STREET AND THE NORTHERLY SIDE OF WAVE STREET;

RUNNING THENCE NORTH 7 DEGREES 48 MINUTES 16 SECONDS WEST ALONG THE EASTERLY SIDE OF BAY STREET, 19.09 FEET (U.S. STANDARD) 18.94 FEET (DEED);

THENCE NORTH 12 DEGREES 46 MINUTES 12 SECONDS EAST STILL ALONG THE EASTERLY SIDE OF BAY STREET, 160.23 FEET (U.S. STANDARD AND DEED);

THENCE SOUTH 77 DEGREES 36 MINUTES 05 SECONDS EAST, 280.06 FEET (U.S. STANDARD AND DEED) TO LAND OF THE STATEN ISLAND RAPID TRANSIT;

THENCE SOUTHERLY ALONG THE WESTERLY SIDE OF LAND OF THE STATEN ISLAND RAPID TRANSIT ON A CURVE TO THE LEFT WITH A RADIUS OF 1462.69 FEET, A DISTANCE OF 187.46 FEET (U.S. STANDARD) 187.40 FEET (DEED);

THENCE NORTH 76 DEGREES 48 MINUTES 48 SECONDS WEST 133.65 FEET TO A POINT PARALLEL TO WAVE STREET;

THENCE SOUTH 07 DEGREES 48 MINUTES 16 SECONDS EAST 101.05 FEET TO A POINT ON THE NORTHERLY SIDE OF WAVE STREET;

THENCE SOUTH 82 DEGREES 14 MINUTES 57 SECONDS WEST 30 FEET ALONG THE NORTHERLY SIDE OF WAVE STREET;

THENCE NORTH 07 DEGREES 48 MINUTES 16 SECONDS 112.53 FEET TO A POINT;

THENCE NORTH 76 DEGREES 48 MINUTES 48 SECONDS WEST 151.02 FEET TO THE EASTERLY SIDE OF BAY STREET TO THE POINT OR PLACE OF BEGINNING.

AREA OF PARCEL A = 57,124.49 SQ.FT. = 1.31 ACRES

PARCEL B (PART OF LOT 164, LOT 162 AND LOT 157)
(OR TENTATIVE LOT 157)
31 WAVE STREET, STATEN ISLAND, N.Y.

ALL THAT CERTAIN PLOT, PIECE OR PARCEL OF LAND, SITUATE, LYING AND BEING IN THE BOROUGH OF STATEN ISLAND, COUNTY OF RICHMOND, CITY AND STATE OF NEW YORK, MORE PARTICULARLY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT THE POINT ON THE NORTHERLY SIDE OF WAVE STREET, DISTANT 171.0 FEET EASTERLY FROM THE CORNER FORMED BY THE INTERSECTION OF THE NORTHERLY SIDE OF WAVE STREET WITH THE EASTERLY SIDE OF BAY STREET;

RUNNING THENCE NORTH 07 DEGREES 48 MINUTES 16 SECONDS WEST 101.05 FEET TO A POINT;

RUNNING THENCE SOUTH 76 DEGREES 48 MINUTES 48 SECONDS EAST 149.76 FEET TO A POINT;

RUNNING THENCE SOUTHERLY ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 1447.69 FEET, A CENTRAL ANGLE OF 0 DEGREES 43 MINUTES 10 SECONDS, AN ARC LENGTH OF 18.18 FEET TO A POINT;

RUNNING THENCE SOUTH 05 DEGREES 12 MINUTES 24 SECONDS EAST 29.41 FEET TO A POINT ON THE NORTHERLY SIDE OF WAVE STREET, AND RUNNING

THENCE ALONG THE NORTHERLY SIDE OF WAVE STREET, SOUTH 82 DEGREES 14 MINUTES 57 SECONDS WEST 137.54 FEET TO A POINT OR PLACE OF BEGINNING.

AREA OF PARCEL B = 10,330.81 SQ.FT. = 0.24 ACRES

LEGAL DESCRIPTION - ENVIRONMENTAL EASEMENT AREA (AS-SURVEYED)

ALL THAT CERTAIN PLOT, PIECE OR PARCEL OF LAND, SITUATE, LYING AND BEING IN THE BOROUGH OF STATEN ISLAND, COUNTY OF RICHMOND, CITY AND STATE OF NEW YORK, MORE PARTICULARLY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE EASTERLY SIDE OF BAY STREET, DISTANT 166.50 FEET NORTHERLY FROM THE CORNER FORMED BY THE INTERSECTION OF THE EASTERLY SIDE OF BAY STREET AND THE NORTHERLY SIDE OF WAVE STREET;

RUNNING THENCE NORTH 7 DEGREES 48 MINUTES 16 SECONDS WEST ALONG THE EASTERLY SIDE OF BAY STREET, 19.09 FEET (U.S. STANDARD) 18.94 FEET (DEED);

THENCE NORTH 12 DEGREES 46 MINUTES 12 SECONDS EAST STILL ALONG THE EASTERLY SIDE OF BAY STREET, 160.23 FEET (U.S. STANDARD AND DEED);

THENCE SOUTH 77 DEGREES 36 MINUTES 05 SECONDS EAST, 280.06 FEET (U.S. STANDARD AND DEED) TO LAND OF THE STATEN ISLAND RAPID TRANSIT;

THENCE SOUTHERLY ALONG THE WESTERLY SIDE OF LAND OF THE STATEN ISLAND RAPID TRANSIT ON A CURVE TO THE LEFT WITH A RADIUS OF 1462.69 FEET, A DISTANCE OF 187.46 FEET (U.S. STANDARD) 187.40 FEET (DEED);

RUNNING THENCE SOUTH 76 DEGREES 48 MINUTES 48 SECONDS EAST 16.11 FEET TO A POINT;

RUNNING THENCE SOUTHERLY ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 1447.69 FEET, A CENTRAL ANGLE OF 0 DEGREES 43 MINUTES 10 SECONDS, AN ARC LENGTH OF 18.18 FEET TO A POINT;

RUNNING THENCE SOUTH 05 DEGREES 12 MINUTES 24 SECONDS EAST 29.41 FEET TO A POINT ON THE NORTHERLY SIDE OF WAVE STREET, AND RUNNING

THENCE ALONG THE NORTHERLY SIDE OF WAVE STREET, SOUTH 82 DEGREES 14 MINUTES 57 SECONDS WEST 167.54 FEET TO A POINT;

THENCE NORTH 07 DEGREES 48 MINUTES 16 SECONDS 112.53 FEET TO A POINT;

THENCE NORTH 76 DEGREES 48 MINUTES 48 SECONDS WEST 151.02 FEET TO THE EASTERLY SIDE OF BAY STREET TO THE POINT OR PLACE OF BEGINNING.

AREA OF ENVIRONMENTAL EASEMENT = 67,455.3 SQ.FT. = 1.55 ACRES

This property is subject to an environmental easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the New York Environmental Conservation Law. The engineering and institutional controls for this Easement are set forth in the Site Management Plan(SMP). A copy of SMP must be obtained by any party with an interest in the property. The SMP can be obtained from NYS Department of Environmental Conservation, Division of Environmental Remediation, Site Control Section, 625 Broadway, Albany, NY 12233 or at derweb@dec.ny.gov.

DATE	DESCRIPTION
MAY 26, 2022	ENVIRONMENTAL EASEMENT SURVEY

BLOCK 488
LOT 9 & 157
COUNTY RICHMOND
SECTION 3
DWG BY A.G.
CHKD BY J.A.

NOTE:
Unauthorized alterations or additions to this survey is a violation of section 7209 of the New York State education law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered to be a valid true copy. Guarantees or certifications indicated hereon shall run only to the person for whom the survey is prepared, and on his behalf to the title company, governmental agency and lending institution listed hereon, and to the assignees of the lending institution. Guarantees or certification are not transferable to additional institutions or subsequent owners.

GRAPHIC SCALE
SCALE 1" = 20'
FEET
METERS

STATE OF NEW YORK · VINCENT TEUTONICO · 050307 · LICENSED LAND SURVEYOR
VINCENT M. TEUTONICO
REGISTRATION No. 050307

MERIDIAN LAYOUT INC
3280 SUNRISE HWY, SUITE 341
WANTAGH, NY 11793
TEL. 516-787-3299

LEGEND: TREE PIT · ELECTRIC BOX · HYDRANT · UTILITY POLE · WATER VALVE · TRAFFIC SIGN · CATCH BASIN · GAS VALVE · LIGHT POST · PARKING METER · WATER MANHOLE · ELECTRIC MANHOLE · TELEPHONE MANHOLE · SEWER MANHOLE · EL. ELEVATION · TC-EL.ON TOP OF CURB · BC-EL.ON BOTTOM OF CURB · CL-EL. ON CENTER OF ROAD · LG-LEGAL GRADE · LA-LOW AREA · C.D.-CELLAR DOOR · F.E.-FIRE ESCAPE · ENT. ENTRANCE · RT.-RIGHT ON LINE · C.L. CLEAR · N.T.S. NOT TO SCALE

APPENDIX B

SITE CONTACT LIST

Key contacts for this project are as follows:

Site Owner and Remedial Party:

Owner: BFC 475 Residential LLC c/o BFC Partners
Representative: Donald Capoccia
Telephone: (718)-422-9999
E-mail: dac@bfcnyc.com

Remedial Party's Consultant:

Langan Engineering Program Manager
Mr. Michael Burke
Telephone: (212) 479-5413
E-mail: mrburke@langan.com

Langan Engineering Project Manager
Mrs. Kimberly Semon, P.E.
Telephone: (212) 479-5486
E-mail: atashji@langan.com

Langan Engineering Health & Safety Officer
Mr. Tony Moffa
Telephone: (215) 756-2523
E-mail: tmoffa@langan.com

Langan Engineering Field Safety Officer
Mr. William Bohrer, PG
Telephone: (212) 479-5533
E-mail: wbohrer@langan.com

Qualified Environmental Professional:

Langan Engineering Associate
Mr. Brian Gochenaur, QEP
Telephone: (212) 479-5479
E-mail: bgochenaur@langan.com

NYSDEC:

NYSDEC Chief of the Division of Environmental Remediation Ms. Heide-Marie Dudek
Telephone: 518-402-0193
E-mail: heidi.dudek@dec.ny.gov

NYSDEC Attorney
Jennifer Andaloro
Telephone: 718-402-4009
E-mail: jennifer.andoloro@dec.ny.gov

NYSDEC Project Manager
Meghan Medwid
Phone No.: 518-402-8610
Email: meghan.medwid@dec.ny.gov

NYSDEC Site Control
Ms. Kelly Lewandowski
Telephone: (518) 402-9553
E-mail: Kelly.lewandowski@dec.ny.gov

NYSDOH Project Manager
Steven Berninger
Telephone: (518) 402-0443
Email: beei@health.ny.gov

Remedial Party's Attorney:

Sive, Paget & Riesel P.C.
Mr. Michael Bogin, Esq.
Telephone: (646) 378-7210
E-mail: mbogin@sprlaw.com

Document Repositories:

The document repositories identified below have been established to provide the public with convenient access to important project documents:

New York Public Library – Stapleton Branch
132 Canal Street
Staten Island, NY 10304
(718) 727-0427

Staten Island Community Board 1
1 Edgewater Plaza, Suite 217
Staten Island, NY 10305
(718) 981-6900

APPENDIX C

RESPONSIBILITIES OF OWNER AND REMEDIAL PARTY

APPENDIX C– RESPONSIBILITIES OF OWNER AND REMEDIAL PARTY

Responsibilities

The responsibilities for implementing the Site Management Plan ("SMP") for **475 Bay Street and 31 Wave Street** site (the "site"), site number **C243044** is divided between the site owner and Remedial Party, as defined below. The owner is currently listed as:

BFC 475 Residential LLC
c/o BFC Partners (the "owner")
150 Myrtle Avenue, Suite 2
Brooklyn, New York 11201

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party ("RP") refers to any of the following: Certificate of Completion (COC) holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation ("NYSDEC") is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. The RP is:

BFC 475 Residential LLC
c/o BFC Partners (the "owner")
150 Myrtle Avenue, Suite 2
Brooklyn, New York 11201

Nothing on this page shall supersede the provisions of an Environmental Easement (EE), Consent Order, Consent Decree, agreement, or other legally binding document that affects rights and obligations relating to the site.

Site Owner's Responsibilities:

1) The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the site.

2) In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify, in writing, that all Institutional Controls set forth in the Environmental Easement (EE) remain in place and continue to be complied with. The owner shall provide a written certification to the RP, upon the RP's request, in order to allow the RP to include the certification in the site's Periodic Review Report (PRR) certification to the NYSDEC.

3) In the event the site is delisted, the owner remains bound by the EE and shall submit, upon request by the NYSDEC, a written certification that the EE, is still in place and has been complied with.

4) The owner shall grant access to the site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP.

5) The owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. If damage to the remedial components or vandalism is evident, the owner shall notify the site's RP and the NYSDEC in accordance with the timeframes indicated in Section 1.3- Notifications.

6) If some action or inaction by the owner adversely impacts the site, the owner and RP must notify the NYSDEC in accordance with the time frame indicated in Section 1.3 - Notifications and coordinate the performance of necessary corrective actions with the RP.

7) The owner must notify the RP and the NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site property. NYSDEC Title 6 New York Codes, Rules, and Regulations (6 NYCRR) Part 360 contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: sixty days prior written notification must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 1.3 of the SMP. A change of use includes, but is not limited to, any activity that may increase direct human or environmental exposure

(e.g., day care, school or park). A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

8) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by the NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

1) The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the site.

2) The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.

3) Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the NYSDEC, and (ii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.

4) If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner.

5) The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (ECs). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html .

6) The RP shall notify the NYSDEC of any damage to or modification of the systems as required under Section 1.3- Notifications of the SMP.

7) Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.

8) Any change in use, change in ownership, change in site classification (e.g., delisting), reduction or expansion of remediation, and other significant changes related to the site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the NYSDEC project manager to discuss the need to update such documents.

Change in RP ownership and/or control and/or site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.

APPENDIX D

EXCAVATION WORK PLAN

APPENDIX D – EXCAVATION WORK PLAN (EWP)

E-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). The table below includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Notifications*

Name	**Contact Information**
Remedial Engineer	Jason Hayes, PE Phone No.: 212-479-5427 Email: jahayes@langan.com
Program Manager	Michael Burke, PG, CHMM Phone No.: 212-479-5413 Email: mburke@langan.com
Project Manager	Brian Gochenaur, QEP Phone No.: 212-479-5479 Email: bgochenaur@langan.com
NYSDEC Project Manager	Meghan Medwid Phone No.: 518-402-8610 Email: meghan.medwid@dec.ny.gov
NYSDEC Chief of the Division of Environmental Remediation	Heide-Marie Dudek Phone No.: 518-402-0193 Email: heidi.dudek@dec.ny.gov
NYSDEC Site Control	Kelly Lewandowski Phone No.: 518-402-9543 Email: kelly.lewandowski@dec.ny.gov
NYSDOH Project Manager	Steven Berninger Phone No.: 518-402-0443 Email: beei@health.ny.gov

Site Owner and Remedial Party	Donald Capoccia Phone No.: 718-422-9999 Email: dac@bfcnyc.com

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated, any modifications of truck routes, and any work that may impact an Institutional Control (IC). There are no Engineering Controls (ECs) on this site.
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling
- A schedule for the work, detailing the start and completion of all intrusive work
- A summary of the applicable components of this EWP
- A statement that the work will be performed in compliance with this EWP, and 29 Code of Federal Regulations (CFR) 1910.120
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix F of this Site Management Plan (SMP)
- Identification of disposal facilities for potential waste streams
- Identification of sources of any anticipated backfill, along with the required request to import form and all supporting documentation including, but not limited to, chemical testing results.

The NYSDEC project manager will review the notification and may impose additional requirements for the excavation that are not listed in this EWP.

E-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed by a field engineer, geologist, or scientist under the direction of a qualified environmental professional (QEP) during all excavations into known or potentially contaminated soil, fill or water (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion (COC).

Soils will be segregated based on previous environmental data and screening results into soil and fill that requires off-site disposal and soil and fill that requires testing to determine if the soil and fill can be reused on-site as soil beneath a cover or if the soil and fill can be used as cover soil. Further discussion of off-site disposal of soil, fill, and water, and on-site reuse is provided in Section E-6 of this Appendix.

E-3 SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

E-4 SOIL, FILL, AND WATER EXCAVATION AND LOAD-OUT

A QEP or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated soil and fill.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this EWP or SMP.

The presence of utilities and easements on the site will be investigated by owner. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site, as appropriate. The QEP or field staff under their supervision will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner. Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The QEP will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of soil, fill and sediment derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived soil, fill, and sediment.

E-5 SOIL, FILL, AND WATER TRANSPORT OFF-SITE

All transport of soil, fill, and water will be performed by licensed haulers in accordance with appropriate local, state, and federal regulations, including 6 New York Code, Rules, and Regulations (NYCRR) Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Soil and fill transported by trucks exiting the site will be appropriately lined and secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet soil and fill capable of producing free liquid, truck liners will be used.

Truck traffic would be routed on the most direct course using major thoroughfares where possible and flaggers would be used to protect pedestrians at the site entrances and exits. Truck routes will take into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; (f) overall safety in transport; and (g) community input [where necessary]

Trucks will be prohibited from stopping and idling unnecessarily in the neighborhood outside the project site. Egress points for truck and equipment transport from the site will be kept clean of soil, fill, and sediment. Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

E-6 SOIL, FILL, AND WATER DISOSAL OFF-SITE

All soil and fill excavated and removed from the site will be treated as contaminated and regulated soil and fill and will be transported and disposed off-site in a permitted facility in accordance with all local, state (including 6 NYCRR Part 360) and federal regulations. If disposal of soil and fill from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan

will be made to the NYSDEC project manager. Unregulated off-site management of soil and fill from this site will not occur without formal NYSDEC project manager approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, (e.g. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, concrete and demolition (C&D) debris recovery facility). Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report (PRR). This documentation will include, but will not be limited to: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled consistent with 6 NYCRR Parts 360, 361, 362, 363, 364 and 365. Soil and fill that does not meet Unrestricted Use (UU) Soil Cleanup Objectives (SCOs) is prohibited from being taken to a New York State C&D debris recovery facility (6 NYCRR Subpart 360-15 registered or permitted facility).

E-7 SOIL AND FILL REUSE ON-SITE

The QEP as defined in 6 NYCRR part 375 will ensure that procedures defined for soil and fill reuse in this SMP are followed and that unacceptable soil (i.e. contaminated) does not remain on-site. Contaminated on-site soil and fill, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. Soil and fill that does not meet the lower of Restricted Use Restricted-Residential and Protection of Groundwater SCOs will not be acceptable for reuse on site.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood,

roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

E-8 FLUIDS MANAGEMENT

All liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed off-site at a permitted facility in accordance with applicable local, state, and federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a State Pollutant Dicharge Elimination System (SPDES) permit.

E-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the Remedial Action Work Plan (RAWP). The existing cover system is comprised of a minimum of 12 or 24 inches of clean soil, asphalt pavement, concrete covered sidewalks and concrete building, etc.] [If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt) this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent PRR and in an updated SMP.

E-10 BACKFILL FROM OFF-SITE SOURCES

All soil and fill proposed for import onto the site will be approved by the QEP and will be in compliance with provisions in this SMP prior to receipt at the site. A Professional Engineer (PE) or QEP will collect representative samples at a frequency consistent with the NYSDEC Division of Environmental Remediation (DER) Program Policy: Technical Guidance for Site Investigation and Remediation (DER-10), or at a lesser frequency negotiated with the NYSDEC. The samples would be analyzed for total compound list (TCL) VOCs (United States Environmental Protection Agency ([USEPA] Method 8260), TCL semivolatile organic compounds (SVOC) (EPA Method 8270 and EPA Method 8270 SIM if necessary to achieve NYSDEC-reporting limit goal for 1,4-dioxane), pesticides/polychlorinated biphenyls (PCB) (USEPA Method 8082/8081), total analyte list (TAL) metals (USEPA Method 6010), 1,4-dioxane via EPA Method 8270 SIM, and per- and polyfluoroalkyl substances (PFAS) (Modified EPA Method 537) by NYSDOH Environmental Laboratory Program (ELAP)-certified laboratory. Results shall meet the lower of Restricted Use Restricted-Residential (RURR) or Protection of Groundwater (PGW Soil Clean up Objectives (SCOs).

A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d) for Restricted-Residential use. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site. Soil and fill from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated soil and fill, and covered to prevent dust releases.

E-11 STORMWATER POLLUTION PREVENTION

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

E-12 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition. The NYSDEC project manager will be promptly notified of the discovery.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals, TCL VOCs, SVOCs, pesticides, PCBs, PFAS, and 1,4-dioxane), unless the site history and previous sampling results provide

sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC project manager for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the PRR.

E-13 COMMUNITY AIR MONITORING PLAN (CAMP)

Two stationary air-monitoring stations will be set up at site perimeters during intrusive site work for continuous monitoring. The locations of air sampling stations will be based on the prevailing wind direction and will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least one downwind monitoring station. If a sensitive receptor, such as a school, day care or residential area is adjacent to the site, a fixed monitoring station should be located at that site perimeter, regardless of wind direction, and discussed in the text. Each station will include a photoionization detector reading (PID) and a DustTrak aerosol monitor, or equivalent, capable of recording particulate concentrations up to 10 micrometers in diameter. Action levels for the protection of the community and visitors are set forth in the CAMP, which is included in the HASP. If action levels are exceeded dust or VOC suppression will be implemented as needed.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers

E-14 ODOR CONTROL PLAN

Work practices to minimize odors and vapors will be used during all intrusive activities. Offending odor and organic vapor controls may include the application of foam suppressants or tarps over the odor or VOC source areas. Foam suppressants may include biodegradable foams applied over the source material for short-term control of the odor and VOCs.

If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified

of all odor events and of any other complaints about the project. Implementation of odor monitoring is the responsibility of the Remedial Engineer (RE). The RE will advise the contractor of exceedances that could warrant additional controls or work stoppage. Implementation of effective odor controls is the responsibility of the contractor. Work may not resume until odor is controlled. Any odor control measures that are implemented will be summarized in the PRR.

All necessary means will be employed to prevent on- and off-site nuisances. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (a) limiting excavation areas; (b) direct load-out of soils to trucks for off-site disposal; (c) use of chemical odorants in spray or misting systems; and, (d) use of staff to monitor odors in surrounding neighborhoods.

Although not anticipated, if nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

E-15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work may include, at a minimum, the items listed below:

- Dust suppression will be achieved by spraying water directly onto off-road areas including excavations and stockpiles
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production
- Gravel will be used on roadways to provide a clean and dust-free road surface
- On-site roads will be limited to minimize the area requiring dust suppression
- If dust cannot be controlled using these methods, a dedicated water truck may be require

E-16 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX E

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

for

475 BAY STREET AND 31 WAVE STREET
STATEN ISLAND, NEW YORK
Staten Island Borough Tax Map Block 488
Lots 9, 157, 162 and 164

Prepared For:

BFC PARTNERS
150 Myrtle Avenue, 2nd Floor
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Prepared By:

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LANGAN

July 2022
Langan Project Number: 170610601

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***** Items to be posted prominently on site, or made readily available to personnel.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) HEALTH AND SAFETY PLAN (HASP) was developed to address disturbance of known and reasonably anticipated subsurface contaminants and comply with Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.120(b)(4), *Hazardous Waste Operations and Emergency Response* for the Site Management Plan (SMP) for the property defined as 475 Bay Street and 31 Wave Street in the Stapleton Heights neighborhood of Staten Island, New York ("the Site"). The Site is identified on the New York City (NYC) Staten Island Borough Tax Map as Tax Block 488, Lots 9, 157, 162 and 164.

This HASP provides the minimum requirements for implementing site operations during future remedial measure activities. All contractors performing work on this site shall implement their own HASP that, at a minimum, adheres to this HASP. The contractor is responsible for their own health and safety and that of their subcontractors. Langan personnel will implement this HASP while onsite.

The management of the on-site SMP activities and implementation of this HASP in the field is the responsibility of the site Langan Field Team Leader (FTL). Assistance in the implementation of this HASP can also be obtained from the Langan Health and Safety Officer (HSO) and the Langan Health and Safety Manager (HSM). Contractors operating on the site shall designate their own FTL, HSO and HSM. The content of this HASP may change or undergo revision based upon additional information made available to health and safety personnel, monitoring results, or changes in the work plan.

1.2 Site Location and Background

The Site is located at 475 Bay Street and 31 Wave Street in the Stapleton Heights neighborhood of Staten Island, New York and is identified on the Borough of Staten Island Tax Map as Block 488, Lots 9, 157, 162, and 164. A site location map is provided as Figure 1. The site encompasses an area of approximately 66,800 square-feet. The Site is bound by a two-story commercial building and a one-story industrial building to the north; New York City Transit (NYCT) elevated Staten Island Rail structure to the east; Wave Street and a two-story McDonalds restaurant to the south; and Bay Street to the west.

Historical Sanborn Fire Insurance Maps indicate that the site was located in a developed urban area as early as 1885. In 1885, Lot 9 was developed with a one- and two-story dwelling and a shed. Lots 157, 162 and 164 were unmapped in 1885; however, the 1898 map shows five individual buildings occupied by residential dwellings, a carpenter shop, and storage. Various

commercial and industrial entities occupied the site including James Thompson and Sons Lumber Yard (1989 to 1917), Chas F. McAteer, Inc. coal yard (1937 to 1950), a filling station with three gasoline tanks, a grease and oil storage shed (1937 to 1950), J.T. Montesani Company Inc. sand and gravel yard with one gasoline tank and two garages (1950 to 1962), and auto sales (1977 to 1990) on Lot 9; an auto painting shop (1937 to 1950), auto repair (1977) and unlabeled manufacturing (1981 to 1988) on Lot 164; and a truck shop (1937 to 1950) on Lot 157. By 1991, Lots 9, 157, and 162 are vacant and Lot 164 is developed with a one-story commercial building. Site conditions appear generally the same from 1991 to 2007. City Directory documents also provide additional site usage detail including a gasoline service station (1928) on Lot 9 and auto repair facility (1934; 1979; 1990; 2000 to 2014) and iron works facility (1984) on Lot 164.

1.3 Summary of Work Tasks

1.3.1 Site-Wide Inspeciotn

Langan will complete an annual inspection as specified in the Site Management Plan (SMP). As of the compiling of this HASP, there are no engineering controls, therefore, the proposed inspection is limited to a visual inspection of the site.

1.3.2 Surveying

Surveying activities may be completed by Langan as part of the SMP. Surveying will be conducted by licensed surveyors.

2.0 IDENTIFICATION OF KEY PERSONNEL/HEALTH AND SAFETY PERSONNEL

The following briefly describes the health and safety (H&S) designations and general responsibilities that may be employed for this site. The titles have been established to accommodate the project needs and requirements and ensure the safe conduct of site activities. The H&S personnel requirements for a given work location are based upon the proposed site activities.

2.1 Langan Project Manager

The Langan Environmental Project Manager (PM) is Kimberly Semon, her responsibilities include:

- Ensuring that this HASP is developed, current, 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 Langan Corporate Health and Safety Manager

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

- Updating the *Construction Health and Safety Program for Hazardous Waste Operations*.
- Assisting the site Health and Safety Officer (HSO) with development of the HASP, updating HASP as dictated by changing conditions, jobsite inspection results, etc. and approving changes to this HASP.
- Assisting the HSO in the implementation of this HASP and conducting Jobsite Safety Inspections and assisting with communication of results and correction of shortcomings found.
- Maintaining records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

2.3 Langan Site Health & Safety Officer

The Langan HSO is William Bohrer. His responsibilities include:

- Participating in the development and implementation of this HASP.
- When on-site, assisting the Langan Field Team Leader in conducting Tailgate Safety Meetings and Jobsite Safety Inspections and correcting any shortcomings in a timely manner.
- Ensuring that proper PPE is available, worn by employees, and properly stored and maintained.
- Controlling entry into and exit from the site contaminated areas or zones.
- Monitoring employees 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.
- Resolving conflicts that may arise concerning safety requirements and working conditions.
- Reporting all incidents, injuries and near misses to the Langan Incident/Injury Hotline immediately and the client representative.

2.4 Langan Field Team Leader Responsibilities

The Langan Field Team Leader (FTL) will be determined prior to the start of the start of field activities. The Field Team Leader's responsibilities include:

- The management of the day-to-day site activities and implementation of this HASP in the field.
- Participating in and/or conducting Tailgate Safety Meetings and Jobsite Safety Inspections and correcting any shortcomings in a timely manner.
- When a Community Air Monitoring Operating Program (CAMP) is part of the scope, the FTL will set up and maintaining community air monitoring activities and instructing the responsible contractor to implement organic vapor or dust mitigation when necessary.
- Overseeing the implementation of activities specified in the work plan.

2.5 Contractor Responsibilities

The contractor shall develop and implement their own HASP for their employees, lower-tier subcontractors, and consultants. The contractor is responsible for their own health and safety and that of their subcontractors. Contractors operating on the site shall designate their own FTL, HSO and HSM. The contractor's HASP will be at least as stringent as this Langan HASP. The contractor must be familiar with and abide by the requirements outlined in their own HASP. A contractor may elect to adopt Langan's HASP as its own provided that it has given written notification to Langan, but where Langan's HASP excludes provisions pertinent to the contractor’s work (i.e., confined space entry); the contractor must provide written addendums to this HASP. Additionally, the contractor must:

- Ensure their employees are trained in the use of all appropriate PPE for the tasks involved;
- Notify Langan of any hazardous material brought onto the job site or site related area, the hazards associated with the material, and must provide a material safety data sheet (MSDS) or safety data sheet (SDS) for the material;
- Have knowledge of, understand, and abide by all current federal, state, and local health and safety regulations pertinent to the work;
- Ensure their employees handling hazardous materials, if identified at the site, have received current training in the appropriate levels of 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER) if hazardous waste is identified at the Site;
- Ensure their employees handling hazardous materials, if identified at the Site, have been fit-tested within the year on the type respirator they will wear; and
- Ensure all air monitoring is in place pertaining to the health and safety of their employees as required by OSHA 1910.120; and
- All contractors must adherer to all federal, state, and local regulatory requirements.

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSES

A Task-Hazard Analysis (Table 1) was completed for general construction hazards that may be

encountered at the Site. The potential contaminants that might be encountered during the field activities and the exposure limits are listed in Table 2 complete inventory of MSDS/SDS for chemical products used on site is included as Attachment E.

3.1 Specific Task Safety Analysis

Site-Wide Inspection

Langan will conduct annual site-wide inspections as specified in the SMP. Seasonal precautions should be implemented including insect repellent and sun screen during warm weather and appropriate protective clothing for warm and cold weather outdoor work.

3.2 Radiation Hazards

No radiation hazards are known or expected at the site.

3.3 Physical Hazards

Physical hazards, which may be encountered during site operations for this project, are detailed in Table 1.

3.3.1 Explosion

No explosion hazards are expected for the scope of work at this site.

3.3.2 Heat Stress

The use of Level C protective equipment, or greater, may create heat stress. Monitoring of personnel wearing personal protective clothing should commence when the ambient temperature is 72°F or above. Table 6 presents the suggested frequency for such monitoring. Monitoring frequency should increase as ambient temperature increases or as slow recovery rates are observed. Refer to the Table 7 to assist in assessing when the risk for heat related illness is likely. To use this table, the ambient temperature and relative humidity must be obtained (a regional weather report should suffice). Heat stress monitoring should be performed by the HSO or the FTL, who shall be able to recognize symptoms related to heat stress.

To monitor the workers, be familiar with the following heat-related disorders and their symptoms:

- **Heat Cramps:** Painful spasm of arm, leg or abdominal muscles, during or after work
- **Heat Exhaustion:** Headache, nausea, dizziness; cool, clammy, moist skin; heavy sweating; weak, fast pulse; shallow respiration, normal temperature

- **Heat Stroke**: Headache, nausea, weakness, hot dry skin, fever, rapid strong pulse, rapid deep respirations, loss of consciousness, convulsions, coma. *This is a life threatening condition***.**

Do not permit a worker to wear a semi-permeable or impermeable garment when they are showing signs or symptoms of heat-related illness.

To monitor the worker, measure:

- **Heart rate:** Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 100 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 100 beats per minute at the next rest period, shorten the following work cycle by one-third. A worker cannot return to work after a rest period until their heart rate is below 100 beats per minute.
- **Oral temperature:** Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking). If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. A worker cannot return to work after a rest period until their oral temperature is below 99.6°F. If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third. Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

Prevention of Heat Stress - Proper training and preventative measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat related illness. To avoid heat stress the following steps should be taken:

- Adjust work schedules.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, id., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace

lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:

- Maintain water temperature 50° to 60°F (10° to 16.6°C).
- Provide small disposal cups that hold about four ounces (0.1 liter).
- Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
- Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
- Train workers to recognize the symptoms of heat related illness.

3.3.3 Cold-Related Illness

If work on this project begins in the winter months, thermal injury due to cold exposure can become a problem for field personnel. Systemic cold exposure is referred to as hypothermia. Local cold exposure is generally called frostbite.

- **Hypothermia -** Hypothermia is defined as a decrease in the patient core temperature below 96°F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interference with any of these mechanisms can result in hypothermia, even in the absence of what normally is considered a "cold" ambient temperature. Symptoms of hypothermia include: shivering, apathy, listlessness, sleepiness, and unconsciousness.
- **Frostbite -** Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Symptoms of frostbite are: a sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale, and solid.

<u>Prevention of Cold-Related Illness</u> - To prevent cold-related illness:

- Educate workers to recognize the symptoms of frostbite and hypothermia
- Identify and limit known risk factors:
- Assure the availability of enclosed, heated environment on or adjacent to the site.
- Assure the availability of dry changes of clothing.
- Assure the availability of warm drinks.
- Start (oral) temperature recording at the job site:
- At the FSO or Field Team Leader's discretion when suspicion is based on changes in a worker's performance or mental status.
- At a worker's request.

- As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20°F, or wind-chill less than 30°F with precipitation).
- As a screening measure whenever anyone worker on the site develops hypothermia.

Any person developing moderate hypothermia (a core temperature of 92°F) cannot return to work for 48 hours.

3.3.4 Noise

Work activities during the proposed activities may be conducted at locations with high noise levels from the operation of equipment. Hearing protection will be used as necessary.

3.3.5 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. All hand and power tools should be inspected for health and safety hazards prior to use. If deemed unserviceable/un-operable, notify supervisor and tag equipment out of service. Ground Fault Circuit Interrupters (GFCI) are required for all power tools requiring direct electrical service.

3.3.6 Slips, Trips and Fall Hazards

Care should be exercised when walking at the site, especially when carrying equipment. The presence of surface debris, uneven surfaces, pits, facility equipment, and soil piles contribute to tripping hazards and fall hazards. To the extent possible, all hazards should be identified and marked on the site, with hazards communicated to all workers in the area.

3.3.7 Utilities (Electrocution and Fire Hazards)

3.3.7.1 Utility Clearance

The possibility of encountering underground utilities poses fire, explosion, and electrocution hazards. All excavation work will be preceded by review of available utility drawings and by notification of the subsurface work to the N.Y. One –Call--Center.

3.3.7.2 Lockout-Tagout

The potential adverse effects of electrical hazards include burns and electrocution, which could result in death. Therefore, there is a procedure that establishes the requirements for the lockout/tagout (LOTO) of energy isolating devices in accordance with the OSHA electrical lockout and tagging requirements as specified in 29 CFR 1926.417. This procedure will be used to ensure

that all machines and equipment are isolated from potentially hazardous energy. If possible, equipment that could cause injury due to unexpected energizing, start-up, or release of stored energy will be locked/tagged, before field personnel perform work activities.

Depending upon the specific work task involved, Langan's SSC or FTL will serve as the authorized lockout/tagout coordinator, implement the lockout/tagout procedure and will be responsible to locate, lock and tag valves, switches, etc.

SPECIAL NOTE: Project personnel will assume that all electrical equipment at surface, subsurface and overhead locations is energized, until equipment has been designated and confirmed as de-energized by a utility company representative. Langan will notify the designated utility representative prior to working adjacent to this equipment and will verify that the equipment is energized or de-energized in the vicinity of the work location.

No project work shall be performed by Langan personnel or subcontractors on or near energized electrical lines or equipment unless hazard assessments are completed in writing, reviewed by Langan's SSHO, and clearly communicated to the field personnel.

The FTL shall conduct a survey to locate and identify all energy isolating devices. They shall be certain which switches, valves or other isolating devices apply to the equipment. The lockout/tagout procedure involves, but is not limited to, electricity, motors, steam, natural gas, compressed air, hydraulic systems, digesters, sewers, etc.

3.3.8 Physical Hazard Considerations for Material Handling

There are moderate to severe risks associated with moving heavy objects at the Site. The following physical hazards should be considered when handling materials at the Site:

- Heavy objects will be lifted and moved by mechanical devices rather than manual effort whenever possible.
- The mechanical devices will be appropriate for the lifting of 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.
- Lifting devices 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 wheels of any trucks being loaded or unloaded will be chocked to prevent movement. Outriggers will be fully extended on a flat, firm surface during operation.

- 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, currently (monthly) inspected, will be available in all mechanical lifting devices.
- Verify all loads/materials are secure before transportation.

Material handling tasks that are unusual or require specific guidance will need a written addendum to this HASP. The addendum must identify the lifting protocols before the tasks are performed. Upon approval, the plan must be reviewed with all affected employees and documented. Any deviation from a written plan will require approval by the Langan HSM.

3.3.9 Hearing Conservation

Under the construction industry standard, the maximum permissible occupational noise exposure is 90 dbA (8-hour TWA), and noise levels in excess of 90 dbA must be reduced through feasible administrative and engineering controls (20 CFR 1926.52). Hearing protection is required when working within 15 feet of vacuum extraction equipment and drill rigs.

3.3.9 Open Water

Employees working over or near water, where the danger of drowning exists, shall be provided with U.S. Coast Guard-approved life jackets or buoyant work vests. Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used.

And should a worker fall into the water, OSHA requires (29 CFR 1926.106(c)) that ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. The distance between ring buoys shall not exceed 200 feet. Another remedial action required by OSHA (29 CFR 1926.106(d)) is the use of lifesaving skiffs.

OSHA requires that at least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water and must include the following provisions.

- The skiff must be in the water or capable of being quickly launched by one person.
- At least one person must be present and specifically designated to respond to water emergencies and operate the skiff at all times when there are employees above water.
- When the operator is on break another operator must be designated to provide requisite coverage when there are employees above water.

- The designated operator must either have the skiff staffed at all times or have someone remain in the immediate area such that the operator can quickly reach the skiff and perform rescue services.
- The skiff operator maybe assigned other tasks provided the tasks do not interfere with the operator's ability to quickly reach the skiff.
- A communication system, such as a walkie-talkie, must be used to inform the skiff operator of an emergency and to inform the skiff operator where the skiff is needed.
- The skiff must be equipped with both a motor and oars.

With regard to the number of skiffs required and the appropriate maximum response time, the following factors must be evaluated:

- The number of work locations where there is a danger of falling into water;
- The distance to each of those locations;
- Water temperature and currents;
- Other hazards such as, but not limited to, rapids, dams, and water intakes;

Other regulations that present S&H practices and PPE for work on or near water include: 29 CFR 1910, Subpart T (401 – 440)

3.4 Biological Hazards

3.4.1 Animals

There is a possibility of encountering wildlife including reptiles, rodents and other small and medium size mammals. The Langan personnel is to avoid interacting with any wildlife.

3.4.2 Insects

Ticks and other biting or stinging insects may to be encountered during site operations. Langan personnel should take necessary precautions including donning long sleeve shirts and insecticide to prevent bites and stings. After field work, Langan personnel should perform a complete visual inspection of their clothing to insure they are not inadvertently harboring ticks. If they do observe a tick bite, they are to contact the HSM or HSO and report the event.

3.4.3 Plants

Poisonous plants may to be encountered during site operations. Langan personnel should take necessary precautions including donning long sleeve shirts and applying preventative poison Ivy/Sumac lotion to prevent or limit effects of exposure. If after field work, Langan employees do observe a reaction to poisonous plant exposure, they are to contact the HSM or HSO and report the event.

3.4.4 Coronavirus

3.4.4.1 General Preventative Measures

Field personnel must follow general proper hygiene measures while in the field including:

- Avoid touching eyes, nose and mouth.
- Cover cough or sneeze with tissue, and throw in trash.
- Wash hands often with soap and water for 20 seconds after going to bathroom, before eating, after blowing nose, coughing or sneezing.
- Use hand sanitizer with at least 60% alcohol if soap and water are not available.
- Avoid physical contact with other people (e.g., no handshakes).
- Maintain a safe distance of at least 6 feet from other people (social distancing).
- Wear face coverings when around other worker to minimize spread of COVID-19. (May be required in certain states or locations.)

3.4.4.2 Construction Trailers

Employees should avoid use of shared construction trailers or where employees cannot maintain a safe distance (minimum 6 feet) from other workers. If trailer use is needed, areas such as desks, phones, chairs and other common areas, should be cleaned and disinfected before and after use. Protocols should be developed to minimize trailer use to essential personal, restrict use from any workers who are ill or showing symptoms of being ill, and ensure a safe distance of 6 feet can be established between workers.

3.4.4.3 Communication

Include Coronavirus topics and prevention topics in daily tailgate meetings to ensure Coronavirus awareness is communicated daily. Discussions can focus on general topics including: social distancing, prevention measures for field personnel, signs and symptoms and recent news on the Coronavirus. Site-specific topics should include minimizing face-to-face contact, disinfecting/sterilizing field equipment, use of PPE to reduce exposure, site security and other potential exposure issues/concerns.

3.4.4.4 Sick/Ill Workers

No Langan employee is permitted to be onsite when ill and/or showing potential symptoms of the Coronavirus. Symptoms of the Coronavirus may appear 2-14 days after exposure and can range from mild to severe. The most common symptoms include: fever, fatigue, dry cough and shortness of breath. If an employee or subcontractor is observed being ill or exhibiting symptoms of Coronavirus, employees must immediately utilize their Stop Work Authority and contact their

project manager to address the situation. If an employee observes another worker onsite exhibiting symptoms of Coronavirus, immediately utilize Stop Work Authority and notify their project manager and site construction manager or safety officer. Work should resume when the safety and health of Langan and subcontractors is adequately addressed.

3.5 Additional Safety Analysis

3.5.1 Presence of Non-Aqueous Phase Liquids (NAPL)

There is potential for exposure to NAPL at this site. Special care and PPE should be considered when NAPL is observed as NAPL is a typically flammable fluid and releases VOCs known to be toxic and/or carcinogenic. If NAPL is present in a monitoring well, vapors from the well casing may contaminate the work area breathing zone with concentrations of VOCs potentially exceeding health and safety action levels. In addition, all equipment used to monitor or sample NAPL (or ground water from wells containing NAPL) must be intrinsically safe. Equipment that directly contacts NAPL must also be resistant to organic solvents.

At a minimum, a PID should be used to monitor for VOCs when NAPL is observed. If NAPL is expected to be observed in an excavation or enclosed area, air monitoring must be started using calibrated air monitoring equipment designed to sound an audio alarm when atmospheric concentrations of VOC are within 10% of the LEL. In normal atmospheric oxygen concentrations, the LEL monitoring may be done with a Wheatstone bridge/catalytic bead type sensor (i.e. MultiRAE). However in oxygen depleted atmospheres (confined space), only an LEL designed to work in low oxygen environments may be used. Best practices require that the LEL monitoring unit be equipped with a long sniffer tube to allow the LEL unit to remain outside the UST excavation.

When NAPL is present, Langan personnel are required to use disposable nitrile gloves at all times to prevent skin contact with contaminated materials. They should also consider having available a respirator and protective clothing (Tyvek® overalls), especially if NAPL is in abundance and there are high concentrations of VOCs.

All contaminated disposables including PPE and sampling equipment must be properly disposed of in labeled 55-gallon drums

3.6 Job Safety Analysis

A Job Safety Analysis (JSA) is a process to identify existing and potential hazards associated with each job or task so these hazards can be eliminated, controlled or minimized. A JSA will be performed at the beginning of each work day, and additionally whenever an employee begins a

new task or moves to a new location. All JSAs must be developed and reviewed by all parties involved. A blank JSA form and documentation of completed JSAs are in Attachment G.

4.0 PERSONNEL TRAINING

4.1 Basic Training

Completion of an initial 40-hour HAZWOPER training program as detailed in OSHA's 29 CFR 1910.120(e) is required for all employees working on a site engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances, health hazards, or safety hazards as defined by 29 CFR 1910.120(a). Annual 8-hour refresher training is also required to maintain competencies to ensure a safe work environment. In addition to these training requirements, all employees must complete the OSHA 10 hour Construction Safety and Health training and supervisory personnel must also receive eight additional hours of specialized management training. Training records are maintained by the HSM.

4.2 Initial Site-Specific Training

Training will be provided to specifically address the activities, procedures, monitoring, and equipment for site operations at the beginning of each field mobilization and the beginning of each discrete phase of work. The training will include the site and facility layout, hazards, and emergency services at the site, and will detail all the provisions contained within this HASP. For a HAZWOPER operation, training on the site must be for a minimum of 3 days. Specific issues that will be addressed include the hazards described in Section 3.0.

4.3 Tailgate Safety Briefings

Before starting work each day or as needed, the Langan HSO will conduct a brief tailgate safety meeting to assist site personnel in conducting their activities safely. Tailgate meetings will be documented in Attachment H. Briefings will include the following:

- Work plan for the day;
- Review of safety information relevant to planned tasks and environmental conditions;
- New activities/task being conducted;
- Results of Jobsite Safety Inspection Checklist;
- Changes in work practices;
- Safe work practices; and
- Discussion and remedies for noted or observed deficiencies.

5.0 MEDICAL SURVEILLANCE

All personnel who will be performing field work involving potential exposure to toxic and hazardous substances (defined by 29 CFR 1910.120(a)) will be required to have passed an initial baseline medical examination, with 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.

Additionally, personnel who may be required to perform work while wearing a respirator must receive medical clearance as required under CFR 1910.134(e), *Respiratory Protection*. 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.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 Levels of Protection

Langan will provide PPE to Langan employees to protect them from the specific hazards they are likely to encounter on-site. Direct hired contractors will provide their employees with equivalent PPE to protect them from the specific hazards likely to be encountered 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. The upgrading/downgrading of the level of protection will be based on continuous air monitoring results as described in Section 6.0 (when applicable). The decision to modify standard PPE will be made by the site HSO or FTL after conferring with the PM. The levels of protection are described below.

Level D Protection (as needed)

- Safety glasses with side shields or chemical splash goggles
- Safety boots/shoes
- Coveralls (Tyvek® or equivalent)
- Hard hat
- Long sleeve work shirt and work pants
- Nitrile gloves
- Hearing protection
- Reflective safety vest

Level D Protection (Modified, as needed)

- Safety glasses with sideshields or chemical splash goggles
- Safety boots/shoes (toe-protected)
- Disposable chemical-resistant boot covers
- Coveralls (polycoated Tyvek or equivalent to be worn when contact with wet contaminated soil, groundwater, or non-aqueous phase liquids is anticipated)
- Hard hat
- Long sleeve work shirt and work pants
- Nitrile gloves
- Hearing protection (as needed)
- Personal floatation device (for work within 5 feet of the water)
- Reflective traffic vest

Level C Protection (as needed)

- Full or Half face, air-purifying respirator, with NIOSH approved HEPA filter
- Inner (latex) and outer (nitrile) chemical-resistant gloves
- Safety glasses with side shields or chemical splash goggles
- Chemical-resistant safety boots/shoes
- Hard hat
- Long sleeve work shirt and work pants
- Coveralls (Tyvek® or equivalent)
- Hearing protection (as needed)
- Reflective safety 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 and is available if needed. The monitoring procedures and equipment are outlined in Section 6.0 (when applicable).

6.2 Respirator Fit-Test

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

6.3 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.

7.0 AIR QUALITY MONITORING AND ACTION LEVELS

7.1 Monitoring During Site Operations

Atmospheric air monitoring results may be collected and 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 HSO may establish an exclusion zone 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 petroleum-impacted or fill material, real time air monitoring may be conducted for volatile organic compounds (VOCs). A photoionization detector (PID) and/or flame ionization detector (FID) will be used to monitor concentrations of VOCs at personnel breathing-zone height. Air monitoring will be the responsibility of the HSO or designee. Air monitoring may be conducted during intrusive activities associated with the completion of excavation, debris removal, and soil grading. 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.

7.1.1 Volatile Organic Compounds

Monitoring with a PID, such as a MiniRAE 2000 (10.6v) or equivalent may occur during intrusive work in the AOCs. 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, etc.) since the last measurement. If VOC levels are observed above 5 ppm for longer than 5 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring the site perimeter at a location downwind of the AOC every 30 minutes in addition to the employee breathing zone. Instrument action levels for monitored gases are provided in Table 4.

7.1.2 Metals

Based upon the site historical fill, there is a potential for the soils to contain PAHs and metals. During invasive procedures which have the potential for creating airborne dust, such as excavation of dry soils, a real time airborne dust monitor such as a Mini-Ram may be used to monitor for air particulates. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (appearance of visible dust) since the last measurement. If dust levels are observed to be greater than 0.100 mg/m^3 or visible dust is observed for longer than 15 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring the site perimeter at a location downwind of the AOC every 30 minutes in addition to the employee breathing zone. Instrument action levels for dust monitoring are provided in Table 4.

7.2 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.

7.3 Determination of Background Levels

Background (BKD) levels for VOCs and dust will be established prior to intrusive activities within the AOC at an upwind location. 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 HSO.

Table 4 lists the instrument action levels.

8.0 COMMUNITY AIR MONITORING PROGRAM

Community air monitoring may be conducted in compliance with local standards or the generic CAMP outlined below:

Monitoring for dust and odors will be conducted during all ground intrusive activities by the FTL. Continuous monitoring on the perimeter of the work zones for odor, VOCs, and dust may be required for all ground intrusive activities such as soil excavation and handling activities. The work zone is defined as the general area in which machinery is operating in support of remediation activities. A portable PID will be used to monitor the work zone and for periodic monitoring for VOCs during activities such as soil and groundwater sampling and .soil excavation. The site perimeter will be monitored for fugitive dust emissions by visual observations as well as instrumentation measurements (if required). When required, particulate or dust will be monitored continuously with real-time field instrumentation that will meet, at a minimum, the local standards or, default to the performance standards below:

If VOC monitoring is required, the following actions will be taken based on VOC levels measured:

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

If dust monitoring with field instrumentation is required, the following actions will be taken based on instrumentation measurements:

- If the downwind particulate level is 100 micrograms per cubic meter (µg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression must be employed. Work may continue with dust suppression techniques provided that downwind PM10 levels do not exceed 150 µg/m^3 above the background level and provided that no visible dust is migrating from

the work area.

- If, after implementation of dust suppression techniques, downwind PM10 levels are greater than 150 µg/m³ above the background level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM10 concentration to within 150 µg/m³ of the upwind level and in preventing visible dust migration.

8.1 Dust Suppression Techniques

Preventative measures for dust generation may include wetting site fill and soil, construction of an engineered construction entrance with gravel pad, a truck wash area, covering soils with tarps, and limiting vehicle speeds to five miles per hour.

Work practices to minimize odors and vapors include limiting the time that the excavations remain open, minimizing stockpiling of contaminated-source soil, and minimizing the handling of contaminated material. Offending odor and organic vapor controls may include the application of foam suppressants or tarps over the odor or VOC source areas. Foam suppressants may include biodegradable foams applied over the source material for short-term control of the odor and VOCs.

If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: direct load-out of soils to trucks for off-site disposal; use of chemical odorants in spray or misting systems; and, use of staff to monitor odors in surrounding neighborhoods.

Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

9.0 WORK ZONES AND DECONTAMINATION

9.1 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 HSO 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 HSO allowing adequate space for the activity to be completed, field members and emergency equipment.

9.2 Contamination Zone

9.2.1 Personnel Decontamination Station

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

9.2.2 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.

9.2.3 Personnel Decontamination Sequence

Decontamination may be performed by removing all PPE used in EZ and placing it in drums/trash cans at the CRZ. Baby wipes should 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, and tools are provided below.

9.2.4 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.

9.2.5 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.

9.2.6 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.

9.3 Support Zone

The support zone or cold zone will include the remaining areas of the job site. Break areas and support facilities (include equipment storage and maintenance areas) will be located in this zone. No equipment or personnel will be permitted to enter the cold zone from the hot zone without passing through the decontamination station in the warm zone (if necessitated). Eating, smoking, and drinking will be allowed only in this area.

9.4 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:

Hand Signal	Meaning
Hand gripping throat	Out of air; cannot breathe
Grip partners wrists or place both hands around waist	Leave immediately without debate
Hands on top of head	Need assistance
Thumbs up	OK; I'm alright; I understand
Thumbs down	No; negative
Simulated "stick" break with fists	Take a break; stop work

9.5 The Buddy System

When working in teams of two or more, workers will use the "buddy system" for all work activities to ensure that rapid assistance can be provided in the event of an emergency. This requires work groups to be organized such that workers can remain close together and maintain visual contact with one another. Workers using the "buddy system" have the following responsibilities:

- Provide his/her partner with assistance.
- Observe his/her partner for signs of chemical or heat exposure.
- Periodically check the integrity of his/her partner's PPE.
- Notify the HSO or other site personnel if emergency service is needed.

10.0 NEAREST MEDICAL ASSISTANCE

The address and telephone number of the nearest hospital:

Richmond University Hospital Center
355 Bard Avenue
Staten Island, New York
718-818-1234

Map with directions to the hospital are shown in Figure 2. This information will either be posted prominently at the site or will be available to all personnel all of the time. Further, all field

personnel, including the HSO & FTL, will know the directions to the hospital.

11.0 STANDING ORDERS/SAFE WORK PRACTICES

The standing orders, which consist of a description of safe work practices that must always be followed while on-site by Langan employees and contractors, are shown in Attachment A. The site HSO and FTL each have the responsibility for enforcing these practices. The standing orders will be posted prominently at the site, or are made available to all personnel at all times. Those who do not abide by these safe work practices will be removed from the site.

12.0 SITE SECURITY

No unauthorized personnel shall be permitted access to the work areas.

13.0 UNDERGROUND UTILITIES

As provided in Langan's Underground Utility Clearance Guidelines, the following safe work practices should be followed by Langan personnel and the contractor before and during subsurface work in accordance with federal, state and local regulations:

- Obtain available utility drawings from the property owner/client or operator.
- Provide utility drawings to the project team.
- In the field, mark the proposed area of subsurface disturbance (when possible).
- Ensure that the utility clearance system has been notified.
- Ensure that utilities are marked before beginning subsurface work.
- Discuss subsurface work locations with the owner/client and contractors.
- Obtain approval from the owner/client and operators for proposed subsurface work locations.
- Use safe digging procedures when applicable.
- Stay at least 10 feet from all equipment performing subsurface work.

14.0 SITE SAFETY INSPECTION

The Langan HSO or alternate will check the work area daily, at the beginning and end of each work shift or more frequently to ensure safe work conditions. The HSO or alternate must complete the Jobsite Safety Inspection Checklist, found in Attachment F. Any deficiencies shall be shared with the FTL, HSM and PM and will be discussed at the daily tailgate meeting.

15.0 HAND AND POWER TOOLS

All hand- and electric-power tools and similar equipment shall be maintained in a safe operating

condition. All electric-power tools must be inspected before initial use. Damaged tools shall be removed immediately from service or repaired. Tools shall be used only for the purpose for which they were designed. All users must be properly trained in their safe operation.

16.0 EMERGENCY RESPONSE

16.1 General

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, and 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, call *Incident Intervention®* at 1-888-479-7787 to report their injuries. For all other communications, contact the Langan Incident Hotline at **(800) 9-LANGAN** (800-952-6426) extension 4699 as soon as possible.

Should outside assistance be needed for accidents, fire, or release of hazardous substances, the emergency numbers will be available and posted at the site (Table 5) where a readily accessible telephone is made available for emergency use.

Also, in the event of an incident where a team member becomes exposed or suffers from an acute symptom from contact with site materials and has to be taken to a hospital, a short medical data sheet (Attachment T) for that individual will be made available to the attending physician. The medical data sheet will include the following:

- Name, address, home phone
- Age, height, weight
- Name of person to be notified in case of an accident
- Allergies
- Particular sensitivities
- Does he/she wear contact lenses
- Short checklist of previous illness
- Name of personal physician and phone
- Name of company physician and phone
- Prescription and non-prescription medications currently used.

A sample medical data sheet is included in Attachment T.

16.2 Responsibilities

16.2.1 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.

16.2.2 Emergency Coordinator

The HSO or their designated alternate will serve as the Emergency Coordinator. The Emergency Coordinator 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. They are also responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The Emergency Coordinator is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized.

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 Plan.

16.2.3 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.

16.3 Communications

Once an emergency situation has been stabilized, or as soon as practically, the injured Langan personnel should contact *Incident Intervention®* at 1-888-479-7787 to report their injuries. For all other communications, contact the Langan Incident Hotline at **(800) 9-LANGAN** (800-952-6426) extension 4699 as soon as possible.

16.4 Local Emergency Support Units

In order to be able to deal with any emergency that might occur during investigative activities at the site, the Emergency Notification Numbers (Table 5) will be posted and provided to all personnel conducting work within the EZ.

Figure 2 shows 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. Always contact first responders when there are serious or life threatening emergencies on the site. Project personnel are instructed not to drive injured personnel to the Hospital. In the event of an injury, provide first aid and keep the injured party calm and protected from the elements and treat for shock when necessary.

16.5 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.

16.6 Emergency Medical Treatment

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

- First Aid Kit: Contractor Vehicles
- Emergency Eye Wash: Contractor 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. 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.

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

Only in non-emergency situations may an injured person be transported to an urgent care facility. Due to hazards that may be present at the site and the conditions under which operations are conducted, it is possible that an emergency situation may develop. Emergency situations can be

characterized as injury or acute chemical exposure to personnel, fire or explosion, environmental release, or hazardous weather conditions.

16.8 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.

In the event that an emergency situation arises, the FTL will implement an immediate evacuation of all project personnel due to immediate or impending danger. The FTL will also immediately communicate with the contractor to coordinate any needed evacuation of the property.

The FTL or Site Supervisor will give necessary instructions until the Designated Incident Commander (IC) assumes control. After the emergency has been resolved, the FTL or Site Supervisor will coordinate with the IC and indicate when staff should resume their normal duties. If dangers are present for those at the designated assembly point, another designated location of assembly will be established.

It will be the responsibility of the FTL or Site Supervisor to report a fire or emergency, assess the seriousness of the situation, and initiate emergency measures until the arrival of the local fire fighters or other first responders, should they be necessary. The FTL, working with emergency responders, may also order the closure of the Site for an indefinite period as long as it is deemed necessary.

Under no circumstances will incoming visitors be allowed to proceed to the area of concern, once an emergency evacuation has been implemented. Visitors or other persons present in the area of the emergency shall be instructed to evacuate the area. The FTL will ensure that access roads are not obstructed and will remain on-site to provide stand-by assistance upon arrival of emergency personnel.

If it is necessary to temporarily control traffic in the event of an emergency, those persons controlling traffic will wear proper reflection warning vests until the arrival of police or fire personnel.

16.8.1 Designated Assembly Locations

All personnel will evacuate the site and assemble at a designated assembly location. The assembly location will be designated by Langan personnel and discussed during each shift's pre-job safety briefing.

16.8.2 Accounting for Personnel

All contractor and subcontractor supervisors are responsible for the accounting of all personnel assembled at the designed assembly area. The Designated Incident Commander shall be notified if personnel are not found.

16.9 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).

16.9.1 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.

16.10 Significant Vapor Release

Based on the proposed tasks, the potential for a significant vapor release 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.

16.11 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.

16.12 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 advice 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.

16.13 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.

16.14 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.

16.15 Emergency Equipment

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

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

16.16 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.

16.17 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)-9-

LANGAN (ext. #4699) and the client representative to report the incident or near miss. For emergencies involving personnel injury and/or exposure, the HSO and affected employee will complete and submit an Employee Exposure/Injury Incident Report (Attachment C) to the Langan Corporate Health and Safety Manager as soon as possible following the incident.

17.0 SPECIAL CONDITIONS

This guideline contains information and requirements for special conditions that may not be routinely encountered.

17.1 Scope

The guideline applies to the specific projects identified within this document. Additional provisions will be addressed in each Site-Specific HASP, as needed.

17.2 Responsibilities

Site Personnel - All site personnel must be alert to safety hazards on work sites and take action to minimize such hazards. Personnel must utilize the buddy system, watch for inappropriate behavior, and be alert to changes in site conditions.

Health and Safety Officer (HSO) - The HSO is responsible for considering these procedures in the development of site specific HASPs. The HSO shall schedule frequent "tail gate" safety briefings to enhance safety awareness and discuss potential problems.

17.3 Procedures

The procedures outlined below shall be followed when such conditions are encountered.

17.3.1 Ladders

Langan safety procedures shall be used to ensure employee safety when using ladders in the office or work sites. All ladders shall be coated or repaired to prevent injury to the employee from punctures or lacerations and to prevent snagging or clothing. Any wood ladders used must have an opaque covering except for identification or warning labels, which may be placed on one face only of a side rail.

17.3.1.1 Ladder Use

Employees shall only use ladders for the purposes, which they were designed and shall not be used as scaffolding. Ladders will be maintained and inspected prior to use for slip hazards

including oil and grease. Employees shall use ladders only on stable and level surfaces unless the ladder is secured to prevent possible displacement. Ladders should not be used on slippery surfaces unless secured or provided with slip resistant feet to prevent accidental displacement. Ladders should not be used in locations where they could be displaced by workplace activities or traffic. Ladder rungs, cleats and steps shall be parallel, level and uniformly spaced when the ladder is in the use position.

Employees should not be carrying anything including equipment that could cause injury if there was a fall while utilizing the ladder. The top and bottom of the ladder area must remain clear while in use. When ascending and descending the ladder, employees must face the ladder.

Ladders shall not be loaded beyond the maximum intended load for which they were built or the manufacturer's rated capacity.

17.3.1.2 Portable Ladders

Rungs, cleats and steps for portable ladders and fixed ladders shall be spaced not less than 10 inches apart, nor more than 14 inches apart, as measured between center lines of the rungs, cleats and steps. When used to access an upper landing surface, the ladder side rails must extend at least three feet above the upper landing surface to which the ladder is used to gain access. If this is not possible, due to the ladders length, then the top of the ladder shall be secured at its top to a rigid support.

17.3.1.3 Step Stools

Rungs, cleats and steps of step stools shall not be less than 8 inches apart, nor more than 12 inches apart, as measured between center lines of the rungs, cleats and steps.

17.3.1.4 Extension Ladders

Rungs, cleats and steps of the base section of extension trestle ladders shall be spaced not less than 8 inches apart, nor more than 18 inches apart, as measured between center lines of the rungs, cleats and steps. The rung spacing on the extension section of the extension trestle ladder shall not be less than 6 inches nor more than 12 inches, as measured between center lines of the rungs, cleats and steps. Ladders shall be used at an angle such that the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder (the distance along the ladder between the foot and the top support).

17.3.1.5 Inspection

Ladders will be inspected for visible detects periodically, prior to utilization or after any occurrence that could have negatively affected the ladder. Portable ladders with defects including broken or missing rungs, cleats, or steps, broken or split rails, corroded components or other faulty or defective components shall not be used. The ladder will be immediately marked as defective, tagged as "Do Not Use" or blocked from being used and removed from service until repaired.

17.3.2 First Aid/Cardiopulmonary Resuscitation (CPR)

Langan field and office personnel will be encouraged to be trained in First Aid and Cardiopulmonary Resuscitation (CPR). Training will be provided free of charge by Langan to all employees. Employees will receive a training certificate that will be kept on file with the Health & Safety Coordinator (HSC). Training and certification will be provided by a credited provider such as American Red Cross or equivalent.

17.3.2.1 Emergency Procedures

Prior to work at sites the Langan employees certified in first aid and CPR will be identified in the site specific HASP. Langan will endear to have at least one employee at a job site trained and able to render first aid and CPR. The site specific HASP will contain first aid information on both potential chemical and physical hazards. Emergency procedures to be followed are in case of injury or illnesses are provided in the HASP. The HASP will include emergency contact information including local police and fire departments, hospital emergency rooms, ambulance services, on-site medical personnel and physicians. The HASP will also include directions and contact information to the nearest emergency facility in case immediate medical attention is required. The emergency contact information will be conspicuously posted at the worksite. Employees that are injured and require immediate medical attention shall call either 911 or the local posted emergency contacts. Employees should use ambulatory services to transport injured workers to the nearest facility for emergency medical care. In areas where 911 is not available, the telephone numbers of the physicians, hospitals, or ambulances shall be conspicuously posted.

17.3.2.2 First Aid Supplies

First aid supplies are readily available to all Langan employees when required. First aid kits are located in each Langan office. Portable first aid kits are available for employees to use at work sites. First aid kits should consist of items needed to treat employees for potential chemical and physical injuries. At a minimum, first aid kits should contain items to allow basic first aid to be rendered. Where the eyes or body of an employee may be exposed to corrosive materials,

suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use including eye wash.

First aid kits will be weatherproof with individual sealed packages of each item. All portable first aid kits shall be inspected by Langan employees before and after use to ensure all used items are replaced. When out in the field, employees shall check first aid kits weekly to ensure used items are replaced.

17.3.3 Hydrogen Sulfide

Langan employees with the potential to be exposed to hydrogen sulfide while at work sites shall have training in hydrogen sulfide awareness. The training will include identification of areas where employees could be exposed to hydrogen sulfide, health effects, permissible exposure limits, and first aid procedures and personnel protective equipment. Langan employees could be exposed to hydrogen sulfide while at job sites including petroleum refineries, hazardous waste treatment, storage and disposal facilities, uncontrolled hazardous waste sites and remediation projects.

17.3.3.1 Characteristics

Hydrogen sulfide is a colorless gas with a strong odor of rotten eggs that is soluble in water. Hydrogen sulfide is used to test and make other chemicals. It is also found as a by-product of chemical reactions, such as in sewer treatment. It is a highly flammable gas and a dangerous fire hazard. Poisonous gases are produced in fires including sulfur oxides. Hydrogen sulfide is not listed as a carcinogen.

17.3.3.2 Health Effects

Hydrogen Sulfide can affect employees if inhaled or through contact with skin or eyes. Acute (or short term) health effects of hydrogen sulfide exposure include irritation of the nose and throat, dizziness, confusion, headache and trouble sleeping. Inhalation of hydrogen sulfide can irritate the lungs causing coughing and/or shortness of breath. Higher levels of exposure can cause build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.

Chronic (or long term) health effects of low levels of exposure to hydrogen sulfide can cause pain and redness of the eyes with blurred vision. Repeated exposure may cause bronchitis with cough, phlegm and shortness of breath.

17.3.3.3 Protective Clothing and Equipment

Respirators are required for those operations in which employees will be exposed to hydrogen sulfide above OSHA permissible exposure level. The maximum OSHA permissible exposure limit (PEL) for hydrogen sulfide is 20 parts of hydrogen sulfide vapor per million parts of air (20 ppm) for an 8-hour workday and the maximum short-term exposure limit (STEL) is 10 ppm for any 10-minute period.

Where employees are exposed to levels up to 100 parts of hydrogen sulfide vapor per million parts of air (100 ppm), the following types of respiratory protection are allowed:

- Any powered, air purifying respirator with cartridge(s);
- Any air purifying, full-facepiece respirator (gas mask) with a chin style, front- or back-mounted canister;
- Any supplied air system with escape self-contained breathing apparatus, if applicable; and,
- Any self-contained breathing apparatus with a full facepiece.

Respirators used by employees must have joint Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (NIOSH) seal of approval. Cartridges or canisters must be replaced before the end of their service life, or the end of the shift, whichever occurs first. Langan employees that have the potential to be exposed to hydrogen sulfide will be trained in the proper use of respirators. Respirator training is discussed under– Langan's Respiratory Protection Program.

Employees with potential exposure to hydrogen sulfide, or when required by the client, will wear a portable hydrogen sulfide gas detector. The detector should have an audible, visual and vibrating alarm. The detector may also provide detection for carbon monoxide, sulfur dioxide and oxygen deficient atmospheres. The hydrogen sulfide monitor will, at a minimum, be calibrated to detect hydrogen sulfide at a level of 20 parts of hydrogen sulfide vapor per million parts of air (20 ppm). Many portable gas detectors will have factory defaults with a low level alarm at 10 ppm and a high level alarm at 15 ppm. Langan employees shall consult clients to determine if any site specific threshold levels exist.

If the hydrogen sulfide gas detector sounds and employees are not wearing appropriate respiratory protection, employees must immediately vacate the area and meet at the assigned emergency location. Langan employees may not re- enter the site without proper respiratory protection and approval from the client or property owner, if needed.

Employees shall wear PPE to prevent eye and skin contact with hydrogen sulfide. Employees

must wear appropriate protective clothing including boots, gloves, sleeves and aprons, over any parts of their body that could be exposed to hydrogen sulfide. Non-vented, impact resistant goggles should be worn when working with or exposed to hydrogen sulfide.

17.3.3.4 Emergency and First Aid Procedures

Eye and Face Exposure

If hydrogen sulfide comes in contact with eyes, it should be washed out immediately with large amounts of water for 30 minutes, occasionally lifting the lower and upper eye lids. Seek medical attention immediately.

Skin Exposure

If hydrogen sulfide contaminates clothing or skin, remove the contaminated clothing immediately and wash the exposed skin with large amounts of water and soap. Seek medical attention immediately. Contaminated clothing should either be disposed of or washed before wearing again.

Breathing

If a Langan employee or other personnel breathe in hydrogen sulfide, immediately get the exposed person to fresh air. If breathing has stopped, artificial respiration should be started. Call for medical assistance or a doctor as soon as possible.

Safety Precautions

Hydrogen sulfide is a highly flammable gas and a dangerous fire hazard. Containers of hydrogen sulfide may explode in a fire situation. Poisonous gases are produced during fires.

Langan employees should contact property owners and operators prior to conducting work onsite to be aware of any site specific contingency plans, identify where hydrogen sulfide is used at the facility and be informed about additional safety rules or procedures.

19.3.4 Fire Protection/Extinguishers

Langan field personnel that have been provided with portable fire extinguishers for use at worksites will be trained to familiarize employees with general principles of fire extinguisher use and hazards associated with the incipient stage of firefighting. Training will be provided prior to initial assignment for field work and annually thereafter.

Portable fire extinguishers shall be visually inspected monthly and subjected to an annual maintenance check. Langan shall retain records of the annual maintenance date.

17.3.5 Overhead lines

When field work is performed near overhead lines, the lines shall be deenergized and grounded, or other protective measures shall be provided before the work shall commence. If overhead lines are to be deenergized, arrangements shall be made with the client, property owner or organization that operates or controls the electric circuits involved to deenergize and ground them. If protective measures, such as guarding, isolating, or insulating, are provided, these precautions shall prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.

When unqualified Langan personnel are working in an elevated position near overhead lines, the location shall be such that the person and the longest conductive object they may contact cannot come closer to any unguarded, energized overhead line than the following distances:

1. For voltages to ground 50kV or below - 10 feet; and
2. For voltages to ground over 50kV - 10 feet, plus 4 inches for every 10kV over 50kV.

As previously indicated, Langan does not retain qualified employees to perform work on energized equipment.

17.3.5.1 Vehicle and Equipment Clearance

Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 feet is maintained. If the voltage of the overhead lines is higher than 50kV, the clearance shall be increased 4 inches for every 10kV over that voltage.

If any of the following discussed conditions occur, the clearance may be reduced.

- If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. If the voltage is higher than 50kV, the clearance shall be increased 4 in. for every 10 kV over that voltage.
- If insulating barriers are installed to prevent contact with the lines, and if the barriers are rated for the voltage of the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

Employees standing on the ground may not contact the vehicle or mechanical equipment or any

of its attachments, unless the employee is using protective equipment rated for the voltage; or the equipment is located so that no uninsulated part of its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the overhead line than permitted.

If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding may not stand at the grounding location whenever there is a possibility of overhead line contact. Additional precautions, such as the use of barricades or insulation, shall be taken to protect employees from hazardous ground potentials, depending on earth resistivity and fault currents, which can develop within the first few feet or more outward from the grounding point.

17.3.6 Trade Secret

Langan employees could potentially be provided trade secret information by the client or property owner when site specific information is provided about highly hazardous chemicals. Trade secret means any confidential formula, pattern, process, device, information or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. Langan employees understand that this information should be kept confident and if required, may enter into a confidentially agreement with the client.

17.3.7 Bloodborne Pathogens

Langan employees that can reasonably anticipate exposure to blood or other potentially infectious material while at work sites shall have training in bloodborne pathogens. Applicable employees would include those trained in first aid and serving a designated role as an emergency medical care provider. Bloodborne pathogens are pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus and human immunodeficiency virus.

17.3.7.1 Training

Langan employees with potential occupational exposure to blood or other potentially infectious material must participate in a training program. Training must be conducted prior to initial assignment where there would be potential for exposure and annually thereafter within one year of previous training. The training program will be provided to Langan employees at no cost to them and during working hours.

Langan will ensure the training program shall consist of the following:

- An accessible copy of the regulatory text of 29 CFR 1910.1030 and an explanation of its contents;
- A general explanation of the epidemiology and symptoms of bloodborne diseases;
- An explanation of the modes of transmission of bloodborne pathogens;
- An explanation of Langan's exposure control plan and the means by which the employee can obtain a copy of the written plan;
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials;
- An explanation of the use and limitations of personal protective
    - equipment (PPE) to prevent and reduce exposure;
    - Information on the types, proper use, location, removal, handling and disposal of PPE;
    - An explanation of the basis for selection of PPE;
    - Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine and vaccination will be offered free of charge;
    - Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials;
    - An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available;
    - Information on the post-exposure evaluation and follow-up that the
    - employer is required to provide for the employee following an exposure incident;
    - An explanation of the signs and labels and/or color coding required by paragraph 29 CFR 1910.1030(g)(1); and
    - An opportunity for interactive questions and answers with the person conducting the training session.

Langan will develop and implement a written Exposure Control Plan, which will be designed to eliminate or minimize employee exposure to bloodborne pathogens. The Exposure Control Plan will contain the following elements:

- An exposure determination for employees;
- The schedule and method of implementation for Methods of Compliance (29 CFR 191.1030(d)), Hepatitis B Vaccination and Post-Exposure Evaluation and Follow-up (29 CFR 1910.1030(f)), Communication of Hazards to Employees (29 CFR 1910.1030(g)) and (h) Recordkeeping (29 CFR 1910.1030(h));
- The procedure for the evaluation of circumstances surrounding exposure incidents;
- Ensure a copy of the Exposure Control Plan will be accessible to employees; and,
- The Exposure Control Plan shall be reviewed and updated at least annually.

Langan employees with occupational exposure to bloodborne pathogens include any employees trained in first aid that would be expected to provide emergency medical care. This determination is made without regards to the use of PPE, which could eliminate or minimize exposure.

Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for bloodborne pathogens. Under circumstances in which differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious materials.

Work practice controls shall be used to eliminate or minimize employee exposure, if applicable. Since Langan employees will have occupational exposure only during rendering of first aid, personnel protective equipment will be utilized to reduce or minimize exposure. PPE that could be available to Langan personnel when administering first aid includes safety glasses, gloves, and Tyvek suits or sleeves. PPE and first aid kits will be provided to employees at no cost to them.

Langan employees that render first aid in office areas will have access to hand washing facilities or restrooms. For first aid rendered at field locations, first aid kits will contain an appropriate antiseptic hand cleanser and clean cloth/paper towels or antiseptic towelettes. After using antiseptic hand cleansers or towelettes, employees shall wash their hands with soap and running water as soon as feasible.

After administering first aid, potentially infectious materials, including towels, personnel protective equipment, clothes and bandages, shall be placed in a container, which prevents leakage during collection, handling, processing, storage, transport, or shipping. All PPE will be dispose of after use. Any equipment or working surfaces which was been exposed to blood or potentially infectious materials due to an injury, will be decontaminated prior to reuse.

Langan will make available the hepatitis B vaccine and vaccination series to all employees who have occupational exposure, and post-exposure evaluation and follow-up to all employees who have had an exposure incident. These services will be available to the employee at no cost to them through a medical provider.

17.3.7.2 Recordkeeping

Langan will maintain training and medical records for each employee with occupational exposure to blood or potentially infectious materials. Medical and training records will be maintained by Langan's H&S Department.

Training records will include the following:

- Dates of the training sessions;
- Contents or a summary of the training sessions;
- Names and qualifications of persons conducting the training; and
- Names and job titles of all persons attending the training sessions.

Training records shall be maintained for 3 years from the date on which the training occurred. Medical records will be will be preserved and maintained for the duration of employment plus 30 years.

All records will be made available upon request to employees, the Assistant Secretary of Labor for Occupational Safety and Health, and Director of National Institute for Occupational Safety and Health Director of OSHA for examination and copying. Medical records must have written consent from employee before releasing.

If Langan ceases to do business, all records shall be transferred to the successor employer. The successor employer shall receive and maintain these records.

If there will not be a successor, Langan will notify current employees of their rights to access records at least three months prior to the cessation of business.

18.0 RECORDKEEPING

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

18.1 Field Change Authorization Request

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.

18.2 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.

18.3 Onsite Log

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

18.4 Daily Safety Meetings ("Tailgate Talks")

Completed safety briefing forms will be maintained by the HSO.

18.5 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.

18.6 Hazard Communication Program/MSDS-SDS

Material safety data sheets (MSDS) of Safety Data Sheets (SDS) have been obtained for applicable substances and are included in this HASP (Attachment D). Langan's written hazard communication program, in compliance with 29 CFR 1910.1200, is maintained by the HSM.

18.7 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, extension 4699 and the Project Manager to report the incident or near miss. The Project Manager will contact the client or client representative. A written report must be completed and submitted HSM 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.

18.7.1 Accident and Injury Report Forms

18.7.1.1 Accident/Incident Report

All injuries, no matter how slight, shall be reported to the FTL and the PM immediately. The accident/incident report forms, attached in Attachment U and Attachment V will be filled out on all accidents by the applicable contractor supervision personnel, the FTL, or the HSO. Copies of all accident/incident reports shall be kept on-site and available for review. Project personnel will be instructed on the location of the first aid station, hospital, and doctor and ambulance service near the job. The emergency telephone numbers will be conspicuously posted in site vehicles near the work zone. First aid supplies will be centrally located and conspicuously posted between

restricted and non-restricted areas to be readily accessible to all on the site.

18.7.1.2 First Aid Treatment Record

The forms in will be used for recording all non-lost time injuries treated by the project first-aid attendant, the local physician or hospital will be entered in detail on this record. "Minor" treatment of scratches, cuts, etc. will receive the same recording attention as treatment of more severe injuries.

18.7.1.3 OSHA Form 300

An OSHA Form 300 will be kept at the Langan Corporate Office in Parsippany, New Jersey. All recordable injuries or illnesses will be recorded on this form. Subcontractor employers must also meet the requirements of maintaining an OSHA 300 form. The Incident Report form used to capture the details of work-related injuries/illnesses meets the requirements of the OSHA Form 301 (supplemental record) and must be maintained with the OSHA Form 300 for all recordable injuries or illnesses. Forms for recording OSHA work-related injuries and illnesses are included in Attachment U and Attachment V.

19.0 CONFINED SPACE ENTRY

Confined spaces are not anticipated at the Site during planned construction activities. If confined spaces are identified, the contractor must implement their own confined space program that all applicable federal, state and local regulations. Confined spaces **will not** be entered by Langan personnel.

20.0 HASP ACKNOWLEDGEMENT FORM

All Langan personnel and contractors will sign this HASP Compliance Agreement indicating that they have become familiar with this HASP and that they understand it and agree to abide by it.

Printed Name	Signature	Company	Date

Printed Name	Signature	Company	Date

Printed Name	Signature	Company	Date

Printed Name	Signature	Company	Date

Printed Name	Signature	Company	Date

TABLES

TABLE 1
TASK HAZARD ANALYSES

Task	Hazard	Description	Control Measures	First Aid
1.3.1 – 1.3.2	Contaminated Soil or Groundwater-Dermal Contact	Contaminated water spills on skin, splashes in eyes; contact with contaminated soil/fill during construction activities or sampling.	Wear proper PPE; follow safe practices, maintain safe distance from construction activities	See Table 2, seek medical attention as required
1.3.1 – 1.3.2	Lacerations, abrasions, punctures	Cutting bailer twine, pump tubing, acetate liners, etc. with knife; cuts from sharp site objects or previously cut piles, tanks, etc.; Using tools in tight spaces	Wear proper PPE; follow safe practices	Clean wound, apply pressure and/or bandages; seek medical attention as required.
1.3.1 – 1.3.2	Contaminated Media Inhalation	Opening drums, tanks, wells; vapors for non-aqueous phase liquids or other contaminated site media; dust inhalation during excavation; vapor accumulation in excavation	Follow air monitoring plan; have quick access to respirator, do not move or open unlabeled drums found at the site, maintain safe distance from construction activities	See Table 2, seek medical attention as required
1.3.1 – 1.3.2	Lifting	Improper lifting/carrying of equipment and materials causing strains	Follow safe lifting techniques; Langan employees are not to carry contractor equipment or materials	Rest, ice, compression, elevation; seek medical attention as required
1.3.1 – 1.3.2	Slips, trips, and falls	Slips, trips and falls due to uneven surfaces, cords, steep slopes, debris and equipment in work areas	Good housekeeping at site; constant awareness and focus on the task; avoid climbing on stockpiles; maintain safe distance from construction activities and excavations; avoid elevated areas over six feet unless fully accredited in fall protection and wearing an approved fall protection safety apparatus	Rest, ice, compression, elevation; seek medical attention as required
1.3.1 – 1.3.2	Noise	Excavation equipment, hand tools, drilling equipment.	Wear hearing protection; maintain safe distance from construction activities	Seek medical attention as required
1.3.1 – 1.3.2	Falling objects	Soil material, tools, etc. dropping from drill rigs, front-end loaders, etc.	Hard hats to be worn at all times while in work zones; maintain safe distance from construction activities and excavations	Seek medical attention as required
1.3.1 – 1.3.2	Underground/ overhead utilities	Excavation equipment, drill rig auger makes contact with underground object; boom touches overhead utility	"One Call" before dig; follow safe practices; confirm utility locations with contractor; wear proper PPE; maintain safe distance from construction activities and excavations	Seek medical attention as required
1.3.1 – 1.3.2	Insects (bees, wasps, hornet, mosquitoes, and spider)	Sings, bites	Insect Repellent; wear proper protective clothing (work boots, socks and light colored pants);field personnel who may have insect allergies (e.g., bee sting) should provide this information to the HSO or FSO prior to commencing work, and will have allergy medication on site.	Seek medical attention as required
1.3.1 – 1.3.2	Vehicle traffic / Heavy Equipment Operation	Vehicles unable to see workers on site, operation of heavy equipment in tight spaces, equipment failure, malfunctioning alarms	Wear proper PPE, especially visibility vest; use a buddy system to look for traffic; rope off area of work with cones and caution tape or devices at points of hazard, maintain safe distance from construction activities and equipment	Seek medical attention as required

TABLE 2
CONTAMINANT HAZARDS OF CONCERN

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	1,1′-Biphenyl 1,1-Biphenyl Biphenyl Phenyl benzene Diphenyl	92-52-4	None	1 mg/m^3 100 mg/m^3	Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, throat; headache, nausea, lassitude (weakness, exhaustion), numb limbs; liver damage	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	1,2,3-Trichlorobenzene vic-Trichlorobenzene 1,2,6-Trichlorobenzene	87-61-6	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	1,2,4,5-Tetramethylbenzene	95-93-2	NA	None None	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	1,2,4-Trimethylbenzene	95-63-6	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	1,2-Dichloroethene 1,2-Dichloroethylene 1,2-DCE Total 1,2-Dichloroethene cis-1,2-Dichloroethylene mixture of cis and trans Acetylene dichloride cis-Acetylene dichloride sym-Dichloroethylene cis-1,2-Dichloroethene cDCE 1,1-dimethyl-;dimethyl1,1-cyclohexane	159-59-2 156-60-5 540-59-0	PID	200 ppm 4000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	Irritant to eyes, skin, mucous membranes and respiratory system. May be harmful by ingestion, skin absorption and inhalation	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	1,3,5-Trimethylbenzene Mesitylene sym-Trimethylbenzene	108-67-8	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	1,3-Butadiene Biethylene Bivinyl Butadiene Divinyl Erythrene Vinylethylene	106-99-0	PID	1 ppm 2000 ppm	Vapor	inhalation, skin and/or eye contact (liquid)	irritation to the eyes, nose, throat; drowsiness, dizziness; liquid: frostbite; teratogenic, reproductive effects; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.2	2,4-Dimethylphenol 2,4-Xylenol m-Xylenol 1-Hydroxy-2,4-dimethylbenzene 2,4-Dimethylphenol 4-Hydroxy-1,3-dimethylbenzene 4,6-Dimethylphenol 1,3-Dimethyl-4-hydroxybenze	105-67-9	None	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	2-Butanone Ethyl methyl ketone MEK Methyl acetone Methyl ethyl ketone	78-93-3	PID	200 ppm 3000 ppm	Soil Groundwater Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eye: Irrigate immediately Skin: Water wash immediately Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.2	2-Hexanone Butyl methyl ketone MBK Methyl butyl ketone Methyl n-butyl ketone	591-78-6	PID	100 ppm 1600 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose; peripheral neuropathy: lassitude (weakness, exhaustion), paresthesia; dermatitis; headache, drowsiness	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	2-Methylnaphthalene β-methylnaphthalene	91-57-6	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion or skin absorption, eye contact	irritation to the skin, eyes, mucous membranes and upper respiratory tract. It may also cause headaches, nausea, vomiting, diarrhea, anemia, jaundice, euphoria, dermatitis, visual disturbances, convulsions and comatose	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	4,4'-DDD Dichlorodiphenyldichloroethane 1,1'-(2,2-Dichloroethylidene)bis (4-chlorobenzene) p,p'-DDD	72-54-8	None	NA NA	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the 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]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	4-Chloroaniline p-Chloroaniline	106-47-8	None	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the 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]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	4-Chlorotoluene p-Chlorotoluene 1-Chloro-4-methylbenzene p-Tolyl chloride	106-43-4	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; dermatitis; drowsiness, incoordination, anesthesia; cough; liver, kidney injury	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	4-Isopropyltoulene 1-Methyl-4-(1-methylethyl)benzene 4-Isopropyltoluene; 4-Methylcumene; 1-Methyl-4-isopropylbenzene Dolcymene Camphogen Paracymene Cymene p-Cymene p-Isopropyltoluene	99-87-6	PID	NA NA	Soil Groundwater Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	4-Methyl-2-pentanone Hexone Isobutyl methyl ketone Methyl isobutyl ketone MIBK	108-10-1	PID	100 ppm 500 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Acenaphthene 1,2-Dihydroacenaphthylene 1,8-Ethylenenaphthalene peri-Ethylenenaphthalene Naphthyleneethylene Tricyclododecapentaene	83-32-9	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact,	irritation to the skin, eyes, mucous membranes and upper respiratory tract; If ingested, it can cause vomiting	Eye: Irrigate immediately Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately
1.3.1 – 1.3.2	Acenaphthylene Cycopental(de)naphthalene, Acenaphthalene	208-96-8	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the skin, eyes, mucous membranes and upper respiratory tract	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Acetone Dimethyl ketone Ketone propane 2-Propanone	67-64-1	PID	1000 ppm 2500 ppm	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Acrylonitrile Acrylonitrile monomer AN Cyanoethylene Propenenitrile 2-Propenenitrile VCN, Vinyl cyanide	107-13-1	PID	1 ppm 85 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; asphyxia; headache; sneezing; nausea, vomiting; lassitude (weakness, exhaustion), dizziness; skin vesiculation; scaling dermatitis; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Alpha-BHC alpha-Hexachlorocyclohexane -alpha,2-alpha,3-beta,4-alpha,5-beta,6-beta-Hexachlorocyclohexane alpha-1,2,3,4,5,6-Hexachlorocyclohexane alpha-Benzenehexachloride α-1,2,3,4,5,6-hexachlorocyclohexane α-HCH α-Benzenehexachloride alpha-hexacloran(e) alpha-Lindane Alpha Hexachlorocyclohexane	319-84-6	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane possible carcinogenic, effects to liver, blood, and central nervous system	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Alpha-Chlordane Alpha Chlordane a-Chlordane	5103-71-9	None	0.5 mg/m³ 100 mg/m³	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Aluminum	7429-90-5	None	0.5 mg/m3 50 mg/m3	Soil	inhalation, skin and/or eye contact	irritation to the eyes, skin, respiratory system	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.2	Anthracene	120-12-7	PID	0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to the skin, eyes, mucous membranes and upper respiratory tract, abdominal pain if ingested.	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, Breathing: Move to fresh air, refer to medical attention; Swallow: refer to medical attention
1.3.1 – 1.3.2	Antimony	7440-36-0	None	0.5 mg/m³ 50 mg/m³	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation skin, possible dermatitis; resp distress; diarrhea; muscle tremor, convulsions; possible gastrointestinal tract	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Aroclor 1242	53469-21-9	None	0.5 mg/m^3 5 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, chloracne	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Aroclor 1254	11097-69-1	None	0.5 mg/m^3 5 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, chloracne	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Aroclor 1260	11096-82-5	None	0.5 mg/m^3 5 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, chloracne	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Arsenic	NA	None	0.5 mg/m^3 NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation skin, possible dermatitis; resp distress; diarrhea; muscle tremor, convulsions; possible gastrointestinal tract	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Barium	10022-31-8	None	0.5 mg/m^3 50 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Benzene Benzol Phenyl hydride Alkyl benzene isomers	71-43-2	PID	3.19 mg/m^3 1,595 mg/mg^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; lassitude (weakness, exhaustion) [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Benzo(a)anthracene Benzanthracene Benzanthrene 1,2-Benzanthracene Benzo[b]phenanthrene Tetraphene	56-55-3	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Benzo(a)pyrene	50-32-8	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately, seek medical attention Skin: Soap wash immediately; Breathing: move to fresh air; Swallow: Induce vomiting if conscious, seek medical attention immediately
1.3.1 – 1.3.2	Benzo(b)fluoranthene	205-99-2	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.2	Benzo(g,h,i)perylene Benzo(ghi)perylene	191-24-2	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	NA	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Benzo(k)fluoranthene	207-08-9	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation (dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.2	Benzoic acid Carboxybenzene E210 Dracylic acid Phenylmethanoic acid Benzenecarboxylic acid Benzoic acid isomer	65-85-0	None	NA NA	Groundwater Soil Vapor	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air
1.3.1 – 1.3.2	Benzyl butyl phthalate Butyl benzyl phthalate Butylbenzylphthalate	86-66-7	None	NA NA	Groundwater Soil Vapor	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation (dizziness, weakness, fatigue, nausea, headache	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Beryllium	7440-41-7	None	0.002 mg/m^3 4 mg/m^3	Soil	inhalation, skin and/or eye contact	berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation to the eyes; dermatitis; [potential occupational carcinogen]	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.2	Bis(2-ethylhexyl)phthalate Bis(2-Ethylhexyl) Phthalate Di-sec octyl phthalate DEHP Di(2-ethylhexyl)phthalate Octyl phthalate bis(2-ethylexyl)phthalate Bis(2-Ethylhexyl) Phthalate	117-81-7	None	5 mg/m^3 5000 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, mucous membrane; in animals: liver damage; teratogenic effects; [potential occupational carcinogen	Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Cadmium	7440-43-9	None	0.005 mg/m^3 9 mg/m^3	Soil	inhalation, ingestion	pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Calcium	7440-70-2	None	NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, upper resp tract; ulcer, perforation nasal septum; pneumonitis; dermatitis	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Carbazole 9-azafluorene Dibenzopyrrole Diphenylenimine diphenyleneimide	86-74-8	None	NA NA	Soil	inhalation, skin absorption (liquid), skin and/or eye contact	irritation to eyes and skin, respiratory irritation	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.2	Carbon disulfide	75-15-0	PID	20 ppm 500 ppm	Soil Groundwater Vapor	inhalation, skin or eye contact, ingestion	irritation to the eyes, skin, respiratory system	Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support
1.3.1 – 1.3.2	Carbon tetrachloride Carbon chloride Carbon tet Freon® 10 Halon® 104 Tetrachloromethane	56-23-5	PID	10 ppm 200 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Chlordane Chlordan Chlordano 1,2,4,5,6,7,8,8-Octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindane Total Chlordane	57-74-9	None	0.5 mg/m³ 100 mg/m³	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Chloroform Methane trichloride Trichloromethane Chloro-3-methyl phenol	67-66-3	None	50 ppm 500 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Chromium Total Chromium Chromium, Total	7440-47-3	None	1.0 mg/m³ 250 mg/m³	Groundwater Soil	inhalation absorption ingestion	irritation to eye, skin, and respiratory	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Chrysene Benzo[a]phenanthrene 1,2-Benzphenanthrene	218-01-9	PID	0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eye, skin, and respiratory, gastrointestinal irritation nausea, vomit, diarrhea [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Cobalt	7440-48-4	None	0.1mg/m^3 20 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Copper	7440-50-8	None	1.0 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, metallic taste; dermatitis; anemia	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Cyanide	57-12-5	None	5 mg/m^3 25 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	Exposure to cyanide can cause weakness, headaches, confusion, dizziness, fatigue, anxiety, sleepiness, nausea and vomiting. Breathing can speed up then become slow and gasping. Coma and convulsions also occur. If large amounts of cyanide have been absorbed by the body, the person usually collapses and death can occur very quickly. Long-term exposure to lower levels of cyanide can cause skin and nose irritation, itching, rashes and thyroid changes.	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Cyclohexane Benzene hexahydride Hexahydrobenzene Hexamethylene Hexanaphthene	110-82-7	PID	300 ppm 1300 ppm	Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, respiratory system; drowsiness; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	DDE 4,4-DDE 4,4′-DDE 1,1-bis-(4-chlorophenyl)-2,2-dichloroethene Dichlorodiphenyldichloroethylene p,p'-DDE	72-55-9	None	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Oral ingestion of food is the primary source of exposure for the general population. Acute and chronic ingestion may cause nausea, vomiting, diarrhea, stomach pain, headache, dizziness, disorientation, tingling sensation, kidney damage, liver damage, convulsions, coma, and death. 4,4' DDE may cross the placenta and can be excreted in breast milk	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	DDT 4,4-DDT 4,4′-DDT p,p′-DDT Dichlorodiphenyltrichloroethane 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane	50-29-3	None	1 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the 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]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Dibenz(a,h)anthracene Dibenzo(a,h)anthracene Dibenzo[a,h]anthracene	53-70-3	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support PID Swallow: Medical attention immediately
1.3.1 – 1.3.2	Dibenzofuran	132-64-9	None	NA NA	Soil	inhalation, absorption	irritation to eyes, and skin	Eyes: Irrigate immediately Skin: Soap wash promptly.
1.3.1 – 1.3.2	Dichlorodifluoromethane Difluorodichloromethane, Fluorocarbon 12 Freon 12 Freon® 12 Genetron® 12 Halon® 122 Propellant 12 Refrigerant 12 Dichlorodiflurometh ane	75-71-8	None	1000 pp, 15,000 ppm	Groundwater Soil Vapor	inhalation, skin and/or eye contact (liquid)	dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.2	Diesel Fuel automotive diesel fuel oil No. 2 distillate diesoline diesel oil diesel oil light diesel oil No. 1-D summer diesel	68334-30-5	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Di-n-octyl phthalate Di-n-cotylphthalate Di-n-octylphthalate Di-sec octyl phthalate Dioctyl phthalate DEHP, Di(2-ethylhexyl)phthalate, DOP, bis-(2-Ethylhexyl)phthalate, Octyl phthalate	117-84-0	None	5 mg/m3 5000 mg/m3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, mucous membrane; in animals: liver damage; teratogenic effects; [potential occupational carcinogen]	Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Ethanol Absolute alcohol Alcohol cologne spirit drinking alcohol ethane monoxide ethylic alcohol EtOH ethyl alcohol ethyl hydrate ethyl hydroxide ethylol grain alcohol hydroxyethane methylcarbinol	64-17-5	PID	1000 ppm 3300 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose; headache, drowsiness, lassitude (weakness, exhaustion), narcosis; cough; liver damage; anemia; reproductive, teratogenic effects	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.2	Ethyl acetate Acetic ester Acetic ether Ethyl ester of acetic acid Ethyl ethanoate	141-78-6	PID	400 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; narcosis; dermatitis	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Ethyl benzene Ethylbenzene Ethylbenzol Phenylethane	100-41-4	PID	435 mg/m^3 3,472 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Ethyl chloride Chloroethane Hydrochloric ether Monochloroethane Muriatic ether Hydrochloric ether	75-00-3	PID	1000 ppm 3800 ppm	Groundwater Soil Vapor	inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact	incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Fluoranthene Benzo(j, k)fluorene	206-44-0	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.2	Fluorene	86-73-7	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attenti

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Fuel Oil No. 2	68476-30-2	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	gamma-Chlordane Gamma Chlordane y-Chlordane	5566-34-7	None	0.5 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Gasoline	8006-61-9	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Helium	7440-59-7	Helium Detector	NA NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Heptachlor	76-44-8	None	0.5 mg/m^3 35 mg/m^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	In animals: tremor, convulsions; liver damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Heptane n-Heptane	142-82-5	PID	500 ppm 750 ppm	Goundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	dizziness, stupor, incoordination; loss of appetite, nausea; dermatitis; chemical pneumonitis (aspiration liquid); unconsciousness	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Hexavalent Chromium Chromium VI Chromium, Hexavalent	18540-29-9	None	1.0 mg/m^3 250 mg/m^3	Groundwater Soil	inhalation absorption ingestion	irritation to eye, skin, and respiratory	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Indeno(1,2,3-cd)pyrene Indeno(1,2,3-c,d)Pyrene Indeno[1,2,3-cd]Pyrene	193-39-5	None	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately, wash mouth with water

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Iodomethane Idomethane Methyl Iodide Methyl iodine Monioodomethane	74-88-4	None	5 ppm (28 mg/m^3) 100 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, respiratory system; nausea, vomiting; dizziness, ataxia; slurred speech, drowsiness; dermatitis; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Iron	7439-89-6	None	10 mg/m^3 NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Isopropyl Acetate Isopranol Isopropyl ester of acetic acid 1-Methylethyl ester of acetic acid 2-Propyl acetate	10821-4	PID	250 ppm 1800 ppm		inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose; dermatitis; In Animals: narcosis	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Isopropyl alcohol Iso-Propyl Alcohol Carbinol IPA Isopropanol 2-Propanol sec-Propyl alcohol Rubbing alcohol Isopropylalcohol	67-63-0	PID	400 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; drowsiness, dizziness, headache; dry cracking skin; in animals: narcosis	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Lead	7439-92-1	None	0.050 mg/m^3 100 mg/m^3	Groundwater Soil	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 to the eyes; hypertension	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Magnesium	7439-95-4	None	15 mg/m^3 NA	Soil	inhalation, skin and/or eye contact	irritation to the eyes, skin, respiratory system; cough	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.2	Manganese	7439-96-5	None	5 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation, ingestion	aerosol is irritating to the respiratory tract	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	m-Cresol meta-Cresol 3-Cresol m-Cresylic acid 1-Hydroxy-3-methylbenzene 3-Hydroxytoluene 3-Methylphenol	108-39-4	PID	5 ppm 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; central nervous system effects: confusion, depression, resp failure; dyspnea (breathing difficulty), irreg rapid resp, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Mercury	7439-97-6	None	0.1 mg/m^3 10 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Methyl Acetate	79-20-9	PID	200 ppm 3100 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; headache, drowsiness; optic nerve atrophy; chest tightness; in animals: narcosis	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Methyl Chloride Chloromethane Monochloromethane Refrigerant-40 R-40	74-87-3	NA	100 ppm 2000 ppm	Groundwater Soil	inhalation, skin and/or eye contact	dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Methyl methacrylate Methacrylate monomer Methyl ester of methacrylic acid Methyl-2-methyl-2-propenoate	80-62-6	PID	100 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; dermatitis	Eye: Irrigate immediately Skin: Water wash immediately Breathing: Fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.2	Methyl *tert*-butyl ether MTBE Methyl tertiary-butyl ether Methyl t-butyl ether tert-Butyl methyl ether tBME tert-BuOMe Methyl tert butyl ether	1634-04-4	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Methylcyclohexane Methyl cyclohexane Methylcyclohexane Hexahydrotoluene Cyclohexylmethane Toluene hexahydride	108-87-2	PID	500 ppm 1200 ppm	Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, drowsiness; in animals: narcosis	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Methylene Chloride Dichloromethane Methylene dichloride	75-09-2	PID	25 ppm 2300 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	m-Xylenes 1,3-Dimethylbenzene m-Xylol Metaxylene	108-38-3 179601-23-1	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	N.Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA	24448-09-7	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Naphthalene Naphthalin Tar camphor White tar	91-20-3	PID	50 mg/m^3 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; hematuria (blood in the urine); dermatitis, optical neuritis	Eye: Irrigate immediately Skin: Molten flush immediately/solid-liquid soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	n-Butylbenzene Butylbenzene 1-phenylbutane	104-51-8	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	N-ethyl perfluorooctane sulfonamido acetic acid NEtFOSAA N-Ethylperfluorooctanesulfonamide	4151-50-2	NA	NA NA	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	n-Hexane Hexane, Hexyl hydride, normal-Hexane	110-54-3	PID	500 ppm 1100 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose; nausea, headache; peripheral neuropathy: numb extremities, muscle weak; dermatitis; dizziness; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Nickel	7440-02-0	None	NA 10 mg/m^3	Groundwater Soil	ion, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas : Oxygen Methane Hydrogen Sulfide Carbon Monoxide Nitrogen	7782-44-7 74-82-8 7783-08-4 830-08-0 7727-37-9	Multi-Gas PID	NA/NA NA/NA 10/100 ppm 50/1200 ppm NA/NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.2	Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas : Oxygen Isobutylene Nitrogen	7782-44-7 115-11-7 7727-37-9	PID	NA/NA NA/NA NA/NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	n-Propylbenzene Isocumene Propylbenzene 1-Phenylpropane 1-Propylbenzene Phenylpropane	103-65-1	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	o-Cresol ortho-Cresol 2-Cresol o-Cresylic acid 1-Hydroxy-2-methylbenzene 2-Hydroxytoluene 2-Methyl phenol 2-Methylphenol 2-Metyhlphenol	95-48-7	PID	5 ppm 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; central nervous system effects: confusion, depression, resp failure; dyspnea (breathing difficulty), irreg rapid resp, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediatelyethylp hhhhhhhhhh
1.3.1 – 1.3.2	o-Xylenes 1,2-Dimethylbenzene ortho-Xylene o-Xylol	95-47-6 179601-23-1	PID	100 ppm 900 ppm	Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	p-Cresol para-Cresol 4-Cresol p-Cresylic acid 1-Hydroxy-4-methylbenzene 4-Hydroxytoluene 4-Methylphenol	106-44-5	PID	5 ppm 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; central nervous system effects: confusion, depression, resp failure; dyspnea (breathing difficulty), irreg rapid resp, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluorobutanesulfonic acid FC-98 Nonaflate Nonafluorobutanesulphonic acid Perfluorobutanesulfonic Acid Perfluorobutane sulfonate PFBS	375-73-5	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluorobutanoic Acid Heptafluorobutyric acid Heptafluorobutanoic acid Perfluorobutyric acid PFBA	375-22-4	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Perfluorodecanesulfonic Acid PFDS	335-77-3	NA	NA NA	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluorodecanoic acid PFDA	335-76-2	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluorododecanoic acid Perfluoralauric acid Tricosafluorododecanoic acid PFDoA	307-55-1	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluoroheptane sulfonic Acid Perfluoroheptane sulfonate Perfluoroheptanesulfonic acid PFHpS	375-92-8	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Perfluoroheptanoic acid Perfluoroheptanoic acid Tridecafluoroheptanoic acid PFHpA	375-85-9	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluorohexanesulfonic Acid perfluorohexanesulfonate perfluorohexanesulfonic acid PFHxS	355-46-4	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluorohexanoic Acid PFHxA	307-24-4	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluoronoanoic Acid Perfluorononanoic Acid PFNA perfluoro-n-nonanoic acid perfluorononanoate	375-95-1	NA	None None	Groundwater	Groundwater	inhalation, skin or eye contact, ingestion; strong acid	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Perfluorooctanesulfonamide Erfluoroctylsulfonamide Perfluorooctane sulfonamide Heptadecafluorooctanesulphon amide Perfluorooctanesulfonic acid amide Deethylsulfluramid FC-99 PFOSA FOSA	754-91-6	NA	NA NA	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluorooctanesulfonic Acid PFOS	1763-23-1	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluorooctanoic Acid PFOA pentadecafluorooctanoic acid perfluorooctanoate perfluorocaprylic acid	335-67-1	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluoropentanoic Acid PFPeA	2706-90-3	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Perfluorotetradecanoic Acid PFTA	376-06-7	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluorotridecanoic Acid PFTrDA Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	72629-94-8	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Perfluoroundecanoic Acid PFPUnA	2058-94-8	NA	None None	Groundwater	inhalation, skin or eye contact, ingestion	irritation to eyes with possible eye damage, skin causing rash, redness or burning, irritation to nose, throat and lungs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Phenanthrene	85-01-8	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Phenol Carbolic acid Hydroxybenzene, Monohydroxybenzene Phenyl alcohol Phenyl hydroxide	108-95-2	PID	5 ppm 250 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine, skin burns; dermatitis; tremor, convulsions, twitching	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Potassium	7440-09-7	None	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact inhalation, ingestion, skin and/or eye contact	eye: Causes eye burns. Skin: Causes skin burns. Reacts with moisture in the skin to form potassium hydroxide and hydrogen with much heat. ingestion: Causes gastrointestinal tract burns. inhalation: May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Causes chemical burns to the respiratory tract. inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.	Eyes: Get medical aid immediately Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Ingestion: If victim is conscious and alert, give 2-4 full cups of milk or water. Get medical aid immediately. inhalation: Get medical aid immediately.

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Propylene Propene Methyl ethylene	115-07-1	PID	NA NA	Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat, skin burns asphyxiation	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	p-Xylenes 1,4-Dimethylbenzene para-Xylene p-Xylol	106-42-3	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Pyrene benzo[def]phenanthrene	129-00-0	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	sec-Butylbenzene	135-98-8	PID	10 ppm 100 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; inhalation: nausea or vomiting	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Selenium	7782-49-2	None	1 mg/m^3 0.2 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Silver	7440-22-4	None	0.01mg/m^3 10 mg/m^3	Soil	inhalation, ingestion, skin and/or eye contact	blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Sodium	7440-23-5	None	NA NA	Groundwater Soil	ion, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Styrene Ethenyl benzene Phenylethylene Styrene monomer Styrol Vinyl benzene	100-42-5	PID	100 ppm 700 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects	Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Tetrachloroethylene Perchlorethylene Perchloroethylene PCE Perk Tetrachlorethylene Tetrachloroethene	127-18-4	PID	100 ppm 150 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Thallium	7440-28-0	None	0.1 mg/m^3 15 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Toluene Methyl benzene Methyl benzol Phenyl methane Toluol	108-88-3	PID	200 ppm 500 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, paresthesia; dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Total PCBs Chlorodiphenyl (42% chlorine) Aroclor® 1242 PCB Polychlorinated biphenyl	53469-21-9	None	0.5 mg/m^3 5 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, chloracne	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Total Petroleum Hydrocarbons TPH	143-07-7	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Total Xylenes Dimethylbenzene Xylol	1330-20-7	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Trichloroethylene Ethylene trichloride TCE Trichloroethene Trilene	79-01-6	PID	100 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Trichlorofluoromethane Fluorotrichloromethane Freon® 11 Monofluorotrichloromethane Refrigerant 11 Trichloromonofluoromethane	75-69-4	PID	1000 ppm 2000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	incoordination, tremor; dermatitis; cardiac arrhythmias, cardiac arrest; asphyxia; liquid: frostbite	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.2	Trivalent Chromium Chromium III Chromium, Trivalent	NA	None	1.0 mg/m³ 250 mg/m³	Groundwater Soil	inhalation absorption ingestion	irritation to eye, skin, and respiratory	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Vanadium	7440-62-2	None	0.1 mg/m3 15 mg/m3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.2	Zinc	7440-62-2	None	15 mg/m³ 500 mg/m³	Groundwater Soil	inhalation	chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function	Breathing: Respiratory support`

EXPLANATION OF ABBREVIATIONS

PID = Photoionization Detector
PEL = Permissible Exposure Limit (8-hour Time Weighted Average)
IDLH = Immediately Dangerous to Life and Health

ppm = part per million
mg/m^3 = milligrams per cubic meter

TABLE 3
Summary of Monitoring Equipment

Instrument	Operation Parameters
Photoionization Detector (PID)	**Hazard Monitored:** Many organic and some inorganic gases and vapors. **Application:** Detects total concentration of many organic and some inorganic gases and vapors. Some identification of compounds is possible if more than one probe is measured. **Detection Method:** Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions. **General Care/Maintenance:** Recharge or replace battery. Regularly clean lamp window. Regularly clean and maintain the instrument and accessories. **Typical Operating Time:** 10 hours. 5 hours with strip chart recorder.
Oxygen Meter	**Hazard Monitored:** Oxygen (O_2). **Application:** Measures the percentage of O_2 in the air. **Detection Method:** Uses an electrochemical sensor to measure the partial pressure of O_2 in the air, and converts the reading to O_2 concentration. **General Care/Maintenance:** Replace detector cell according to manufacturer's recommendations. Recharge or replace batteries prior to explanation of the specified interval. If the ambient air is less than 0.5% C O_2, replace the detector cell frequently. **Typical Operating Time:** 8 – 12 hours.
Additional equipment (if needed, based on site conditions)	
Combustible Gas Indicator (CGI)	**Hazard Monitored:** Combustible gases and vapors. **Application:** Measures the concentration of combustible gas or vapor. **Detection Method:** A filament, usually made of platinum, is heated by burning the combustible gas or vapor. The increase in heat is measured. Gases and vapors are ionized in a flame. A current is produced in proportion to the number of carbon atoms present. **General Care/Maintenance:** Recharge or replace battery. Calibrate immediately before use. **Typical Operating Time:** Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.
Flame Ionization Detector (FID) with Gas Chromatography Option *(i.e., Foxboro Organic Vapor Analyzer (OVA))*	**Hazard Monitored:** Many organic gases and vapors (approved areas only). **Application:** In survey mode, detects the concentration of many organic gases and vapors. In gas chromatography (GC) mode, identifies and measures specific compounds. In survey mode, all the organic compounds are ionized and detected at the same time. In GC mode, volatile species are separated. **General Care/Maintenance:** Recharge or replace battery. Monitor fuel and/or combustion air supply gauges. Perform routine maintenance as described in the manual. Check for leaks. **Typical Operating Time:** 8 hours; 3 hours with strip chart recorder.
Potable Infrared (IR) Spectrophotometer	**Hazard Monitored:** Many gases and vapors. **Application:** Measures concentration of many gases and vapors in air. Designed to quantify one or two component mixtures. **Detection Method:** Passes different frequencies of IR through the sample. The frequencies absorbed are specific for each compound. **General Care/Maintenance:** As specified by the manufacturer.

Instrument	Operation Parameters
Direct Reading Colorimetric Indicator Tube	**Hazard Monitored:** Specific gas and vapors. **Application:** Measures concentration of specific gases and vapors. **Detection Method:** The compound reacts with the indicator chemical in the tube, producing a stain whose length or color change is proportional to the compound's concentration. **General Care/Maintenance:** Do not use a previously opened tube even if the indicator chemical is not stained. Check pump for leaks before and after use. Refrigerate before use to maintain a shelf life of about 2 years. Check expiration dates of tubes. Calibrate pump volume at least quarterly. Avoid rough handling which may cause channeling.
Aerosol Monitor	**Hazard Monitored:** Airborne particulate (dust, mist, fume) concentrations **Application:** Measures total concentration of semi-volatile organic compounds, PCBs, and metals. **Detection Method:** Based on light-scattering properties of particulate matter. Using an internal pump, air sample is drawn into the sensing volume where near infrared light scattering is used to detect particles. **General Care/Maintenance:** As specified by the mfr. Also, the instrument must be calibrated with particulates of a size and refractive index similar to those to be measured in the ambient air.
Monitox	**Hazard Monitored:** Gases and vapors. **Application:** Measures specific gases and vapors. **Detection Method:** Electrochemical sensor relatively specific for the chemical species in question. **General Care/Maintenance:** Moisten sponge before use; check the function switch; change the battery when needed.
Gamma Radiation Survey Instrument	**Hazard Monitored:** Gamma Radiation. **Application:** Environmental radiation monitor. **Detection Method:** Scintillation detector. **General Care/Maintenance:** Must be calibrated annually at a specialized facility. **Typical Operating Time:** Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

TABLE 4
INSTRUMENTATION ACTION LEVELS

Photoionization Detector Action Levels	**Action Required**
Background to 5 ppm[1]	No Respirator, no further action
>5ppm but </= 15 ppm at the parameter of the work area	Work temporarily halted and monitoring continues If instantaneous readings decrease below 5 ppm above background, work activities will resume with continued monitoring
>5ppm but </= 25 ppm at the downwind parameter of the hot zone	Work activities will be halted Source of vapors identified Corrective actions taken to abate emissions Continued monitoring Workers will don appropriate respirators and work can resume if vapor levels 200 feet downwind or the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, Work can continue when vapor levels be whichever is less – but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average
>25ppm at the perimeter of the hot zone	Activities will shut down

Particulate Monitoring Action Levels	**Action Required**
Background to 100 micrograms per cubic meter (µg/m³)[2] , no dust observed	No further action
Background to 100 µg/m³, dust observed leaving the work area	Dust suppression must be employed
100 to 150 µg/m³ at the downwind perimeter of the hot zone	Work activities will be halted Source of dust identified Dust suppression activities initiated Corrective actions taken to abate emissions Continued monitoring Workers will don appropriate respirators Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM10 concentration to within 150 µg/m³ of the upwind level and in preventing visible dust migration.
>150 µg/m³ at the perimeter of the hot zone	Activities will shut down

[1] VOC concentrations are 15-minute averages above site background (upwind parameter)
[2] Particulate concentrations are 15 minute averages above site background (upwind parameter)

TABLE 5
EMERGENCY NOTIFICATION LIST

ORGANIZATION	CONTACT	TELEPHONE
Local Police Department		911
Local Fire Department		911
Ambulance/Rescue Squad		911
Hospital	Richmond University Medical Center	911 or 718-818-1234
Langan Incident Hotline		800-952-6426 ex 4699
Medical Treatment Hotline	Incident Intervention	888-449-7787
Langan Environmental Project Manager	Kimberly Semon	631-338-2036 (cell)
Langan Health and Safety Manager (HSM)	Tony Moffa	914-803-7130 (cell)
Langan Health & Safety Officer (HSO)	William Bohrer	410-984-3068 (cell)
Langan Field Team Leader (FTL)	To Be Determined	
Client's Representative	Donald Capoccia	718-422-9999
National Response Center (NRC)		800-424-8802
Chemical Transportation Emergency Center (Chemtrec)		800-424-9300
Center for Disease Control (CDC)		404-639-3534
EPA (RCRA Superfund Hotline)		800-424-9346
TSCA Hotline		202-554-1404
Poison Control Center		800-222-1222

Immediately following an injury, unless immediate emergency medical treatment is required, the injured employee must contact Incident Intervention® at 888-449-7787.

For all other incidents or near misses, unless emergency response is required, either the employee or a coworker must contact the Langan Incident Hotline at 1-(800)-9-LANGAN (ext. #4699).

TABLE 6
SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING
FOR FIT AND ACCLIMATED WORKERS[A]

Adjusted Temperature[b]	Normal Work Ensemble[c]	Impermeable Ensemble
90°F or above (32.2°C) or above	After each 45 min. of work	After each 15 min. of work
87.5°F (30.8°-32.2°C)	After each 60 min. of work	After each 30 min. of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 min. of work	After each 60 min. of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 min. of work	After each 90 min. of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 min. of work	After each 120 min. of work

a For work levels of 250 kilocalories/hour.

b Calculate the adjusted air temperature (ta adj) by using this equation: ta adj ^{o}F = ta ^{o}F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

c A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

TABLE 7

HEAT INDEX

	ENVIRONMENTAL TEMPERATURE (Fahrenheit)										
	70	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**
RELATIVE HUMIDITY	**APPARENT TEMPERATURE***										
0%	64	69	73	78	83	87	91	95	99	103	107
10%	65	70	75	80	85	90	95	100	105	111	116
20%	66	72	77	82	87	93	99	105	112	120	**130**
30%	67	73	78	84	90	96	104	113	123	**135**	**148**
40%	68	74	79	86	93	101	110	123	**137**	**151**	
50%	69	75	81	88	96	107	120	**135**	**150**		
60%	70	76	82	90	100	114	**132**	**149**			
70%	70	77	85	93	106	124	**144**				
80%	71	78	86	97	113	**136**					
90%	71	79	88	102	122						
100%	72	80	91	108							

*Combined Index of Heat and Humidity...what it "feels like" to the body
Source: National Oceanic and Atmospheric Administration

How to use Heat Index:
1. Across top locate Environmental Temperature
2. Down left side locate Relative Humidity
3. Follow across and down to find Apparent Temperature
4. Determine Heat Stress Risk on chart at right

Note: Exposure to full sunshine can increase Heat Index values by up to 15 degrees F.

Apparent Temperature	**Heat Stress Risk with Physical Activity and/or Prolonged Exposure**
90-105	Heat Cramps or Heat Exhaustion Possible
105-130	Heat Cramps or Heat Exhaustion Likely, Heat Stroke Possible
>130	Heatstroke Highly Likely

FIGURES

FIGURE 1

Site Location Map

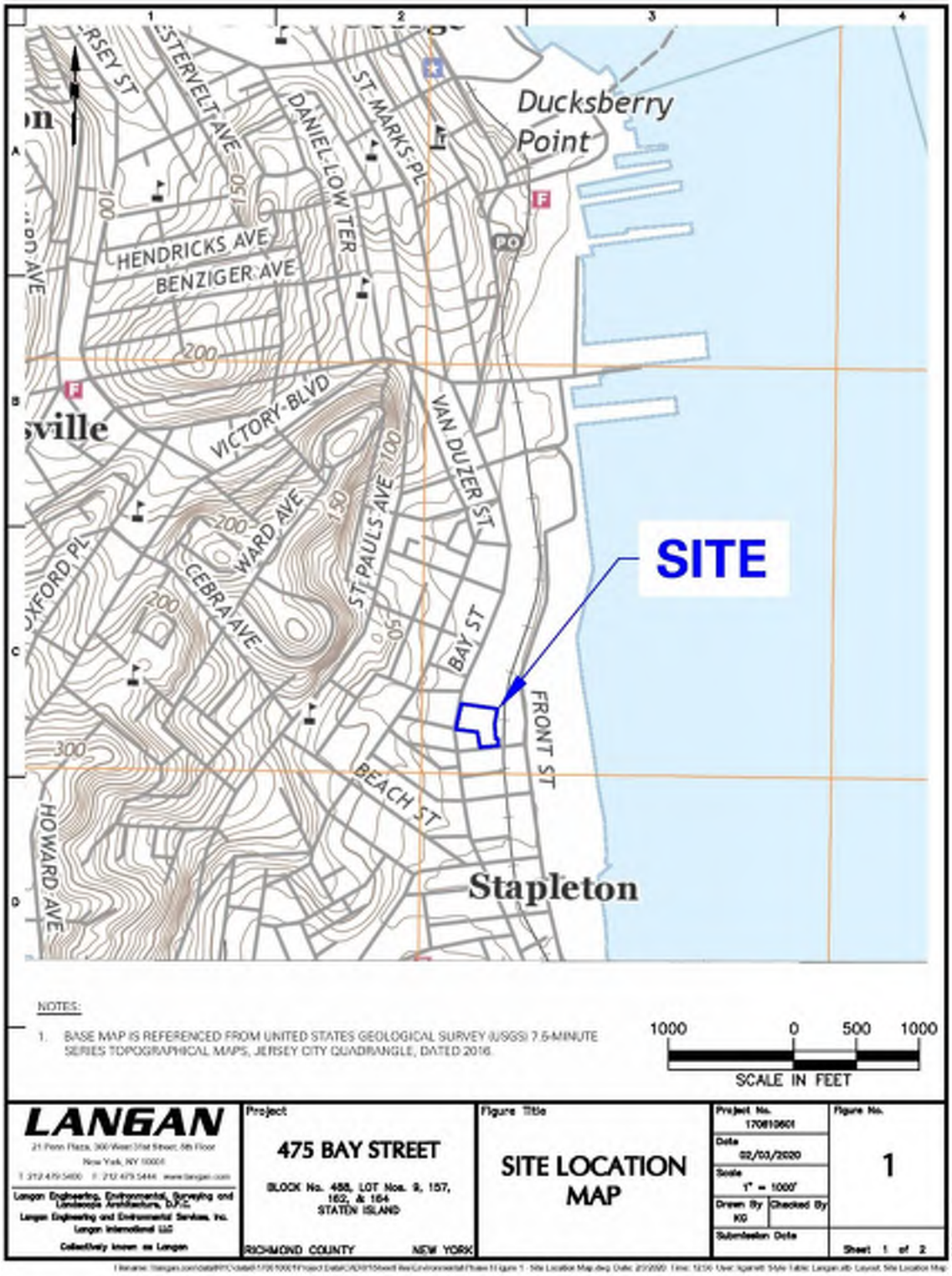


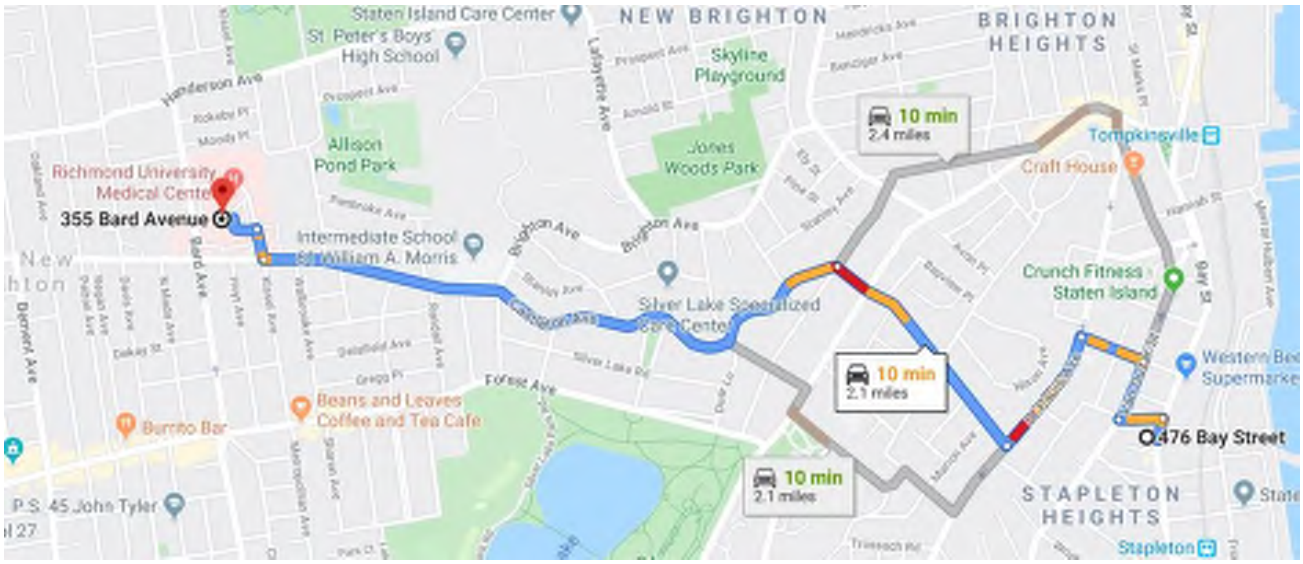
FIGURE 2
HOSPITAL ROUTE PLAN

Hospital Location: **Richmond University Medical Center**
355 Bard Avenue
Staten Island, New York
718-818-1234

START: 476 Bay Street, Staten Island, New York

1. Head north on Bay Street toward William Street
2. Turn left onto William Street
3. Turn right onto Van Duzer Street
4. Turn left onto Clinton Street
5. Turn left onto Saint Paul Avenue
6. Turn right onto Cebra Avenue
7. Continue onto Castleton Avenue
8. Turn right onto Kissel Avenue
9. Turn left into hospital complex, destination will be on the left.

END: Richmond University Medical Center, 355 Bard Avenue, Staten Island, New York



ATTACHMENT A

STANDING ORDERS

STANDING ORDERS

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 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.

ATTACHMENT B

DECONTAMINATION PROCEDURES

PERSONNEL DECONTAMINATION

LEVEL C DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask Change	4. If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6:	Face piece Removal	6. Face piece is removed (avoid touching face with fingers). Face piece deposited on plastic sheets.
Station 7:	Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

LEVEL D DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Boot, Gloves and Outer Garment Removal	4. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 5:	Field Wash	5. Hands and face are thoroughly washed. Shower as soon as possible.

EQUIPMENT DECONTAMINATION

GENERAL:

Equipment to be decontaminated during the project may include tools, monitoring equipment, respirators, sampling containers, laboratory equipment and drilling equipment.

All decontamination will be done by personnel in protective gear, appropriate for the level of decontamination, as determined by the site HSO. The decontamination work tasks will be split or rotated among support and work crews.

Depending on site conditions, backhoe and pumps may be decontaminated over a portable decontamination pad to contain wash water; or, wash water may be allowed to run off into a storm sewer system. Equipment needed may include a steam generator with high-pressure water, empty drums, screens, screen support structures, and shovels. Drums will be used to hold contaminated wash water pumped from the lined pit. These drums will be labeled as such.

Miscellaneous tools and equipment will be dropped into a plastic pail, tub, or other container. They will be brushed off and rinsed with a detergent solution, and finally rinsed with clean water.

MONITORING EQUIPMENT:

Monitoring equipment will be protected as much as possible from contamination by draping, masking, or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The PID, HNu or OVA meter, for example, can be placed in a clear plastic bag, which allows reading of the scale and operation of knobs. The probes can be partially wrapped keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe.

RESPIRATORS:

Respirators will be cleaned and disinfected after every use. Taken from the drop area, the masks (with the cartridges removed and disposed of with other used disposable gear) will be immersed in a cleaning solution and scrubbed gently with a soft brush, followed by a rinse in plain warm water, and then allowed to air dry. In the morning, new cartridges will be installed. Personnel will inspect their own masks for serviceability prior to donning them. And, once the mask is on, the wearer will check the respirator for leakage using the negative and positive pressure fit check techniques.

ATTACHMENT C

EMPLOYEE EXPOSURE/
INJURY INCIDENT REPORT

EMPLOYEE INCIDENT/INJURY REPORT
LANGAN ENGINEERING & ENVIRONMENTAL SERVICES

(Complete and return to Tony Moffa in the Doylestown Office)

Affected Employee Name: _____ Date: _____

Incident type: ☐ Injury ☐ Report Only/No Injury
☐ Near Miss ☐ Other: _____

EMPLOYEE INFORMATION (Person completing Form)

Employee Name: _____ Employee No: _____

Title: _____ Office Location: _____

Length of time employed or date of hire: _____

Mailing address: _____

Sex: M ☐ F ☐ Birth date: _____

Business phone & extension: _____ Residence/cell phone: _____

ACCIDENT INFORMATION

Project: _____ Project #: _____

Date & time of incident: _____ Time work started & ended: _____

Site location: _____

Incident Type: Possible Exposure ☐ Exposure ☐ Physical Injury ☐

Names of person(s) who witnessed the incident:_____

_____

Exact location incident occurred:

_____

_____

Describe work being done:_____

_____

_____

_____

Describe what affected employee was doing prior to the incident occurring:

_____

_____

_____

Describe in detail how the incident occurred:

_____

_____

_____

_____

Nature of the incident (List the parts of the body affected):

_____

_____

_____

_____

Person(s) to whom incident was reported (Time and Date):

_____

_____

List the names of other persons affected during this incident:

_____

_____

Possible causes of the incident (equipment, unsafe work practices, lack of PPE, etc.):

_____

_____

_____

Weather conditions during incident:

_____

MEDICAL CARE INFORMATION

Did affected employee receive medical care? Yes ☐ No ☐

If Yes, when and where was medical care received:_____

_____

Provide name of facility (hospital, clinic, etc.):

_____

_____

Length of stay at the facility?

_____

Did the employee miss any work time? Yes ☐ No ☐ Undetermined ☐

Date employee last worked: _____ Date employee returned to work:_____

Has the employee returned to work? Yes ☐ No ☐

Does the employee have any work limitations or restrictions from the injury? : Yes ☐ No ☐

If Yes, please describe:

_____

_____

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

If Yes, please describe:

_____

HEALTH & SAFETY INFORMATION

Was the operation being conducted under an established site specific HEALTH AND SAFETY PLAN?
Yes ☐ No ☐ Not Applicable: ☐

Describe protective equipment and clothing used by the employee:

_____

_____

_____

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

_____

_____

_____

_____

Employee Signature Date

_____

Langan Representative Date

ATTACHMENT D

CALIBRATION LOG

DATE:_____ PROJECT:_____

CALIBRATION LOG

Date & Time	Inst Type	Inst #	Media	Initial Reading	Span #	Calibrat. Reading	Performed By:

ATTACHMENT E

MATERIAL SAFETY DATA SHEETS

SAFETY DATA SHEETS

All Langan Field Personnel Completing This Work Plan Are To Have Real Time Accessibility To Material Safety Data Sheet (MSDs) or Safety Data Sheet (SDSs) Through Their Smart Phone.

The link is http://www.msds.com/
The login name is "drapehead"
The password is "2angan987"

If You Are Unable To Use the Smart Phone App, You Are To Bring Printed Copies of the MSDs/SDSs to the Site

SAFETY DATA SHEET

Version 4.10
Revision Date 01/28/2016
Print Date 02/18/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Biphenyl
Product Number	:	W312908
Brand	:	Aldrich
Index-No.	:	601-042-00-8
CAS-No.	:	92-52-4

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 #	:	(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
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
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)

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
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.
P271	Use only outdoors or in a well-ventilated area.

P273	Avoid release to the environment.
P280	Wear protective gloves/ 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 or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
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.
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	:	$C_{12}H_{10}$
Molecular weight	:	154.21 g/mol
CAS-No.	:	92-52-4
EC-No.	:	202-163-5
Index-No.	:	601-042-00-8

Hazardous components

Component	Classification	Concentration
Biphenyl		
	Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; Aquatic Acute 1; Aquatic Chronic 1; H315, H319, H335, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

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

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

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

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Biphenyl	92-52-4	TWA	0.2 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Pulmonary function		
		TWA	0.200000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Pulmonary function		

		TWA	0.2 ppm 1 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.200000 ppm 1.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	0.2 ppm 1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	0.200000 ppm 1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits

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: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 480 min
Material tested:Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 30 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Colour: light yellow
b)	Odour	characteristic
c)	Odour Threshold	No data available
d)	pH	5.5
e)	Melting point/freezing point	Melting point/range: 68 - 70 °C (154 - 158 °F) - lit.
f)	Initial boiling point and boiling range	255 °C (491 °F) - lit.
g)	Flash point	110 °C (230 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	The product is not flammable. - Flammability (solids)
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 5.8 %(V) Lower explosion limit: 0.6 %(V)
k)	Vapour pressure	0.04 hPa (0.03 mmHg) at 20 °C (68 °F) 5.5 hPa (4.1 mmHg) at 100 °C (212 °F) 12.6 hPa (9.5 mmHg) at 115 °C (239 °F) 95.7 hPa (71.8 mmHg) at 166 °C (331 °F)
l)	Vapour density	No data available
m)	Relative density	0.992 g/cm3
n)	Water solubility	0.0075 g/l at 15 °C (59 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 4.008 at 25 °C (77 °F)
p)	Auto-ignition temperature	566 °C (1,051 °F) at 1,013.0 hPa (759.8 mmHg)
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
Inhalation: No data available

LD50 Dermal - Rabbit - > 5,010 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Irritating to skin. - 24 h
(Draize Test)

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
Maximisation Test (GPMT) - Guinea pig
Does not cause skin sensitisation.
(OECD Test Guideline 406)

Germ cell mutagenicity
Ames test
S. typhimurium
Result: negative

Mouse - male and female
Result: negative

Carcinogenicity

Carcinogenicity - Mouse - Oral
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Blood:Tumors.

Carcinogenicity - Mouse - Subcutaneous
Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Liver:Tumors.

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: DU8050000

Liver injury may occur., Gastrointestinal disturbance

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 3 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	flow-through test EC50 - Daphnia magna (Water flea) - 0.36 mg/l - 48 h

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 14 d Result: 84 % - Readily biodegradable (OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation	Leuciscus idus (Golden orfe) - 3 d - 50 µg/l Bioconcentration factor (BCF): 281

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.

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. (Biphenyl)
Reportable Quantity (RQ): 100 lbs
Marine pollutant:yes
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. (Biphenyl)
Marine pollutant:yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Biphenyl)

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
Biphenyl	92-52-4	2007-07-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Biphenyl	92-52-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Biphenyl	92-52-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Biphenyl	92-52-4	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.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
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:	1
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	1
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 4.10 Revision Date: 01/28/2016 Print Date: 02/18/2016

SAFETY DATA SHEET

Version 4.4
Revision Date 08/21/2014
Print Date 11/14/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	1,2,3-Trichlorobenzene
Product Number	:	T54402
Brand	:	Aldrich
CAS-No.	:	87-61-6

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	+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)
Acute toxicity, Oral (Category 4), H302
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning

Hazard statement(s)

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H411	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.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P312	IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312	Call a POISON CENTER or doctor/ physician if you feel unwell.
P321	Specific treatment (see supplemental first aid instructions on this label).
P330	Rinse mouth.
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.
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	:	$C_6H_3Cl_3$
Molecular weight	:	181.45 g/mol
CAS-No.	:	87-61-6
EC-No.	:	201-757-1

Hazardous components

Component	Classification	Concentration
1,2,3-Trichlorobenzene		
	Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; Aquatic Acute 2; Aquatic Chronic 2; H302, H315, H319, H335, H411	-

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

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

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.Normal measures for preventive fire protection.
For precautions see section 2.2.

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

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

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

Personal protective equipment

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

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

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Colour: beige
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 51 - 53 °C (124 - 127 °F) - lit.
f)	Initial boiling point and boiling range	218 - 219 °C (424 - 426 °F) - lit.
g)	Flash point	127.0 °C (260.6 °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: 6.6 %(V) Lower explosion limit: 2.5 %(V)
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available

n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 4.016
p)	Auto-ignition temperature	571.0 °C (1,059.8 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Oxidizing agents

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 - 1,830 mg/kg

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

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

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

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

known or anticipated carcinogen by NTP.

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: DC2095000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Gambusia affinis (Mosquito fish) - 2.2 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 1.45 mg/l - 48 h

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 48 h - 0.0096 mg/l Bioconcentration factor (BCF): 710

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. 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: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (1,2,3-Trichlorobenzene)
Marine pollutant: No

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. (1,2,3-Trichlorobenzene)
Marine pollutant: Marine pollutant

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (1,2,3-Trichlorobenzene)

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,2,3-Trichlorobenzene	87-61-6	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,2,3-Trichlorobenzene	87-61-6	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,2,3-Trichlorobenzene	87-61-6	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Eye Irrit.	Eye irritation
H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H401	Toxic to aquatic life.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	1
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	1
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 4.4 Revision Date: 08/21/2014 Print Date: 11/14/2016

SAFETY DATA SHEET

Version 4.5
Revision Date 07/01/2014
Print Date 07/13/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	1,2,4,5-Tetramethylbenzene
Product Number	:	T19607
Brand	:	Aldrich
CAS-No.	:	95-93-2

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	+1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable solids (Category 1), H228

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H228	Flammable solid.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Durene 1,2,4,5-Tetramethylbenzene
Formula	:	$C_{10}H_{14}$
Molecular Weight	:	134.22 g/mol
CAS-No.	:	95-93-2
EC-No.	:	202-465-7

No ingredients are hazardous according to OSHA criteria.
No components need to be disclosed according to the applicable regulations.
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
Carbon oxides

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas.
For personal protection see section 8.

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

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed

containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

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

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

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

Personal protective equipment

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Colour: colourless
b)	Odour	no data available
c)	Odour Threshold	no data available
d)	pH	no data available
e)	Melting point/freezing point	Melting point/range: 76 - 80 °C (169 - 176 °F) - lit.
f)	Initial boiling point and boiling range	no data available
g)	Flash point	74 °C (165 °F) - closed cup
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	The substance or mixture is a flammable solid with the category 1.
j)	Upper/lower flammability or explosive limits	no data available
k)	Vapour pressure	no data available
l)	Vapour density	no data available
m)	Relative density	0.838 g/mL at 25 °C (77 °F)
n)	Water solubility	0.00348 g/l at 25 °C (77 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 4.17
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, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Strong oxidizing agents

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - rat - 6,989 mg/kg
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Lungs, Thorax, or Respiration:Dyspnea. Blood: Hemorrhage.

Inhalation: no data available

Dermal: no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

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

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

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

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

Reproductive toxicity
no data available

no data available

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Additional Information
RTECS: DC0500000

12. ECOLOGICAL INFORMATION

12.1 Toxicity

12.2 Persistence and degradability

Biodegradability Result: - Not biodegradable.

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.

no data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1325 Class: 4.1 Packing group: II
Proper shipping name: Flammable solids, organic, n.o.s. (1,2,4,5-Tetramethylbenzene)
Reportable Quantity (RQ):
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG

UN number: 1325 Class: 4.1 Packing group: II EMS-No: F-A, S-G
Proper shipping name: FLAMMABLE SOLID, ORGANIC, N.O.S. (1,2,4,5-Tetramethylbenzene)
Marine pollutant: No

IATA

UN number: 1325 Class: 4.1 Packing group: II
Proper shipping name: Flammable solid, organic, n.o.s. (1,2,4,5-Tetramethylbenzene)

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

SARA 311/312 Hazards

Fire Hazard

Massachusetts Right To Know Components

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

Pennsylvania Right To Know Components

CAS-No. Revision Date

1,2,4,5-Tetramethylbenzene	95-93-2

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,2,4,5-Tetramethylbenzene	95-93-2	

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.

H228	Flammable solid.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	3
Physical Hazard	3

NFPA Rating

Health hazard:	0
Fire Hazard:	3
Reactivity Hazard:	3

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 4.5 Revision Date: 07/01/2014 Print Date: 07/13/2017

Fisher Scientific
Part of Thermo Fisher Scientific

MATERIAL SAFETY DATA SHEET

Section 1 - Chemical Product and Company Identification

MSDS Name:	1,2,4-Trimethylbenzene
Catalog Numbers:	AC140090000, AC140090010, AC140090025, AC140095000
Synonyms:	Pseudocumene.
Company Identification:	Acros Organics BVBA Janssen Pharmaceuticalaan 3a 2440 Geel, Belgium
Company Identification: (USA)	Acros Organics One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	800-ACROS-01
For information in Europe, call:	+32 14 57 52 11
Emergency Number, Europe:	+32 14 57 52 99
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300
CHEMTREC Phone Number, Europe:	703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#:	95-63-6
Chemical Name:	1,2,4-Trimethylbenzene
%:	98
EINECS#:	202-436-9

Hazard Symbols: XN N

Risk Phrases: 10 20 36/37/38 51/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Warning! Flammable liquid and vapor. Harmful if inhaled. Causes eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Target Organs: Blood, central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye: Causes eye irritation. Causes redness and pain.

Skin: Causes skin irritation. Causes redness and pain. May be harmful if absorbed through the skin.

Ingestion: May cause irritation of the digestive tract. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May be harmful if swallowed. May cause central nervous system depression.

Inhalation: Harmful if inhaled. Causes respiratory tract irritation. May cause drowsiness, unconsciousness, and central nervous system depression.

Chronic: Prolonged or repeated skin contact may cause dermatitis. May cause anemia and other blood cell abnormalities. Prolonged exposure may produce a narcotic effect. Prolonged or repeated exposure may cause nausea, dizziness, and headache.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion: Do not induce vomiting. Possible aspiration hazard. Get medical aid immediately. Call a poison control center.

Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Possible aspiration hazard. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Notes to Physician:

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire. Containers may explode in the heat of a fire. Flammable liquid and vapor.

Extinguishing Media: Use water spray to cool fire-exposed containers. Use water spray, dry chemical, carbon dioxide, or chemical foam.

Autoignition Temperature: 500 deg C (932.00 deg F)

Flash Point: 48 deg C (118.40 deg F)

Explosion Limits: Lower: 0.9 vol %

Explosion Limits: Upper: 6.4 vol %

NFPA Rating: health: 2; flammability: 2; instability: 0;

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Use a spark-proof tool. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood. Keep away from heat, sparks and flame.

Storage: Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,2,4-Trimethylbenzene	25 ppm TWA (listed under Trimethyl benzene).	25 ppm TWA; 125 mg/m3 TWA	none listed

OSHA Vacated PELs: 1,2,4-Trimethylbenzene: 25 ppm TWA; 125 mg/m3 TWA (listed under Trimethyl benzene)

Engineering Controls:

Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.

Exposure Limits

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Color: colorless
Odor: aromatic odor
pH: Not available
Vapor Pressure: 7 mm Hg @ 44.4 deg C
Vapor Density: 4.15 (air=1)
Evaporation Rate: Not available
Viscosity: Not available
Boiling Point: 168 deg C @ 760 mmHg (334.40°F)
Freezing/Melting Point: -44 deg C (-47.20°F)
Decomposition Temperature: Not available
Solubility in water: Insoluble
Specific Gravity/Density: 0.880 g/cm3
Molecular Formula: C9H12
Molecular Weight: 120.19

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials Strong oxidizing agents.
Hazardous Decomposition Products Carbon monoxide, carbon dioxide.
Hazardous Polymerization Will not occur.

Section 11 - Toxicological Information

RTECS#: CAS# 95-63-6: DC3325000

LD50/LC50: RTECS:
CAS# 95-63-6: Inhalation, rat: LC50 = 18000 mg/m3/4H;
Oral, mouse: LD50 = 6900 mg/kg;
Oral, rat: LD50 = 5 gm/kg;
.

Carcinogenicity: 1,2,4-Trimethylbenzene - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.

Other: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: LC50 = 77.2 mg/L; 96 Hr; Flow-through at 25 C (pH 7.24)

Other: Do not empty into drains.

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: FLAMMABLE LIQUIDS, N.O.S. (1,2,4-Trimethylbenzene)
Hazard Class: 3
UN Number: UN1993
Packing Group: III
Canada TDG

Shipping Name: Not available
Hazard Class:
UN Number:
Packing Group:

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN N

Risk Phrases:

R 10 Flammable.

R 20 Harmful by inhalation.

R 36/37/38 Irritating to eyes, respiratory system and skin.

R 51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 95-63-6: 3

Canada

CAS# 95-63-6 is listed on Canada's DSL List

Canadian WHMIS Classifications: B3, D1B, D2B

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

CAS# 95-63-6 is listed on Canada's Ingredient Disclosure List

US Federal

TSCA

CAS# 95-63-6 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 5/19/1999

Revision #5 Date 8/30/2007

Revisions were made in Sections: 3, 4, 5, 6, 7, 8, 9, 10, 11, 1

SAFETY DATA SHEET

Version 5.4
Revision Date 12/01/2015
Print Date 02/18/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	1,2-Dichloroethylene, mixture of *cis* and *trans*
Product Number	:	D62403
Brand	:	Aldrich
Index-No.	:	602-026-00-3
CAS-No.	:	540-59-0

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)
Flammable liquids (Category 2), H225
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 4), H332
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)

H225	Highly flammable liquid and vapour.
H302 + H332	Harmful if swallowed or if inhaled
H412	Harmful to aquatic life with long lasting effects.

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.
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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312	IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P312	Call a POISON CENTER or doctor/ physician if you feel unwell.
P330	Rinse mouth.
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

Formula	:	$C_2H_2Cl_2$
Molecular weight	:	96.94 g/mol
CAS-No.	:	540-59-0
EC-No.	:	208-750-2
Index-No.	:	602-026-00-3

Hazardous components

Component	Classification	Concentration
1,2-Dichloroethylene		
	Flam. Liq. 2; Acute Tox. 4; Aquatic Acute 3; Aquatic Chronic 3; H225, H302 + H332, H412	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
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
Carbon oxides, Hydrogen chloride gas

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. Discharge into the environment must be avoided.

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.

Air, light, and moisture sensitive.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,2-Dichloroethylene	540-59-0	TWA	200.000000 ppm 790.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	200.000000 ppm 790.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	The value in mg/m3 is approximate.		
		TWA	200.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Eye irritation		
		TWA	200.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Eye irritation		
		TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Eye irritation		

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, 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. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance — Form: liquid
Colour: colourless

b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -57 °C (-71 °F) - lit.
f)	Initial boiling point and boiling range	48 - 60 °C (118 - 140 °F) - lit.
g)	Flash point	6 °C (43 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	1.265 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
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Strong oxidizing agentsOxidizing agents, Bases

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 770 mg/kg

Dermal: No data available

No data available

Skin corrosion/irritation
Skin - Rabbit

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: KV9360000

prolonged or repeated exposure can cause:, narcosis, 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	LC50 - Lepomis macrochirus (Bluegill) - 140.0 mg/l - 96.0 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.
Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene

Poison Inhalation Hazard: No

IMDG
UN number: 1150 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: 1,2-DICHLOROETHYLENE

IATA
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene

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
1,2-Dichloroethylene	540-59-0	2007-07-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,2-Dichloroethylene	540-59-0	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,2-Dichloroethylene	540-59-0	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,2-Dichloroethylene	540-59-0	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
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H302	Harmful if swallowed.
H302 + H332	Harmful if swallowed or if inhaled

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	1
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 5.4 Revision Date: 12/01/2015 Print Date: 02/18/2016

Material Safety Data Sheet

Version 3.1
Revision Date 04/08/2011
Print Date 12/27/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	1,3,5-Trimethylbenzene
Product Number	:	442236
Brand	:	Supelco
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid, Target Organ Effect, Irritant

Target Organs

Peripheral nervous system., Central nervous system, Blood

GHS Classification
Flammable liquids (Category 3)
Acute toxicity, Inhalation (Category 5)
Skin irritation (Category 2)
Eye irritation (Category 2B)
Specific target organ toxicity - single exposure (Category 3)
Acute aquatic toxicity (Category 2)
Chronic aquatic toxicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning

Hazard statement(s)

H226	Flammable liquid and vapour.
H315 + H320	Causes skin and eye irritation.
H333	May be harmful if inhaled.
H335	May cause respiratory irritation.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P273	Avoid release to the environment.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	2
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	2
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms	:	Mesitylene 1,3,5-Trimethylbenzene
Formula	:	C_9H_{12}
Molecular Weight	:	120.19 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Mesitylene			
108-67-8	203-604-4	601-025-00-5	-

4. FIRST AID MEASURES

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

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

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, 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.

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

Methods and materials for containment and cleaning up
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).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Mesitylene	108-67-8	TWA	25 ppm 125 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	25 ppm 123 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		TWA	25 ppm 125 mg/m3	USA. NIOSH Recommended Exposure Limits

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

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

Skin and body protection
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.

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

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form liquid, clear

Colour	colourless

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: -45 °C (-49 °F) - lit.
Boiling point	163 - 166 °C (325 - 331 °F) - lit.
Flash point	53.0 °C (127.4 °F) - closed cup
Ignition temperature	550 °C (1,022 °F)
Autoignition temperature	550.0 °C (1,022.0 °F)
Lower explosion limit	0.88 %(V)
Vapour pressure	18.7 hPa (14.0 mmHg) at 55.0 °C (131.0 °F) 3.3 hPa (2.5 mmHg) at 25.0 °C (77.0 °F)
Density	0.864 g/cm3 at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
Inhalation LC50
LC50 Inhalation - rat - 4 h - 24,000 mg/m3

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
Skin - rabbit - Skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - rabbit - Mild eye irritation - 24 h

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

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

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
May cause respiratory irritation.

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

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

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

Synergistic effects
no data available

Additional Information
RTECS: OX6825000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Carassius auratus (goldfish) - 12.52 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - 6 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

Toxic to aquatic life with long lasting effects.

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

13. DISPOSAL CONSIDERATIONS

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: 2325 Class: 3 Packing group: III
Proper shipping name: 1,3,5-Trimethylbenzene
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 2325 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: 1,3,5-TRIMETHYLBENZENE
Marine pollutant: No

IATA
UN number: 2325 Class: 3 Packing group: III
Proper shipping name: 1,3,5-Trimethylbenzene

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid, Target Organ Effect, Irritant

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

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

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Mesitylene	108-67-8	1994-04-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Mesitylene	108-67-8	1994-04-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Mesitylene	108-67-8	1994-04-01

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

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SAFETY DATA SHEET

Version 4.6
Revision Date 03/03/2015
Print Date 03/03/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	1,3-Butadiene
Product Number	:	295035
Brand	:	Aldrich
Index-No.	:	601-013-00-X
CAS-No.	:	106-99-0

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable gases (Category 1), H220
Gases under pressure (Liquefied gas), H280
Germ cell mutagenicity (Category 1B), H340
Carcinogenicity (Category 1A), H350

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H340	May cause genetic defects.
H350	May cause cancer.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P281	Use personal protective equipment as required.

P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.
P405	Store locked up.
P410 + P403	Protect from sunlight. Store in a well-ventilated place.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	C_4H_6
Molecular weight	:	54.09 g/mol
CAS-No.	:	106-99-0
EC-No.	:	203-450-8
Index-No.	:	601-013-00-X

Hazardous components

Component	Classification	Concentration
1,3-Butadiene		
	Flam. Gas 1; Press. Gas Liquefied gas; Muta. 1B; Carc. 1A; H220, H280, H340, H350	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Clean up promptly by sweeping or vacuum.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Recommended storage temperature 2 - 8 °C

Contents under pressure. Air sensitive. Light sensitive. Shock or heat may detonate May explode when heated. Handle and store under inert gas.
Storage class (TRGS 510): Gases

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 See Appendix A		
1,3-Butadiene	106-99-0	TWA	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Cancer Suspected human carcinogen		
		TWA	2.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Cancer Suspected human carcinogen		
		TWA	1 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Substance listed; for more information see OSHA document 29 CFR 1910.1051; 29 CFR 1910.19(1)		
		TWA	1.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Substance listed; for more information see OSHA document 29 CFR 1910.1051; 29 CFR 1910.19(1)		

		STEL	5 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Substance listed; for more information see OSHA document 29 CFR 1910.1051; 29 CFR 1910.19(1)		
		STEL	5.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Substance listed; for more information see OSHA document 29 CFR 1910.1051; 29 CFR 1910.19(1)		
		See 1910.1051		
		PEL	1.000000 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		1910.1051 This section applies to all occupational exposures to 1,3-Butadiene (BD), Chemical Abstracts Service Registry No. 106-99-0, except as provided in paragraph (a)(2) of this section. Except for the recordkeeping provisions in paragraph (m)(1) of this section, this section does not apply to the processing, use, or handling of products containing BD or to other work operations and streams in which BD is present where objective data are reasonably relied upon that demonstrate the work operation or the product or the group of products or operations to which it belongs may not reasonably be foreseen to release BD in airborne concentrations at or above the action level or in excess of the STEL under the expected conditions of processing, use, or handling that will cause the greatest possible release or in any plausible accident. This section also does not apply to work operations, products or streams where the only exposure to BD is from liquid mixtures containing 0.1% or less of BD by volume or the vapors released from such liquids, unless objective data become available that show that airborne concentrations generated by such mixtures can exceed the action level or STEL under reasonably predictable conditions of processing, use or handling that will cause the greatest possible release. Except for labeling requirements and requirements for emergency response, this section does not apply to the storage, transportation, distribution or sale of BD or liquid mixtures in intact containers or in transportation pipelines sealed in such a manner as to fully contain BD vapors or liquid. Where products or processes containing BD are exempted under paragraph (a)(2) of this section, the employer shall maintain records of the objective data supporting that exemption and the basis for the employer's reliance on the data, as provided in paragraph (m)(1) of this section 1,3-Butadiene means an organic compound with chemical formula CH2=CH-CH=CH2 that has a molecular weight of approximately 54.15 g/mole OSHA specifically regulated carcinogen		
		STEL	5.000000 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		1910.1051 This section applies to all occupational exposures to 1,3-Butadiene (BD), Chemical Abstracts Service Registry No. 106-99-0, except as provided in paragraph (a)(2) of this section. Except for the recordkeeping provisions in paragraph (m)(1) of this section, this section does not apply to the processing, use, or handling of products containing BD or to other work operations and streams in which BD is present where objective data are reasonably relied upon that demonstrate the work operation or the product or the group of products or operations to which it belongs may not reasonably be foreseen to release BD in airborne concentrations at or above the		

		action level or in excess of the STEL under the expected conditions of processing, use, or handling that will cause the greatest possible release or in any plausible accident. This section also does not apply to work operations, products or streams where the only exposure to BD is from liquid mixtures containing 0.1% or less of BD by volume or the vapors released from such liquids, unless objective data become available that show that airborne concentrations generated by such mixtures can exceed the action level or STEL under reasonably predictable conditions of processing, use or handling that will cause the greatest possible release. Except for labeling requirements and requirements for emergency response, this section does not apply to the storage, transportation, distribution or sale of BD or liquid mixtures in intact containers or in transportation pipelines sealed in such a manner as to fully contain BD vapors or liquid. Where products or processes containing BD are exempted under paragraph (a)(2) of this section, the employer shall maintain records of the objective data supporting that exemption and the basis for the employer's reliance on the data, as provided in paragraph (m)(1) of this section 1,3-Butadiene means an organic compound with chemical formula CH2=CH-CH=CH2 that has a molecular weight of approximately 54.15 g/mole OSHA specifically regulated carcinogen

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
1,3-Butadiene	106-99-0	1,2 Dihydroxy-4-(N-acetylcysteinyl)-butane	2.5000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			
		Mixture of N-1 and N-2(hydroxybutenyl)valine	2.5pmol/g	Hemoglobin (Hb) adducts in blood	ACGIH - Biological Exposure Indices (BEI)
		Not critical			

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: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Liquefied gas
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -109 °C (-164 °F) - lit.
f)	Initial boiling point and boiling range	-4.5 °C (23.9 °F) - lit.
g)	Flash point	-75.99 °C (-104.78 °F) - closed cup - Tested according to Annex V of Directive 67/548/EEC.
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 16.3 %(V) Lower explosion limit: 1.4 %(V)
k)	Vapour pressure	ca.2,400 hPa (1,800 mmHg) at 20 °C (68 °F) 3,200 hPa (2,400 mmHg) at 30 °C (86 °F) 5,700 hPa (4,275 mmHg) at 50 °C (122 °F)
l)	Vapour density	No data available
m)	Relative density	0.62 g/cm3 at 20 °C (68 °F)
n)	Water solubility	0.5 g/l at 20 °C (68 °F) - Tested according to Annex V of Directive 67/548/EEC.
o)	Partition coefficient: n-octanol/water	log Pow: 1.85 at 23 °C (73 °F)
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
Test for peroxide formation before using or discard after 3 months.
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Oxidizing agents, Oxygen, Copper, Copper alloys, Carbides, Halogens, Metal oxides, 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
LD50 Oral - Rat - 5,480 mg/kg

LC50 Inhalation - Rat - 4 h - 285 mg/l

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
In vivo tests showed mutagenic effects

Carcinogenicity

Carcinogenicity - Rat - Inhalation
Tumorigenic:Carcinogenic by RTECS criteria. Cardiac:Tumors. Lungs, Thorax, or Respiration:Tumors.

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

Human carcinogen.

IARC: 1 - Group 1: Carcinogenic to humans (1,3-Butadiene)

NTP: Known to be human carcinogen (1,3-Butadiene)

OSHA: OSHA specifically regulated carcinogen (1,3-Butadiene)

Reproductive toxicity
No data available

Reproductive toxicity - Mouse - Inhalation
Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

No data available

Developmental Toxicity - Rat - Inhalation
Specific Developmental Abnormalities: Musculoskeletal system.

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

Cholinesterase inhibitors can cause heavy salivation and secretion in the lungs, lachrymation, blurred vision, involuntary defecation, diarrhea, tremor, ataxia, sweating, hypothermia, lowered heart rate, and/or a fall in blood pressure as a result of their action at cholinergic nerve sites., narcosis, Headache, Nausea, Vomiting, Dizziness, Drowsiness, Confusion., Weakness, Muscle cramps/spasms., Change in pupil size., Tremors, Seizures., Incoordination., Convulsions, Coma

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - other fish - 71.5 mg/l - 24 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

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

12.6 Other adverse effects

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: 1010 Class: 2.1
Proper shipping name: Butadienes, stabilized
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1010 Class: 2.1 EMS-No: F-D, S-U
Proper shipping name: BUTADIENES, STABILIZED

IATA
UN number: 1010 Class: 2.1
Proper shipping name: Butadienes, stabilized
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
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
1,3-Butadiene	106-99-0	1993-04-24

SARA 311/312 Hazards
Fire Hazard, Sudden Release of Pressure Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,3-Butadiene	106-99-0	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,3-Butadiene	106-99-0	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,3-Butadiene	106-99-0	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. 1,3-Butadiene	106-99-0	2007-09-28
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. 1,3-Butadiene	106-99-0	2007-09-28

16. OTHER INFORMATION

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

Carc.	Carcinogenicity
Flam. Gas	Flammable gases
H220	Extremely flammable gas.

H280	Contains gas under pressure; may explode if heated.
H340	May cause genetic defects.
H350	May cause cancer.
Muta.	Germ cell mutagenicity
Press. Gas	Gases under pressure

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	3

NFPA Rating

Health hazard:	0
Fire Hazard:	4
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 03/03/2015 Print Date: 03/03/2016

SAFETY DATA SHEET

Version 4.5
Revision Date 01/18/2016
Print Date 02/09/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	2,4-Dimethylphenol
Product Number	:	D174203
Brand	:	Aldrich
Index-No.	:	604-006-00-X
CAS-No.	:	105-67-9

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, Dermal (Category 3), H311
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
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

Signal word: Danger

Hazard statement(s)

H301 + H311	Toxic if swallowed or in contact with skin
H314	Causes severe skin burns and eye damage.
H401	Toxic to aquatic life.

Precautionary statement(s)

P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face

	protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/ physician.
P322	Specific measures (see supplemental first aid instructions on this label).
P361	Remove/Take off immediately all contaminated clothing.
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

Synonyms	:	4-Hydroxy-*m*-xylene asym.-*m*-Xylenol
Formula	:	$C_8H_{10}O$
Molecular weight	:	122.16 g/mol
CAS-No.	:	105-67-9
EC-No.	:	203-321-6
Index-No.	:	604-006-00-X

Hazardous components

Component	Classification	Concentration
2,4-Xylenol		
	Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 2; H301 + H311, H314, 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
Take off contaminated clothing and shoes immediately. 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.Continue rinsing eyes during transport to hospital.

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
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
Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

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

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

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

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

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
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

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

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 60 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
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Semi-solid melting to a liquid, clear Colour: brown
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 22 - 23 °C (72 - 73 °F) - lit.
f)	Initial boiling point and boiling range	211 - 212 °C (412 - 414 °F) - lit.
g)	Flash point	94.0 °C (201.2 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	0.1 hPa (0.1 mmHg) at 25.0 °C (77.0 °F)
l)	Vapour density	No data available

m)	Relative density	1.011 g/cm3 at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 2.35
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
Bases, Acid chlorides, Acid anhydrides, Oxidizing agents, Brass, Copper

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 - 3,200 mg/kg

Inhalation: No data available

LD50 Dermal - Rat - 1,040 mg/kg

No data available

Skin corrosion/irritation
Causes burns.

Serious eye damage/eye irritation
Risk of serious damage to eyes.

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

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

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

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

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: ZE5600000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 9.2 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	LC50 - Daphnia magna (Water flea) - 2.1 mg/l - 48 h

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 28 d - 0.0102 mg/l Bioconcentration factor (BCF): 150

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. 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: 2261 Class: 6.1 Packing group: II
Proper shipping name: Xylenols, solid
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 2261 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: XYLENOLS, SOLID

IATA
UN number: 2261 Class: 6.1 Packing group: II
Proper shipping name: Xylenols, solid

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
2,4-Xylenol	105-67-9	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2,4-Xylenol	105-67-9	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,4-Xylenol	105-67-9	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,4-Xylenol	105-67-9	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
Aquatic Acute	Acute aquatic toxicity
Eye Dam.	Serious eye damage
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.

HMIS Rating
Health hazard: 3
Chronic Health Hazard:
Flammability: 1

Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	1
Reactivity Hazard:	0

Further information

Preparation Information

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

Version: 4.5 Revision Date: 01/18/2016 Print Date: 02/09/2016

MATERIAL SAFETY DATA SHEET

Date Printed: 05/24/2004
Date Updated: 03/10/2004
Version 1.5

Section 1 - Product and Company Information

Product Name	2-BUTANONE, 99.5+%, HPLC GRADE
Product Number	270695
Brand	ALDRICH
Company	Sigma-Aldrich
Street Address	3050 Spruce Street
City, State, Zip, Country	SAINT LOUIS MO 63103 US
Technical Phone:	314 771 5765
Emergency Phone:	414 273 3850 Ext. 5996
Fax:	800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
2-BUTANONE	78-93-3	Yes

Formula C4H8O

Synonyms Acetone, methyl- * Aethylmethylketon (German) * Butanone * 2-Butanone (OSHA) * Butanone 2 (French) * 3-Butanone * Ethyl methyl cetone (French) * Ethylmethylketon (Dutch) * Ketone, ethyl methyl * Meetco * MEK (OSHA) * Methyl acetone * Methyl ethyl ketone (ACGIH:OSHA) * Metiletilchetone (Italian) * Metyloetyloketon (Polish) * RCRA waste number U159

RTECS Number: EL6475000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Flammable (USA) Highly Flammable (EU). Irritant.
Irritating to respiratory system and skin. Risk of serious damage to eyes. Vapors may cause drowsiness and dizziness.
Target organ(s): Central nervous system.

HMIS RATING
- HEALTH: 2*
- FLAMMABILITY: 3
- REACTIVITY: 1

NFPA RATING
- HEALTH: 2
- FLAMMABILITY: 3
- REACTIVITY: 1

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

FLAMMABLE HAZARDS
Flammable Hazards: Yes

EXPLOSION HAZARDS
Vapor may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions.

FLASH POINT
30 ˚F -1 ˚C Method: closed cup

EXPLOSION LIMITS
Lower: 1.8 % Upper: 10.1 %

AUTOIGNITION TEMP
516 ˚C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Flammable liquid. Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area. Shut off all sources of ignition. Use nonsparking tools.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Keep away from heat, sparks, and open flame. Store in a cool dry place. Store under nitrogen.

SPECIAL REQUIREMENTS
Hygroscopic.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Use nonsparking tools. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Remove and wash contaminated clothing promptly. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	STEL	300 PPM
USA	ACGIH	TWA	200 PPM
USA	MSHA Standard-air	TWA	200 PPM (590 MG/M3)
USA	OSHA.	PEL	8H TWA 200 PPM (590 MG/M3)
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	200 PPM
		STEL	300 PPM

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	200 MG/M3
Poland		NDSCh	850 MG/M3
Poland		NDSP	-

Section 9 - Physical/Chemical Properties

Appearance
Physical State: Clear liquid
Color: Colorless

Property	Value	At Temperature or Pressure
Molecular Weight	72.11 AMU	
pH	N/A	
BP/BP Range	79 - 80 ˚C	
MP/MP Range	-87 ˚C	
Freezing Point	-85.9 ˚C	
Vapor Pressure	71 mmHg	20 ˚C
Vapor Density	2.49 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	0.804 g/cm3	

Bulk Density	N/A	
Odor Threshold	5.4 - 1 ppm	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	0.4 Pas	25 ˚C
Surface Tension	24.6 mN/m	20 ˚C
Partition Coefficient	Log Kow: 0.29	
Decomposition Temp.	N/A	
Flash Point	30 ˚F -1 ˚C	Method: closed cup
Explosion Limits	Lower: 1.8 % Upper: 10.1 %	
Flammability	N/A	
Autoignition Temp	516 ˚C	
Refractive Index	1.379	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	Solubility in Water:soluble Other Solvents: ALCOHOL, ETHER, ACETONE BENZENE	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Conditions to Avoid: Protect from moisture.
Materials to Avoid: Oxidizing agents, Strong reducing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes severe eye irritation.
Inhalation: Material is irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Central nervous system.

SIGNS AND SYMPTOMS OF EXPOSURE
Can cause CNS depression. Exposure can cause: Gastrointestinal disturbances. Narcotic effect.

TOXICITY DATA

Oral
Rat
2737 mg/kg
LD50

Inhalation
Rat
23,500 mg/m3
LC50

Intraperitoneal
Rat
607 MG/KG
LD50

Oral
Mouse
4050 mg/kg
LD50

Inhalation
Mouse
32,000 mg/m3
LC50

Intraperitoneal
Mouse
616 MG/KG
LD50

Skin
Rabbit
6480 mg/kg
LD50

Inhalation
Mammal
38,000 mg/m3
LC50

IRRITATION DATA

Eyes
Human
350 ppm

Skin
Rabbit
500 mg
24H
Remarks: Moderate irritation effect

Skin
Rabbit
402 mg
24H
Remarks: Mild irritation effect

Skin
Rabbit
13.78 mg
24H
Remarks: Open irritation test

Eyes
Rabbit
80 mg

CHRONIC EXPOSURE - TERATOGEN

Species: Rat
Dose: 3000 PPM/7H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Specific Developmental Abnormalities: Craniofacial (including nose and tongue). Specific Developmental Abnormalities: Urogenital system. Specific Developmental Abnormalities: Homeostasis

Species: Rat
Dose: 1000 PPM/7H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system.

Species: Mouse
Dose: 3000 PPM/7H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 24 h
Value: 7,060 mg/l

Test Type: LC50 Fish
Species: Leuciscus idus
Time: 48 h
Value: 4,600 - 4,880 mg/l

Test Type: LC50 Fish
Species: Pimephales promelas (Fathead minnow)
Time: 96 h
Value: 3,130 - 3,320 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Ethyl methyl ketone [or] Methyl ethyl ketone
UN#: 1193
Class: 3

Packing Group: Packing Group II
Hazard Label: Flammable liquid
PIH: Not PIH

IATA
Proper Shipping Name: Methyl ethyl ketone
IATA UN Number: 1193
Hazard Class: 3
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: F Xi
Indication of Danger: Highly Flammable. Irritant.
R: 11 36 66 67
Risk Statements: Highly flammable. Irritating to eyes. Repeated exposure may cause skin dryness or cracking. Vapors may cause drowsiness and dizziness.
S: 9 16
Safety Statements: Keep container in a well-ventilated place. Keep away from sources of ignition - no smoking.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Flammable (USA) Highly Flammable (EU). Irritant.
Risk Statements: Irritating to respiratory system and skin. Risk of serious damage to eyes. Vapors may cause drowsiness and dizziness.
Safety Statements: Keep away from sources of ignition - no smoking. Take precautionary measures against static discharges. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear eye/face protection.
US Statements: Target organ(s): Central nervous system.

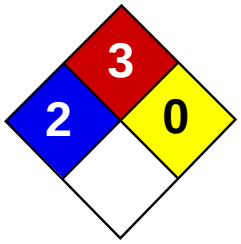
UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
2-Hexanone MSDS

Section 1: Chemical Product and Company Identification

Product Name: 2-Hexanone

Catalog Codes: SLH2950

CAS#: 591-78-6

RTECS: MP1400000

TSCA: TSCA 8(b) inventory: 2-Hexanone

CI#: Not available.

Synonym: Methyl butyl ketone

Chemical Formula: C6H12O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{2-}Hexanone	591-78-6	100

Toxicological Data on Ingredients: 2-Hexanone: ORAL (LD50): Acute: 2590 mg/kg [Rat]. 2430 mg/kg [Mouse]. DERMAL (LD50): Acute: 4860 mg/kg [Rabbit]. VAPOR (LC50): Acute: 8000 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of inhalation (lung irritant). Hazardous in case of skin contact (irritant), of ingestion, . Slightly hazardous in case of skin contact (permeator). Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

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

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

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

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 533°C (991.4°F)

Flash Points: CLOSED CUP: 23°C (73.4°F). OPEN CUP: 28°C (82.4°F) (TAG).

Flammable Limits: LOWER: 1.2% UPPER: 8%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 25 CEIL: 40 (ppm) TWA: 100 CEIL: 165 (mg/m3) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 100.16 g/mole

Color: Colorless to light yellow.

pH (1% soln/water): Not available.

Boiling Point: 127.5°C (261.5°F)

Melting Point: -56.9°C (-70.4°F)

Critical Temperature: Not available.

Specific Gravity: 0.8113 (Water = 1)

Vapor Pressure: 12 mm of Hg (@ 20°C)

Vapor Density: 3.45 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.18 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, acetone.

Solubility:

Easily soluble in acetone. Partially soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2430 mg/kg [Mouse]. Acute dermal toxicity (LD50): 4860 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 8000 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Very hazardous in case of inhalation (lung irritant). Hazardous in case of skin contact (irritant), of ingestion, . Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in animal. Testicular damage in animal.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Ketone Liquid, n.o.s.(2-Hexanone) : UN1224 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Rhode Island RTK hazardous substances: 2-Hexanone Pennsylvania RTK: 2-Hexanone Florida: 2-Hexanone Massachusetts RTK: 2-Hexanone New Jersey: 2-Hexanone TSCA 8(b) inventory: 2-Hexanone

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

DSCL (EEC):
R10- Flammable. R37/38- Irritating to respiratory system and skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:43 PM

Last Updated: 05/21/2013 12:00 PM

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

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

1. Identification

Product Name **2-Methylnaphthalene, 99% (gc)**

Cat No. : **AC414551000; AC414555000**

Synonyms No information available

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)

Acute oral toxicity	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
Warning

Hazard Statements
Harmful 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
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
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: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
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)
Toxic to aquatic life with long lasting effects

3. Composition / information on ingredients

Component	CAS-No	Weight %
2-Methylnaphthalene	91-57-6	99.0

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
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	1	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
2-Methylnaphthalene	TWA: 0.5 ppm Skin		

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
2-Methylnaphthalene			TWA: 0.5 ppm Skin

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

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	Solid
Appearance	No information available
Odor	Odorless
Odor Threshold	No information available
pH	
Melting Point/Range	37 38 °C
Boiling Point/Range	°C
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	< 1 mmHg @ 25 °C
Vapor Density	No information available
Relative Density	1.0000
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	C11H10
Molecular Weight	142.20

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

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-Methylnaphthalene	1630 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.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
2-Methylnaphthalene	91-57-6	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.

12. Ecological information

Ecotoxicity
Do not empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
2-Methylnaphthalene	Not listed	Pimephales promelas:LC50 = 2.5mg/L	Not listed	EC50 = 1.5 mg/L/48h

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

Mobility No information available.

Component	log Pow
2-Methylnaphthalene	3.86

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
2-Methylnaphthalene	X	X	-	202-078-3	-		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	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 does not contain any Proposition 65 chemicals

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
2-Methylnaphthalene	-	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 D1B Toxic materials

D2B Toxic materials

16. Other information

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

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

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

End of SDS

SAFETY DATA SHEET

Version 5.1
Revision Date 06/26/2014
Print Date 05/11/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	4,4′-DDD
Product Number	:	35486
Brand	:	Sigma-Aldrich
CAS-No.	:	72-54-8

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Dermal (Category 4), H312
Carcinogenicity (Category 2), H351
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.

P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P322	Specific measures (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P363	Wash contaminated clothing 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	:	1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane TDE
Formula	:	$C_{14}H_{10}Cl_4$
Molecular Weight	:	320.04 g/mol
CAS-No.	:	72-54-8
EC-No.	:	200-783-0

Hazardous components

Component	Classification	Concentration
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane		
	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H410	-

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

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

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed

no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas
Nature of decomposition products not known.

5.3 Advice for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information

no data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.Normal measures for preventive fire protection.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

7.3 Specific end use(s)

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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
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.

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	94.0 - 96.0 °C (201.2 - 204.8 °F)
f)	Initial boiling point and boiling range	193.0 °C (379.4 °F) at 1.3 hPa (1.0 mmHg)
g)	Flash point	no data available
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	no data available
j)	Upper/lower flammability or explosive limits	no data available
k)	Vapour pressure	< 0.00001 hPa (< 0.00001 mmHg) at 25.0 °C (77.0 °F)
l)	Vapour density	no data available
m)	Relative density	1.38 g/cm3
n)	Water solubility	no data available
o)	Partition coefficient: n-octanol/water	log Pow: 6.02
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
LD50 Oral - Hamster - > 5,000 mg/kg

TDLo Oral - Human - 428.5 mg/kg
Remarks: Endocrine:Adrenal cortex hypoplasia.

TDLo Oral - rat - 6,000 mg/kg
Remarks: Cardiac:Other changes. Gastrointestinal:Other changes. Kidney, Ureter, Bladder:Changes in both tubules and glomeruli.

TDLo Oral - rat - 14 mg/kg
Remarks: Liver:Changes in liver weight. Endocrine:Estrogenic. Musculoskeletal:Other changes.

TDLo Oral - rat - 2,100 mg/kg
Remarks: Behavioral:Altered sleep time (including change in righting reflex).

Inhalation: no data available

LD50 Dermal - rabbit - 1,200 mg/kg
Remarks: Behavioral:Excitement. Behavioral:Convulsions or effect on seizure threshold. Skin irritation

no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

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

Limited evidence of carcinogenicity in animal studies

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as

probable, possible or confirmed human carcinogen by IARC.

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

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

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

Reproductive toxicity
no data available

no data available

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Additional Information
RTECS: KI0700000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - other fish - 1.18 - 9 mg/l - 96.0 h
	LC50 - Lepomis macrochirus (Bluegill) - 0.04 - 0.05 mg/l - 96.0 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.06 - 0.09 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 3.47 - 5.58 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia pulex (Water flea) - 0.01 mg/l - 48 h

12.2 Persistence and degradability
no data available

12.3 Bioaccumulative potential
Indication of bioaccumulation.

12.4 Mobility in soil
no data available

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

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

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Marine pollutant: No

IATA
UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)

15. REGULATORY INFORMATION

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

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

SARA 311/312 Hazards
Acute Health Hazard

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

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	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	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

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

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 5.1 Revision Date: 06/26/2014 Print Date: 05/11/2016

SAFETY DATA SHEET

Version 5.2
Revision Date 06/27/2014
Print Date 11/14/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	4-Chloroaniline
Product Number	:	C22415
Brand	:	Aldrich
Index-No.	:	612-137-00-9
CAS-No.	:	106-47-8

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	+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)
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
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)

H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled
H317	May cause an allergic skin reaction.
H350	May cause cancer.
H400	Very toxic to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.

P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
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.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P322	Specific measures (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P361	Remove/Take off immediately all contaminated clothing.
P363	Wash contaminated clothing before reuse.
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	:	C_6H_6ClN
Molecular Weight	:	127.57 g/mol
CAS-No.	:	106-47-8
EC-No.	:	203-401-0
Index-No.	:	612-137-00-9

Hazardous components

Component	Classification	Concentration
4-Chloroaniline		
	Acute Tox. 3; Skin Sens. 1; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 3; H301 + H311 + H331, H317, H350, H400, H412	-

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
Carbon oxides, nitrogen oxides (NOx), Hydrogen chloride gas

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
no data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

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

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

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

Light sensitive. Store under inert gas. Air sensitive.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

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	6.9 at 1.00000 g/l at 20.0 °C (68.0 °F)
e)	Melting point/freezing point	Melting point/range: 67 - 70 °C (153 - 158 °F) - lit.
f)	Initial boiling point and boiling range	232 °C (450 °F) - lit.
g)	Flash point	120.0 °C (248.0 °F) - closed cup
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	no data available
j)	Upper/lower flammability or	no data available

	explosive limits	
k)	Vapour pressure	0.036 hPa (0.027 mmHg) at 26.0 °C (78.8 °F) 0.4 hPa (0.3 mmHg) at 38.0 °C (100.4 °F) 0.3 hPa (0.2 mmHg) at 25.0 °C (77.0 °F)
l)	Vapour density	no data available
m)	Relative density	1.14 g/cm3 at 100.00 °C (212.00 °F)
n)	Water solubility	2 g/l
o)	Partition coefficient: n-octanol/water	log Pow: 2.12log Pow: 1.70
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, Acid chlorides, Acid anhydrides, Chloroformates, Strong oxidizing agents

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - rat - male - 256.0 mg/kg

LC50 Inhalation - rat - 4 h - 2,340 mg/m3
Remarks: Behavioral:Somnolence (general depressed activity). Lungs, Thorax, or Respiration:Dyspnea. Cyanosis

LD50 Dermal - rat - male - 455.0 mg/kg

no data available

Skin corrosion/irritation
Skin - rabbit
Result: No skin irritation

Serious eye damage/eye irritation
Eyes - rabbit
Result: Mild eye irritation

Respiratory or skin sensitisation
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 (4-Chloroaniline)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

no data available

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Additional Information
RTECS: BX0700000

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

Cardiovascular system. -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 1.8 - 3.2 mg/l - 96.0 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 9.7 - 16 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 7 - 18 mg/l - 96.0 h
	LC50 - Danio rerio (zebra fish) - 33 mg/l - 96.0 h
	LC50 - Leuciscus idus (Golden orfe) - 23 mg/l - 48.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.04 - 0.06 mg/l - 48 h
Toxicity to algae	EC50 - Desmodesmus subspicatus (green algae) - 2.20 - 6.30 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability	aerobic Result: > 90 % - Readily biodegradable.

12.3 Bioaccumulative potential
no data available

12.4 Mobility in soil
no data available

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

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

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2018 Class: 6.1 Packing group: II
Proper shipping name: Chloroanilines, solid
Reportable Quantity (RQ): 1000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 2018 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: CHLOROANILINES, SOLID
Marine pollutant: No

IATA
UN number: 2018 Class: 6.1 Packing group: II
Proper shipping name: Chloroanilines, solid

15. REGULATORY INFORMATION

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

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
4-Chloroaniline	106-47-8	2007-07-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
4-Chloroaniline	106-47-8	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
4-Chloroaniline	106-47-8	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
4-Chloroaniline	106-47-8	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
4-Chloroaniline	106-47-8	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	Toxic if swallowed.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled
H311	Toxic in contact with skin.
H317	May cause an allergic skin reaction.
H331	Toxic if inhaled.
H350	May cause cancer.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	1
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	1
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 5.2 Revision Date: 06/27/2014 Print Date: 11/14/2016

SAFETY DATA SHEET

Version 4.5
Revision Date 04/24/2015
Print Date 10/25/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	4-Chlorotoluene
Product Number	:	111929
Brand	:	Aldrich
Index-No.	:	602-040-00-X
CAS-No.	:	106-43-4

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 #	:	+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 3), H226
Acute toxicity, Inhalation (Category 4), H332
Skin sensitisation (Category 1), H317
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

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)

H226	Flammable liquid and vapour.
H317	May cause an allergic skin reaction.
H332	Harmful if inhaled.
H411	Toxic to aquatic life with long lasting effects.

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.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P271	Use only outdoors or in a well-ventilated area.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
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.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.
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

Formula	:	C_7H_7Cl
Molecular weight	:	126.58 g/mol
CAS-No.	:	106-43-4
EC-No.	:	203-397-0
Index-No.	:	602-040-00-X

Hazardous components

Component	Classification	Concentration
4-Chlorotoluene		
	Flam. Liq. 3; Acute Tox. 4; Skin Sens. 1; Aquatic Acute 2; Aquatic Chronic 2; H226, H317, H332, H411	<= 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
Carbon oxides, Hydrogen chloride gas

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. 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. Discharge into the environment must be avoided.

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.
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
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
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: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, 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 ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 6 - 8 °C (43 - 46 °F) - lit.
f)	Initial boiling point and boiling range	162 °C (324 °F) - lit.
g)	Flash point	53.0 °C (127.4 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available

j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	13.3 hPa (10.0 mmHg) at 45.0 °C (113.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.07 g/mL at 25 °C (77 °F)
n)	Water solubility	slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 3.32
p)	Auto-ignition temperature	570 °C (1,058 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - female - 2,389 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation - 24 h

Respiratory or skin sensitisation
Maximisation Test (GPMT) - Guinea pig
Result: May cause sensitisation by skin contact.

Germ cell mutagenicity
Ames test
S. typhimurium
Result: negative

Mutagenicity (micronucleus test)
Mouse - male and female
Result: negative

Carcinogenicity

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information

Repeated dose toxicity - Rat - male and female - No observed adverse effect level - 200 mg/kg
RTECS: XS9010000

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

Kidney -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oryzias latipes - 6.1 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 2 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	Growth inhibition EC50 - Selenastrum capricornutum (green algae) - 6.1 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 1 % - Not biodegradable (OECD Test Guideline 301F)

12.3 Bioaccumulative potential

Bioaccumulation Cyprinus carpio (Carp) - 56 d
- 0.3 mg/l

Bioconcentration factor (BCF): 21.8 - 76.5
(OECD Test Guideline 305C)

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 with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2238 Class: 3 Packing group: III
Proper shipping name: Chlorotoluenes
Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG
UN number: 2238 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: CHLOROTOLUENES

IATA
UN number: 2238 Class: 3 Packing group: III
Proper shipping name: Chlorotoluenes

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
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
4-Chlorotoluene	106-43-4	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
4-Chlorotoluene	106-43-4	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
4-Chlorotoluene	106-43-4	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Flam. Liq.	Flammable liquids
H226	Flammable liquid and vapour.
H317	May cause an allergic skin reaction.
H332	Harmful if inhaled.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	2
Physical Hazard	0

NFPA Rating

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

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 4.5 Revision Date: 04/24/2015 Print Date: 10/25/2016

SAFETY DATA SHEET

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

1. Identification

Product Name **p-Cymene**

Cat No. : **AC111760000; AC111760010; AC111760025; AC111760100; AC111762500**

Synonyms Dolcymene; p-Isopropyltoluene

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 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.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
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
Keep cool
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 skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO_2, 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)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
p-Cymene	99-87-6	>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. If breathing is difficult, give oxygen. If

not breathing, give artificial respiration. Obtain medical attention.

Ingestion Do not induce vomiting. Clean mouth with water. Get medical attention.

Most important symptoms/effects Breathing difficulties. Symptoms of overexposure may be 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 47 °C / 116.6 °F
Method - No information available

Autoignition Temperature 435 °C / 815 °F
Explosion Limits
Upper 5.60%
Lower .70%
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Flammable. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated.

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	2	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.

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 Avoid contact with skin and eyes. Do not breathe dust. Do not breathe vapors or spray mist. Take precautionary measures against static discharges. Use explosion-proof equipment. Use only non-sparking tools.

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 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.

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	Clear
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-68 °C / -90.4 °F
Boiling Point/Range	176 - 178 °C / 348.8 - 352.4 °F @ 760 mmHg
Flash Point	47 °C / 116.6 °F
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	5.60%
Lower	.70%
Vapor Pressure	1.5 mmHg @ 20 °C
Vapor Density	4.62 (Air = 1.0)
Relative Density	0.854
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	435 °C / 815 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C10 H14
Molecular Weight	134.22

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. Excess heat. Incompatible products.

Incompatible Materials Strong oxidizing agents, Strong acids, Strong bases

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization No information available.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
p-Cymene	3669 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.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
p-Cymene	99-87-6	Not listed	Not listed	Not listed	Not listed	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 Symptoms of overexposure may be 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.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
p-Cymene	Not listed	LC50: 48 mg/L/96h (sheepshead minnow)	Not listed	LC50: 6.5 mg/L/48h

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

Mobility .

Component	log Pow
p-Cymene	4.1

13. Disposal considerations

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

14. Transport information

DOT

UN-No	UN2046
Hazard Class	3
Packing Group	III

TDG

UN-No	UN2046
Hazard Class	3
Packing Group	III

IATA

UN-No	2046
Proper Shipping Name	CYMENES
Hazard Class	3
Packing Group	III

IMDG/IMO

UN-No	2046
Proper Shipping Name	CYMENES
Hazard Class	3
Packing Group	III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
p-Cymene	X	X	-	202-796-7	-		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	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
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
p-Cymene	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
D2B Toxic materials

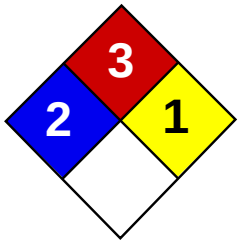
16. Other information

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



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Methyl isobutyl ketone MSDS

Section 1: Chemical Product and Company Identification

Product Name: Methyl isobutyl ketone

Catalog Codes: SLM3412

CAS#: 108-10-1

RTECS: SA9275000

TSCA: TSCA 8(b) inventory: Methyl isobutyl ketone

CI#: Not available.

Synonym: 4-Methyl-2-pentanone

Chemical Formula: C6H12O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Methyl isobutyl ketone	108-10-1	100

Toxicological Data on Ingredients: Methyl isobutyl ketone: ORAL (LD50): Acute: 1600 mg/kg [Guinea pig]. 2671 mg/kg [Mouse]. 2080 mg/kg [Rat]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 8000 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (irritant, permeator). Inflammation of the eye is characterized by redness, watering, and itching.

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

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

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

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 460°C (860°F)

Flash Points: CLOSED CUP: 14°C (57.2°F). OPEN CUP: 23°C (73.4°F).

Flammable Limits: LOWER: 1.4% UPPER: 7.5%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 50 STEL: 75 CEIL: 125 (ppm) from ACGIH (TLV) [1995] TWA: 205 STEL: 300 CEIL: 510 (mg/m3) from ACGIH [1995]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 100.16 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 115.9°C (240.6°F)

Melting Point: -84°C (-119.2°F)

Critical Temperature: Not available.

Specific Gravity: 0.802 (Water = 1)

Vapor Pressure: 15.7 mm of Hg (@ 20°C)

Vapor Density: 3.45 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.1 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Partially soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Not available.

Special Remarks on Reactivity: Forms explosive peroxides on prolonged storage.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 1600 mg/kg [Guinea pig]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 8000 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion, of inhalation. Hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Methyl isobutyl ketone : UN1245 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Methyl isobutyl ketone Massachusetts RTK: Methyl isobutyl ketone TSCA 8(b) inventory: Methyl isobutyl ketone SARA 313 toxic chemical notification and release reporting: Methyl isobutyl ketone CERCLA: Hazardous substances.: Methyl isobutyl ketone

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

DSCL (EEC):
R11- Highly flammable. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:40 PM

Last Updated: 05/21/2013 12:00 PM

SAFETY DATA SHEET

Version 5.4
Revision Date 01/02/2015
Print Date 12/11/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Acenaphthene
Product Number	:	215376
Brand	:	Aldrich
CAS-No.	:	83-32-9

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)
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
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)

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
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.

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear eye protection/ face protection.
P280	Wear protective gloves.
P281	Use personal protective equipment as required.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
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

Synonyms : 1,8-Ethylenenaphthalene

Formula : $C_{12}H_{10}$
Molecular weight : 154.21 g/mol
CAS-No. : 83-32-9
EC-No. : 201-469-6

Hazardous components

Component	Classification	Concentration
Acenaphthene		
	Skin Irrit. 2; Eye Irrit. 2A; Carc. 1B; STOT SE 3; Aquatic Acute 1; Aquatic Chronic 1; H315, H319, H335, H350, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

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

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

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

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

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

Personal protective equipment

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: 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: 90 - 94 °C (194 - 201 °F) - lit.
f)	Initial boiling point and boiling range	279 °C (534 °F) - lit.
g)	Flash point	125.0 °C (257.0 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available

k)	Vapour pressure	13.3 hPa (10.0 mmHg) at 131.0 °C (267.8 °F)
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 3.39 - 4.19
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 - Rat - 600 mg/kg

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Acenaphthene)

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 (Acenaphthene)

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
Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: AB1000000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.67 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 0.6 - 1.73 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 1.27 - 3.45 mg/l - 48 h
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 0.52 - 0.53 mg/l - 96 h

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 28 d - 0.00894 mg/l
	Bioconcentration factor (BCF): 387

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: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Acenaphthene)
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. (Acenaphthene)
Marine pollutant:yes
IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Acenaphthene)

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.

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Acenaphthene	83-32-9	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Acenaphthene	83-32-9	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Acenaphthene	83-32-9	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Acenaphthene	83-32-9	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
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.

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:	1
Physical Hazard	0

NFPA Rating

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

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 5.4 Revision Date: 01/02/2015 Print Date: 12/11/2015

SAFETY DATA SHEET

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

1. Identification

Product Name **Poly(acenaphthylene)**

Cat No. : **AC178020000; AC178020050; AC178020100**

Synonyms None.

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

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

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
Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Based on available data, the classification criteria are not met

Label Elements
None required

Hazards not otherwise classified (HNOC)
None identified
Unknown Acute Toxicity
.? % of the mixture consists of ingredients of unknown toxicity.

3. Composition / information on ingredients

Component	CAS-No	Weight %
Poly(acenaphthylene)	25036-01-5	100

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 soap and plenty of water while removing all contaminated

clothes and shoes.

Inhalation Remove from exposure, lie down. Move to fresh air.

Ingestion Do not induce vomiting. Never give anything by mouth to an unconscious person. Drink plenty of water. If possible drink milk afterwards.

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. alcohol-resistant foam.

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
Thermal decomposition can lead to release of irritating gases and vapors 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. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
0	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.

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. Avoid contact with clothing. Remove and wash contaminated clothing before re-use. Avoid breathing vapors or mists. Do not ingest. Wash thoroughly after handling.

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. Ventilation systems.

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 Wear a NIOSH/MSHA or European Standard EN 149 approved full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Yellow
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	No data available
Boiling Point/Range	No information available
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	No information available
Vapor Density	No information available
Relative Density	No information available
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

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Oxidizing agents

Hazardous Decomposition Products Thermal decomposition can lead to release of irritating gases and vapors, Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization No information available.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product

Oral LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Mist LC50 Based on ATE data, the classification criteria are not met. ATE > 5 mg/l.
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
Poly(acenaphthylene)	25036-01-5	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 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.

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

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	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 does not contain any Proposition 65 chemicals

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 Non-controlled

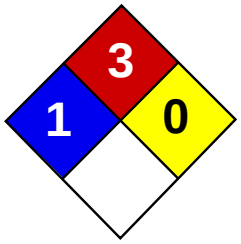
16. Other information

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



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Acetone MSDS

Section 1: Chemical Product and Company Identification

Product Name: Acetone

Catalog Codes: SLA3502, SLA1645, SLA3151, SLA3808

CAS#: 67-64-1

RTECS: AL3150000

TSCA: TSCA 8(b) inventory: Acetone

CI#: Not applicable.

Synonym: 2-propanone; Dimethyl Ketone; Dimethylformaldehyde; Pyroacetic Acid

Chemical Name: Acetone

Chemical Formula: C3-H6-O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Acetone	67-64-1	100

Toxicological Data on Ingredients: Acetone: ORAL (LD50): Acute: 5800 mg/kg [Rat]. 3000 mg/kg [Mouse]. 5340 mg/kg [Rabbit]. VAPOR (LC50): Acute: 50100 mg/m 8 hours [Rat]. 44000 mg/m 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. The substance is toxic to central nervous system (CNS). The substance may be toxic to kidneys, the reproductive system, liver, skin. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

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

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

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 465°C (869°F)

Flash Points: CLOSED CUP: -20°C (-4°F). OPEN CUP: -9°C (15.8°F) (Cleveland).

Flammable Limits: LOWER: 2.6% UPPER: 12.8%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of oxidizing materials, of acids.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Vapor may travel considerable distance to source of ignition and flash back.

Special Remarks on Explosion Hazards:
Forms explosive mixtures with hydrogen peroxide, acetic acid, nitric acid, nitric acid + sulfuric acid, chromic anydride, chromyl chloride, nitrosyl chloride, hexachloromelamine, nitrosyl perchlorate, nitryl perchlorate, permonosulfuric acid, thiodiglycol + hydrogen peroxide, potassium ter-butoxide, sulfur dichloride, 1-methyl-1,3-butadiene, bromoform, carbon, air, chloroform, thitriazylperchlorate.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis.

Storage:
Store in a segregated and approved area (flammables area) . Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Keep away from direct sunlight and heat and avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 500 STEL: 750 (ppm) from ACGIH (TLV) [United States] TWA: 750 STEL: 1000 (ppm) from OSHA (PEL) [United States] TWA: 500 STEL: 1000 [Austalia] TWA: 1185 STEL: 2375 (mg/m3) [Australia] TWA: 750 STEL: 1500 (ppm) [United Kingdom (UK)] TWA: 1810 STEL: 3620 (mg/m3) [United Kingdom (UK)] TWA: 1800 STEL: 2400 from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Fruity. Mint-like. Fragrant. Ethereal

Taste: Pungent, Sweetish

Molecular Weight: 58.08 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 56.2°C (133.2°F)

Melting Point: -95.35 (-139.6°F)

Critical Temperature: 235°C (455°F)

Specific Gravity: 0.79 (Water = 1)

Vapor Pressure: 24 kPa (@ 20°C)

Vapor Density: 2 (Air = 1)

Volatility: Not available.

Odor Threshold: 62 ppm

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.2

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, ignition sources, exposure to moisture, air, or water, incompatible materials.

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3000 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 44000 mg/m3 4 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. Causes damage to the following organs: central nervous system (CNS). May cause damage to the following organs: kidneys, the reproductive system, liver, skin.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenicity) based on studies with yeast (S. cerevisiae), bacteria, and hamster fibroblast cells. May cause reproductive effects (fertility) based upon animal studies. May contain trace amounts of benzene and formaldehyde which may cancer and birth defects. Human: passes the placental barrier.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. May be harmful if absorbed through the skin. Eyes: Causes eye irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. Inhalation: Inhalation at high concentrations affects the sense organs, brain and causes respiratory tract irritation. It also may affect the Central Nervous System (behavior) characterized by dizzness, drowsiness, confusion, headache, muscle weakeness, and possibly motor incoordination, speech abnormalities, narcotic effects and coma. Inhalation may also affect the gastrointestinal tract (nausea, vomiting). Ingestion: May cause irritation of the digestive (gastrointestinal) tract (nausea, vomiting). It may also

affect the Central Nevous System (behavior), characterized by depression, fatigue, excitement, stupor, coma, headache, altered sleep time, ataxia, tremors as well at the blood, liver, and urinary system (kidney, bladder, ureter) and endocrine system. May also have musculoskeletal effects. Chronic Potential Health Effects: Skin: May cause dermatitis. Eyes: Eye irritation.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 5540 mg/l 96 hours [Trout]. 8300 mg/l 96 hours [Bluegill]. 7500 mg/l 96 hours [Fatthead Minnow]. 0.1 ppm any hours [Water flea].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Acetone UNNA: 1090 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Benzene, Formaldehyde Connecticut hazardous material survey.: Acetone Illinois toxic substances disclosure to employee act: Acetone Illinois chemical safety act: Acetone New York release reporting list: Acetone Rhode Island RTK hazardous substances: Acetone Pennsylvania RTK: Acetone Florida: Acetone Minnesota: Acetone Massachusetts RTK: Acetone Massachusetts spill list: Acetone New Jersey: Acetone New Jersey spill list: Acetone Louisiana spill reporting: Acetone California List of Hazardous Substances (8 CCR 339): Acetone TSCA 8(b) inventory: Acetone TSCA 4(a) final test rules: Acetone TSCA 8(a) IUR: Acetone

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R36- Irritating to eyes. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:
-Material safety data sheet issued by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. LOLI, RTECS, HSDB databases. Other MSDSs

Other Special Considerations: Not available.

Created: 10/10/2005 08:13 PM

Last Updated: 05/21/2013 12:00 PM

SAFETY DATA SHEET

Version 4.10
Revision Date 12/10/2015
Print Date 03/03/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Acrylonitrile
Product Number	:	320137
Brand	:	Aldrich
Index-No.	:	608-003-00-4
CAS-No.	:	107-13-1

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)
Flammable liquids (Category 2), H225
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Skin irritation (Category 2), H315
Serious eye damage (Category 1), H318
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

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.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled

H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
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.
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.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P281	Use personal protective equipment as required.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P311	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

Lachrymator., Vesicant.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Vinyl cyanide
Formula	:	C_3H_3N
Molecular weight	:	53.06 g/mol
CAS-No.	:	107-13-1
EC-No.	:	203-466-5
Index-No.	:	608-003-00-4

Hazardous components

Component	Classification	Concentration

Acrylonitrile		
	Flam. Liq. 2; Acute Tox. 3; Skin Irrit. 2; Eye Dam. 1; Skin Sens. 1; Carc. 1B; Repr. 2; STOT SE 3; Aquatic Acute 2; Aquatic Chronic 2; H225, H301 + H311 + H331, H315, H317, H318, H335, H350, H361, H411	<= 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
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
Carbon oxides, Nitrogen oxides (NOx)

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
Wear respiratory protection. 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. Discharge into the environment must be avoided.

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.

Light sensitive.
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
Acrylonitrile	107-13-1	TWA	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Lower Respiratory Tract irritation Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption 15 minute ceiling value		
		C	10 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption 15 minute ceiling value		
		Substance listed; for more information see OSHA document 1910.1045		
		See 1910.1045		

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
Tightly fitting safety goggles. Faceshield (8-inch minimum). 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: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 480 min
Material tested:Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact
Material: Chloroprene
Minimum layer thickness: 0.6 mm
Break through time: 37 min
Material tested:Camapren® (KCL 722 / Aldrich Z677493, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: clear, liquid Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -83 °C (-117 °F) - lit.
f)	Initial boiling point and boiling range	77 °C (171 °F) - lit.
g)	Flash point	-4.99 °C (23.02 °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: 17 %(V) Lower explosion limit: 3 %(V)
k)	Vapour pressure	115 hPa (86 mmHg) at 20 °C (68 °F)
l)	Vapour density	1.83 - (Air = 1.0)
m)	Relative density	0.806 g/cm3
n)	Water solubility	soluble
o)	Partition coefficient: n-	log Pow: 0.25

	octanol/water	
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	27.3 mN/m at 24 °C (75 °F)
Relative vapour density	1.83 - (Air = 1.0)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.
Contains the following stabiliser(s):
Mequinol (>=35 - <=45 ppm)

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, Copper

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 - 81 mg/kg

LC50 Inhalation - Rat - male - 4 h - 2.09 mg/l

LD50 Dermal - Rabbit - 226 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Risk of serious damage to eyes.

Respiratory or skin sensitisation
Maximisation Test (GPMT) - Guinea pig
Result: May cause sensitisation by skin contact.
(OECD Test Guideline 406)

Germ cell mutagenicity
No data available

Carcinogenicity

Possible human carcinogen

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Acrylonitrile)
NTP:	Reasonably anticipated to be a human carcinogen (Acrylonitrile)
OSHA:	OSHA specifically regulated carcinogen (Acrylonitrile)

Reproductive toxicity
Suspected human reproductive toxicant

No data available

Specific target organ toxicity - single exposure
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: AT5250000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence (Mequinol)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 7.4 - 10.0 mg/l - 48 h

12.2 Persistence and degradability

Biodegradability	Biotic/Aerobic - Exposure time 28 d

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus - 14 d - 9.94 µg/l Bioconcentration factor (BCF): 48

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 with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1093 Class: 3 (6.1) Packing group: I
Proper shipping name: Acrylonitrile, stabilized
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1093 Class: 3 (6.1) Packing group: I EMS-No: F-E, S-D
Proper shipping name: ACRYLONITRILE, STABILIZED
Marine pollutant:yes

IATA
UN number: 1093 Class: 3 (6.1) Packing group: I
Proper shipping name: Acrylonitrile, stabilized
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Acrylonitrile	107-13-1	1993-04-24

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Acrylonitrile	107-13-1	1993-04-24

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Acrylonitrile	107-13-1	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Acrylonitrile	107-13-1	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Acrylonitrile	107-13-1	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Acrylonitrile	107-13-1	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
Eye Dam.	Serious eye damage
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H301	Toxic if swallowed.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled
H311	Toxic in contact with skin.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H318	Causes serious eye damage.
H331	Toxic if inhaled.
H335	May cause respiratory irritation.
H350	May cause cancer.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.
Repr.	Reproductive toxicity
Skin Irrit.	Skin irritation
Skin Sens.	Skin sensitisation
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 4.10 Revision Date: 12/10/2015 Print Date: 03/03/2016

SAFETY DATA SHEET

Version 5.8
Revision Date 06/02/2016
Print Date 08/02/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	α-BHC
Product Number	:	48493
Brand	:	Supelco
Index-No.	:	602-042-00-0
CAS-No.	:	319-84-6

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

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	+1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Dermal (Category 4), H312
Carcinogenicity (Category 2), H351
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.

P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P281	Use personal protective equipment as required.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P363	Wash contaminated clothing 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 : α-1,2,3,4,5,6-Hexachlorocyclohexane

Formula : $C_6H_6Cl_6$
Molecular weight : 290.83 g/mol
CAS-No. : 319-84-6
EC-No. : 206-270-8
Index-No. : 602-042-00-0

Hazardous components

Component	Classification	Concentration
(1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane		
	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. 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.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
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.

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	156.0 - 161.0 °C (312.8 - 321.8 °F)
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 3.80
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 - 177.0 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

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

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans ((1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)
IARC:	2B - Group 2B: Possibly carcinogenic to humans ((1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)
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 ((1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)
NTP:	Reasonably anticipated to be a human carcinogen ((1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)

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: GV3500000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Carassius auratus (goldfish) - 0.12 mg/l - 48.0 h
	LC50 - Cyprinus carpio (Carp) - 0.2 mg/l - 48.0 h
	LC50 - other fish - 1.49 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.20 - 1.70 mg/l - 48 h
Toxicity to algae	EC50 - No information available. - > 100.00 mg/l - 48 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential

Bioaccumulation	other fish - 96 h - 0.8 mg/l Bioconcentration factor (BCF): 250

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: III
Proper shipping name: Toxic solids, organic, n.o.s. ((1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)
Reportable Quantity (RQ): 10 lbs
Marine pollutant:yes
Poison Inhalation Hazard: No

IMDG
UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. ((1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)

IATA
UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. ((1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)

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
(1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane	319-84-6	2007-07-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
(1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane	319-84-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
(1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane	319-84-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
(1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane	319-84-6	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer. (1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane	CAS-No. 319-84-6	Revision Date 2009-02-01
WARNING! This product contains a chemical known to the State of California to cause cancer. (1α,2α,3β,4α,5β,6β)-1,2,3,4,5,6-Hexachlorocyclohexane	CAS-No. 319-84-6	Revision Date 2009-02-01

16. OTHER INFORMATION

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

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity

Carc.	Carcinogenicity
H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0
Health hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

Further information

Preparation Information

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

Version: 5.8 Revision Date: 06/02/2016 Print Date: 08/02/2019

SAFETY DATA SHEET

Version 4.8
Revision Date 05/03/2017
Print Date 07/13/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	α-Chlordane
Product Number	:	442449
Brand	:	Supelco

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)
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning

Hazard statement(s)

H302 + H332	Harmful if swallowed or if inhaled
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.

P202	Do not handle until all safety precautions have been read and understood.
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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
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.
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

Molecular weight : 409.8 g/mol
EC-No. : 225-825-5

Hazardous components

Component	Classification	Concentration
Chlordane		
	Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; STOT SE 3; Aquatic Acute 1; Aquatic Chronic 1; H302 + H332, H315, H319, H335, H351, H410	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid 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
Contains no substances with occupational exposure limit values.
Hazardous components without workplace control parameters

8.2 Exposure controls

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

Personal protective equipment

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	93.0 - 94.0 °C (199.4 - 201.2 °F)
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available

i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	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 - 500 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

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Chlordane)

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

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Lepomis macrochirus (Bluegill) - 0.0074 mg/l - 96 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
Bioaccumulation Lepomis macrochirus (Bluegill) - 24 h
- 0.005 mg/l

Bioconcentration factor (BCF): 322

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: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Chlordane)
Reportable Quantity (RQ): Marine pollutant:yes
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. (Chlordane)
Marine pollutant:yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Chlordane)

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

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chlordane	5103-71-9	

	CAS-No.	Revision Date
Chlordane	5103-71-9	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Chlordane	5103-71-9	

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H302	Harmful if swallowed.
H302 + H332	Harmful if swallowed or if inhaled
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.

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

Preparation Information

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

Version: 4.8 Revision Date: 05/03/2017 Print Date: 07/13/2017

SAFETY DATA SHEET

1. Identification

Product identifier **ATOMIZED ALUMINUM POWDER**

Other means of identification

SDS number 123

Chemical formula Al

Version # 08

Revision date August 11, 2015.

Other means of identification

Synonyms All non-alloyed, non-coated nodular aluminum powder containing < 1% trace elements * Grade 13, 101, 102, 104, 101T, 120, 121, 123, 1124, 1202, 1233, 1235, 1401/S2(1406), 1403, 1404, 1407, 1401/S9(1409), 1125, * 4402, 6401, 7123, 7124, 7125, 7401

Recommended use Various metallurgical/chemical/structural/coating applications

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Alcoa Inc.
201 Isabella Street
Pittsburgh, PA USA 15212
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Health and Safety Fax: +1-412-553-4822
Health and Safety Email: accmsds@alcoa.com

Alcoa Inc.
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P.O. Box 472
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Tel.: (+55 35) 2101-5000
E-mail: pfacomercialprimarios@alcoa.com.br

Emergency Information CHEMTREC: +1-703-527-3887 +1-800-424-9300 (24 Hour Emergency Telephone, multiple languages spoken); ALCOA: +1-412-553-4001 (24 Hour Emergency Telephone, only English spoken)

Website For a current Safety Data Sheet, refer to Alcoa websites: www.alcoa.com or internally at my.alcoa.com EHS Community

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards Not classified.

Environmental hazards Not classified.

Authority defined hazards Combustible dust

Label elements

Hazard symbol None.

Signal word Warning

Hazard statement May form combustible dust concentrations in air.

Precautionary statement

Prevention Care should be taken during bulk handling to prevent accumulation/generation over time of 75 micron or finer particles. Use only non-sparking tools and natural bristle brushes. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting equipment. Prevent dust accumulation to minimize explosion hazard. Take precautionary measures against static discharge.

Response In case of fire: Use appropriate media for extinction.

Storage Store in a dry place and/or in closed container. Keep away from heat, sparks and open flame - No smoking.Do not allow chips, fines or dust to contact water, particularly in enclosed areas.

Disposal Reuse or recycle material whenever possible. Material that cannot be reused may be sent to a metals reclamation facility that is able to handle fines. Waste material that cannot be reclaimed for metal value should be rendered non-reactive prior to disposal.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information Powder may ignite readily. Powder or dusts dispersed in the air can be explosive.

Explosion/fire hazards may be present when:
• Powder or dust are dispersed in air.
• Powder or dusts are in contact with water.
• Powder or dusts are in contact with certain metal oxides (e.g., rust, copper oxide).

3. Composition/information on ingredients

Composition comments Complete composition is provided below and may include some components classified as non-hazardous.

Substances

Chemical name	Common name and synonyms	CAS number	%
Aluminum powder		7429-90-5	≥99.7

4. First-aid measures

Eye contact Dust from processing: Rinse eyes with plenty of water or saline for at least 15 minutes. Consult a physician.

Skin contact Dust from processing: Wash with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Inhalation Dust from processing: Remove to fresh air. Check for clear airway, breathing, and presence of pulse. If breathing is difficult, provide oxygen. Loosen any tight clothing on neck or chest. Provide cardiopulmonary resuscitation for persons without pulse or respirations. Consult a physician.

Ingestion If swallowed, dilute by drinking water. Recommend quantities up to 30 mL (~1 oz.) in children and 250 mL (~9 oz.) in adults. Never give anything by mouth to a victim who is unconscious or is having convulsions. Do NOT induce vomiting. Consult a physician.

Most important symptoms/effects, acute and delayed Dust from processing: Can cause irritation of the upper respiratory tract. See Section 11 of the SDS for additional information on health hazards.

Medical conditions aggravated by exposure Asthma, chronic lung disease, and skin rashes.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. In case of shortness of breath, give oxygen.

General information If exposed or concerned: Get medical advice/attention. In case of shortness of breath, give oxygen.

5. Fire-fighting measures

Suitable extinguishing media Use Class D extinguishing agents on fines, dust or molten metal.

Unsuitable extinguishing media DO NOT USE water, halogenated agents, or ABC dry chemical agents. These fire extinguishing agents will react with the burning material.

Specific hazards arising from the chemical	Alcoa aluminum powders were tested by the United States Department of Interior Bureau of Mines in 1991, under UN criteria and found not to meet the definition of a hazard class 4. Care should be taken, however, during bulk handling to prevent accumulation/generation over time of 75 micron or finer particles. May be a potential hazard under the following conditions: • Dust clouds may be explosive. Even a minor dust cloud can explode violently. Dust accumulation on the floor, ledges and beams can present a risk of ignition, flame propagation and secondary explosions. • Powder or dusts in contact with water can generate flammable/explosive hydrogen gas. These gases could present an explosion hazard in confined or poorly ventilated spaces. • Powder or dusts are in contact with certain metal oxides (e.g., rust, copper oxide).
Special protective equipment and precautions for firefighters	Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.
Fire fighting equipment/instructions	Use gentle surface application of Class D extinguishing agent or dry inert granular material (e.g., sand) to cover and ring the burning material. Avoid mixing of the extinguishing agent with the burning material. Apply extinguishing media carefully to avoid creating airborne dust. Do not disturb the material until completely cool. If possible, isolate the burning material to prevent fire spread, and allow the material to burn itself out. Move undamaged containers away from heat or flame, if possible.
General fire hazards	Dust and fines from processing may ignite readily. Dust or fines dispersed in the air can be explosive.
Explosion data	
Sensitivity to mechanical impact	Not sensitive.
Sensitivity to static discharge	Static electricity and formation of sparks must be prevented. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Use non-sparking handling equipment, tools and natural bristle brushes. Cover and reseal partially empty containers. Provide grounding and bonding where necessary to prevent accumulation of static charges during metal dust handling and transfer operations. Obtain and follow the safety procedures and equipment guides contained in Aluminum Association Bulletin F-1 and National Fire Protection Association (NFPA) Standards listed in Section 16. Use non-sparking handling equipment, tools and natural bristle brushes. Cover and reseal partially empty containers. Provide grounding and bonding where necessary to prevent accumulation of static charges during metal dust handling and transfer operations (See Section 15).

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Avoid contact with skin and eyes. Use personal protection recommended in Section 8 of the SDS.
Personal precautions, protective equipment and emergency procedures	
For emergency responders	Avoid contact with skin and eyes. Use personal protection recommended in Section 8 of the SDS.
Evacuation procedures	Keep people away from and upwind of spill/leak. Keep unnecessary personnel away.
Methods and materials for containment and cleaning up	Isolate area. Avoid the generation of dusts during clean-up. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Use only non-sparking tools and natural bristle brushes. Use dry cleanup procedures. Keep material dry. Place carefully in dry, water-tight containers. Seal containers. After complete clean-up by sweeping, area may be washed with large amounts of water if necessary. Material that cannot be reused may be sent to a metals reclamation facility that is able to handle fines. Waste material that cannot be reclaimed for metal value should be rendered non-reactive prior to disposal. For waste disposal, see section 13 of the SDS.
Environmental precautions	No specific precautions.

7. Handling and storage

Handling	Keep away from sources of ignition - No smoking. Avoid contact with skin and eyes. Care should be taken during bulk handling to prevent accumulation/generation over time of 75 micron or finer particles. Keep material dry.
Storage	Keep dry. Storage rooms must be of fire-resistant construction. Do not store powder in same room as other combustible materials.

Requirements for Processes Which Generate Dusts or Fines

Obtain and follow the safety procedures and equipment guides contained in Aluminum Association Bulletin TR-2 and National Fire Protection Association (NFPA) brochures listed in Section 16. Use non-sparking handling equipment, tools and natural bristle brush. Cover and reseal partially empty containers. Provide grounding and bonding where necessary to prevent accumulation of static charges during metal dust handling and transfer operations (See Section 15).

Local ventilation and vacuum systems must be designed to handle explosive dusts. Dry vacuums and electrostatic precipitators must not be used, unless specifically approved for use with flammable/explosive dusts. Dust collection systems must be dedicated to aluminum dust only and should be clearly labeled as such. Do not co-mingle fines of aluminum with fines of iron, iron oxide (rust) or other metal oxides.

Process equipment, storage containers, vessels and buildings should be equipped with explosion/pressure relief valves, panels and windows. Precautions must also be taken to prevent water leakage or seepage which could contact the powder. Refer to NFPA 484.

Avoid all ignition sources. Good housekeeping practices must be maintained. Dust accumulation on the floor, ledges and beams can present a risk of ignition, flame propagation and secondary explosions. Do not use compressed air to remove settled material from floors, beams or equipment . Do not allow fines or dust to contact water, particularly in enclosed areas.

8. Exposure controls/personal protection

Occupational exposure limits

U.S. - OSHA

Components	Type	Value	Form
Aluminum powder (CAS 7429-90-5)	TWA	15 mg/m3	(total dust)

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Material	Type	Value	Form
ATOMIZED ALUMINUM POWDER	PEL	5 mg/m3	Respirable dust.
		15 mg/m3	Total dust.

Components	Type	Value	Form
Aluminum powder (CAS 7429-90-5)	TWA	5 mg/m3	Respirable dust.

US ACGIH Threshold Limit Values: Time Weighted Average (TWA): mg/m3, non-standard units

Material	Type	Value	Form
ATOMIZED ALUMINUM POWDER	TWA	1 mg/m3	Respirable fraction.

Components	Type	Value	Form
Aluminum powder (CAS 7429-90-5)	TWA	1 mg/m3	Respirable fraction.

Alcoa

Material	Type	Value	Form
ATOMIZED ALUMINUM POWDER	TWA	3 mg/m3	Respirable fraction
		10 mg/m3	Total dust

Components	Type	Value	Form
Aluminum powder (CAS 7429-90-5)	TWA	3 mg/m3	Respirable fraction
		10 mg/m3	Total dust

General Use personal protective equipment as required.

Appropriate engineering controls Dust from processing: Use with adequate explosion-proof ventilation designed to handle particulates to meet the limits listed in Section 8, Exposure Guidelines.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields.

Skin protection

Hand protection Wear impervious gloves to avoid direct skin contact.

Other	Recommend fire resistant cotton or equivalent full-length fire resistant pants and jackets along with electrically conductive safety shoes or grounding straps. Great caution is required to avoid contact with unprotected electrical devices when wearing conductive safety shoes or grounding straps.
Respiratory protection	Use NIOSH-approved respiratory protection as specified by an Industrial Hygienist or other qualified professional if concentrations exceed the limits listed in Section 8. Suggested respiratory protection: N95.
Thermal hazards	Not applicable.
General hygiene considerations	Handle in accordance with good industrial hygiene and safety practice. When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product.
Control parameters	

9. Physical and chemical properties

Form	Solid, powder.
Color	Silvery to gray.
Odor	Odorless
Odor threshold	Not applicable
pH	Not applicable
Density	0.80 - 1.30 g/cm3
Melting point/freezing point	1194.8 - 1214.6 °F (646 - 657 °C) 1220 °F (660 °C)
Initial boiling point and boiling range	Not determined 4220.6 °F (2327 °C)
Flash point	Not applicable
Evaporation rate	Not applicable
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - upper (%)	Not determined
Flammability limit - lower (%)	40 mg/l
Explosive properties	Dust can form an explosive mixture in air. Dust accumulation from this product may present an explosion hazard in the presence of an ignition source.
Dust explosion properties	
St class	Very strong explosion.
Vapor pressure	Not applicable
Vapor density	Not applicable
Relative density	Not determined
Solubility(ies)	Insoluble Insoluble
Partition coefficient (n-octanol/water)	Not applicable. Not applicable
Auto-ignition temperature	1202 °F (650 °C) layered
Decomposition temperature	Not applicable
Viscosity	Not applicable

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Stable under normal conditions of use, storage, and transportation as shipped.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	• Water: Slowly generates flammable and explosive hydrogen gas and heat. Generation rate is greatly increased with smaller particles (e.g., fines and dusts). Water/aluminum mixtures may be hazardous when confined. • Heat: Oxidizes at a rate dependent upon temperature and particle size.

Incompatible materials	• Acids and alkalis: Reacts to generate flammable/explosive hydrogen gas. Generation rate is greatly increased with smaller particles (e.g., fines and dusts). • Strong oxidizers: Violent reaction with considerable heat generation. Can react explosively with nitrates (e.g., ammonium nitrate and fertilizers containing nitrate) when heated or molten. • Halogenated compounds: Many halogenated hydrocarbons, including halogenated fire extinguishing agents, can react violently with finely divided or molten aluminum. • Iron oxide (rust) and other metal oxides (e.g., copper and lead oxides): A violent thermite reaction generating considerable heat can occur. Reaction with aluminum fines and dusts requires only very weak ignition sources for initiation. • Iron powder and water: Explosive reaction forming hydrogen gas when heated above 1470°F (800°C).
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Health effects associated with ingredients

Aluminum dust/fines and fumes: Low health risk by inhalation. Generally considered to be biologically inert.

Health effects associated with compounds formed during processing

No new/additional compounds are expected to be formed during processing.

Information on likely routes of exposure

Eye contact	Can cause mechanical irritation.
Skin contact	Dust from processing: Can cause mechanical irritation.
Inhalation	Dust from processing: Can cause irritation of the upper respiratory tract.
Ingestion	Can cause irritation of the gastrointestinal tract.
Symptoms related to the physical, chemical and toxicological characteristics	Dust from processing: Can cause mechanical irritation. Dust: Can cause irritation of the upper respiratory tract.

Information on toxicological effects

Acute toxicity	Based on available data, the classification criteria are not met.
Skin corrosion/irritation	Non-corrosive.
Serious eye damage/eye irritation	Can cause mechanical irritation.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	Not a skin sensitizer.
Germ cell mutagenicity	Based on available data, the classification criteria are not met.
Neurological effects	Based on available data, the classification criteria are not met.
Pre-existing conditions aggravated by exposure	Asthma, chronic lung disease, and skin rashes.
Carcinogenicity	Does not present any cancer hazards.
Reproductive toxicity	Does not present any reproductive hazards.
Routes of exposure	Inhalation. Skin contact. Eye contact.
Specific target organ toxicity - single exposure	Based on available data, the classification criteria are not met.
Specific target organ toxicity - repeated exposure	Based on available data, the classification criteria are not met.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Not classified.
Further information	None known.

12. Ecological information

Ecotoxicity	Not expected to be harmful to aquatic organisms.

Product		Species	Test Results
ATOMIZED ALUMINUM POWDER			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	0.16 mg/l, 96 hours

Persistence and degradability The product is not biodegradable.

Bioaccumulative potential The product does not contain any substances expected to be bioaccumulating.

Mobility in soil Not considered mobile.

Mobility in general Not considered mobile.

Other adverse effects Not available.

13. Disposal considerations

Disposal instructions Reuse or recycle material whenever possible. Material that cannot be reused may be sent to a metals reclamation facility that is able to handle fines. Waste material that cannot be reclaimed for metal value should be rendered non-reactive prior to disposal.

Local disposal regulations Dispose in accordance with all applicable regulations.

Waste codes RCRA Status: Not federally regulated in the U.S. if disposed of "as is."
RCRA waste codes other than described here may apply depending on use of the product. Status must be determined at the point of waste generation. Refer to 40 CFR 261 or state equivalent in the U.S.

Waste from residues / unused products If reuse or recycling is not possible, disposal must be made according to local or governmental regulations.

Contaminated packaging Dispose of in accordance with local regulations.

14. Transport information

General Shipping Information

Basic Shipping Information

ID number -

Proper shipping name Not regulated

Hazard class -

Packing group -

General Shipping Notes

• This material has been tested under UN criteria and found not to meet the definition of a hazard class 4 and does not meet the definition of any other hazard class.
• Standard Transportation Commodity Code: 33-991-19.
• HTS (Harmonized Tariff Schedule) code: 7603.10.0000.
• The import/export HTS (Harmonized Tariff Schedule) code given above is the United States HTS code provided by Alcoa's Customs Compliance Office in Knoxville, TN. Other country specific HTS codes may apply. If available, more information on the HTS codes will be provided on country specific Material Safety Data Sheets.
• When "Not regulated", enter the proper freight classification, SDS Number and Product Name onto the shipping paperwork.

Disclaimer

This section provides basic classification information and, where relevant, information with respect to specific modal regulations, environmental hazards and special precautions. Otherwise, it is presumed that the information is not available/not relevant

15. Regulatory information

US federal regulations In reference to Title VI of the Clean Air Act of 1990, this material does not contain nor was it manufactured using ozone-depleting chemicals.
All electrical equipment must be suitable for use in hazardous atmospheres involving aluminum powder in accordance with 29 CFR 1910.307. The National Electrical Code, NFPA 70, contains guidelines for determining the type and design of equipment and installation which will meet this requirement.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Section 311/312 hazard categories	Immediate Hazard - No Delayed Hazard - No Fire Hazard - No Pressure Hazard - Yes Reactivity Hazard - No	 If dust clouds are generated

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Aluminum powder	7429-90-5	≥99.7

US state regulations

US. California Proposition 65

Not Listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

SDS Status

August 11, 2015: Change(s) in Section: 1 and 16.
April 30, 2015 (April 30, 2015 Minor modification 0123usa): Change(s) in Section: 1, 2 Minor modification..
January 7, 2015: Change(s) in Section: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16.

Origination date: September 17, 1980

Hazardous Materials Control Committee
Preparer: Jim Perriello, +1-865-977-2051.

SDS System Number: 145308

Revision date August 11, 2015.

Version # 08

Revision Information

Product and Company Identification: Synonyms
Composition / Information on Ingredients: Disclosure Overrides
Physical & Chemical Properties: Multiple Properties
Transport Information: Agency Name, Packaging Type, and Transport Mode Selection
Regulatory Information: United States
HazReg Data: North America
GHS: Classification

Disclaimer The information in the sheet was written based on the best knowledge and experience currently available.

Other information

• Aluminum Association Bulletin TR-2, "Recommendations for Storage and Handling of Aluminum Pigments and Powders." The Aluminum Association, 1525 Wilson Boulevard, Suite 600, Arlington, Virginia 22209, www.aluminum.org.
• Aluminum Association, "Guidelines for Handling Molten Aluminum, The Aluminum Association, 1525 Wilson Boulevard, Suite 600, Arlington, Virginia 22209, www.aluminum.org.
• NFPA 484, Standard for Combustible Metals (NFPA phone: 800-344-3555)
• NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
• NFPA 70, Standard for National Electrical Code (Electrical Equipment, Grounding and Bonding)
• NFPA 77, Standard for Static Electricity
• NFPA 68, Standard on Explosion Protection by Deflagration Venting • NFPA 69, Standard on Explosion Prevention Systems

Key/Legend:

ACGIH	American Conference of Governmental Industrial Hygienists
AICS	Australian Inventory of Chemical Substances
CAS	Chemical Abstract Services
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CPR	Cardio-pulmonary Resuscitation
DOT	Department of Transportation
DSL	Domestic Substances List (Canada)
EC	Effective Concentration
ED	Effective Dose
EINECS	European Inventory of Existing Commercial Chemical Substances
ENCS	Japan - Existing and New Chemical Substances
EWC	European Waste Catalogue
EPA	Environmental Protective Agency
IARC	International Agency for Research on Cancer
LC	Lethal Concentration
LD	Lethal Dose
MAK	Maximum Workplace Concentration (Germany) "maximale Arbeitsplatz-Konzentration"
NDSL	Non-Domestic Substances List (Canada)
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Administration
PIN	Product Identification Number
PMCC	Pensky Marten Closed Cup
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
SIMDUT	Système d'Information sur les Matières Dangereuses Utilisées au Travail
STEL	Short Term Exposure Limit
TCLP	Toxic Chemicals Leachate Program
TDG	Transportation of Dangerous Goods
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average
WHMIS	Workplace Hazardous Materials Information System

m meter, cm centimeter, mm millimeter, in inch,
g gram, kg kilogram, lb pound, µg microgram,
ppm parts per million, ft feet

*** End of SDS ***

Hazard statement

May form combustible dust concentrations in air.

Precautionary statement

Prevention

Care should be taken during bulk handling to prevent accumulation/generation over time of 75 micron or finer particles. Use only non-sparking tools and natural bristle brushes. Keep away from heat/sparks/open flames/hot surfaces - No smoking. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting equipment. Prevent dust accumulation to minimize explosion hazard. Take precautionary measures against static discharge.

Response

In case of fire: Use appropriate media for extinction.

Storage

Store in a dry place and/or in closed container. Keep away from heat, sparks and open flame - No smoking. Do not allow chips, fines or dust to contact water, particularly in enclosed areas.

Disposal

Reuse or recycle material whenever possible. Material that cannot be reused may be sent to a metals reclamation facility that is able to handle fines. Waste material that cannot be reclaimed for metal value should be rendered non-reactive prior to disposal.

Warning

Supplemental information

Powder may ignite readily. Powder or dusts dispersed in the air can be explosive.

Explosion/fire hazards may be present when:

- Powder or dust are dispersed in air.
- Powder or dusts are in contact with water.
- Powder or dusts are in contact with certain metal oxides (e.g., rust, copper oxide).

FIRE FIGHTING MEASURES: Use gentle surface application of Class D extinguishing agent or dry inert granular material (e.g., sand) to cover and ring the burning material. Avoid mixing of the extinguishing agent with the burning material. If possible, isolate the burning material to prevent fire spread, and allow the material to burn itself out. Do not disturb the material until completely cool. Move undamaged containers away from heat or flame, if possible.

DO NOT USE water, halogenated agents, or ABC dry chemical agents.

These fire extinguishing agents will react with the burning material.

IN CASE OF SPILL: Avoid dusting of powder to the greatest extent possible. Use only non-sparking tools and natural bristle brushes. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Prohibit smoking. Use dry cleanup procedures. Place carefully in dry, water-tight containers. Seal containers. After complete clean-up by sweeping, area may be washed with large amounts of water if necessary.

See Alcoa SDS Number 0123.

Alcoa Inc., 201 Isabella Street, Pittsburgh, PA 15212-5858 United States +1-412-553-4001 (24 Hour Emergency Telephone, English only)
Alcoa Health and Safety Email: accmsds@alcoa.com Tel: +1-412-553-4649 and Fax: +1-412-553-4822

ALCOA

SAFETY DATA SHEET

Version 4.9
Revision Date 04/20/2015
Print Date 12/11/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Anthracene
Product Number	:	A89200
Brand	:	Aldrich
CAS-No.	:	120-12-7

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)
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
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)

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
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.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear eye protection/ face protection.

P280	Wear protective gloves.
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 or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
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.
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

Photosensitizer., Lachrymator.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_{14}H_{10}$
Molecular weight	:	178.23 g/mol
CAS-No.	:	120-12-7
EC-No.	:	204-371-1

Hazardous components

Component	Classification	Concentration
Anthracene Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; Aquatic Acute 1; Aquatic Chronic 1; H315, H319, H335, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
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 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
Anthracene	120-12-7	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		

		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C See Appendix A		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Anthracene	120-12-7	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: Chloroprene
Minimum layer thickness: 0.6 mm
Break through time: 480 min
Material tested:Camapren® (KCL 722 / Aldrich Z677493, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 30 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Colour: beige
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 210 - 215 °C (410 - 419 °F) - lit.
f)	Initial boiling point and boiling range	340 °C (644 °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	Lower explosion limit: 0.6 %(V)
k)	Vapour pressure	1.3 hPa (1.0 mmHg) at 145.0 °C (293.0 °F)
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 4.45
p)	Auto-ignition temperature	540.0 °C (1,004.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

Strong oxidizing agents, Hypochlorites

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
Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - 430 mg/kg

Skin corrosion/irritation
Skin - Mouse
Result: Mild skin irritation

Serious eye damage/eye irritation
Irritating to eyes. The preceding data, or interpretation of data, was determined using Quantitative Structure Activity Relationship (QSAR) modeling.

Respiratory or skin sensitisation
Causes photosensitivity. Exposure to light can result in allergic reactions resulting in dermatologic lesions, which can vary from sunburnlike responses to edematous, vesiculated lesions, or bullae

Germ cell mutagenicity
No data available

Carcinogenicity

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Anthracene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	OSHA specifically regulated carcinogen (Anthracene)

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure
Inhalation - May cause respiratory irritation.
The preceding data, or interpretation of data, was determined using Quantitative Structure Activity Relationship (QSAR) modeling.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: CA9350000

Possible tumor promoter., Headache, Nausea, Weakness

Blood -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 0.001 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.10 mg/l - 48 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
Indication of bioaccumulation.

Bioaccumulation	Pimephales promelas (fathead minnow) - 42 d - 0.01191 mg/l Bioconcentration factor (BCF): 649

12.4 Mobility in soil
No data available

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

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

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. (Anthracene)
Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Anthracene)
Marine pollutant:yes
IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Anthracene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

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

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Anthracene	120-12-7	2007-07-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Anthracene	120-12-7	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Anthracene	120-12-7	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Anthracene	120-12-7	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Anthracene	120-12-7	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
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
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

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: 4.9 Revision Date: 04/20/2015 Print Date: 12/11/2015

Antimony

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Revision Date: 02/12/2014 Version: 1.0

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY

1.1. Product Identifier

Product Form: Substance

Product Name: Antimony

Synonyms: Stibium (Sb)

1.2. Intended Use of the Product

No additional information available

1.3. Name, Address, and Telephone of the Responsible Party

Company

Atomized Products Group, Inc
3838 Miller Park Dr
Garland, TX 75042
T 972-272-9596
atomizedproductsgroup.com

1.4. Emergency Telephone Number

Emergency Number : 800-255-3924 (CHEMTEL)

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the Substance or Mixture

Classification (GHS-US)

Comb. Dust

Acute Tox. 3 (Oral)	H301
Acute Tox. 4 (Inhalation:dust,mist)	H332
Carc. 2	H351
Aquatic Acute 2	H401
Aquatic Chronic 2	H411

2.2. Label Elements

GHS-US Labeling

Hazard Pictograms (GHS-US) :

GHS06 GHS07 GHS08 GHS09

Signal Word (GHS-US) : Danger

Hazard Statements (GHS-US) : May form combustible dust concentrations in air
H301 - Toxic if swallowed
H332 - Harmful if inhaled
H351 - Suspected of causing cancer
H401 - Toxic to aquatic life
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements (GHS-US) : P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P261 - Avoid breathing dust.
P264 - Wash hands, forearms, and other exposed areas thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P271 - Use only outdoors or in a well-ventilated area.
P273 - Avoid release to the environment.
P280 - Wear protective gloves, protective clothing, eye protection, face protection, respiratory protection.
P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P304+P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P308+P313 - If exposed or concerned: Get medical advice/attention.

P312 - Call a POISON CENTER/doctor/physician if you feel unwell.
P321 - Specific treatment (see section 4).
P330 - If swallowed, rinse mouth.
P391 - Collect spillage.
P405 - Store locked up.
P501 - Dispose of contents/container to local, regional, national, territorial, provincial, and international regulations.

2.3. Other Hazards

Other Hazards Not Contributing to the Classification: Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions. May form combustible dust concentrations in air. Exposure may aggravate individuals with pre-existing skin, kidney, liver, and pulmonary disorders. On burning release of harmful/irritant gases/vapours (antimony oxides). Inhalation of dusts and fumes can cause metal fume fever. Symptoms can include a metallic or sweet taste in the mouth, sweating, shivering, headache, throat irritation, fever, chills, thirstiness, muscle aches, nausea, vomiting, weakness, fatigue, and shortness of breath.

2.4. Unknown Acute Toxicity (GHS-US)

No data available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substance

Name : Antimony

Name	Product identifier	%	Classification (GHS-US)
Antimony	(CAS No) 7440-36-0	100	Comb. Dust Acute Tox. 3 (Oral), H301 Acute Tox. 4 (Inhalation), H332 Carc. 2, H351 Aquatic Acute 2, H401 Aquatic Chronic 2, H411

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: FIRST AID MEASURES

4.1. Description of First Aid Measures

First-aid Measures General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid Measures After Inhalation: When symptoms occur: go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.

First-aid Measures After Skin Contact: Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Obtain medical attention if irritation persists.

First-aid Measures After Eye Contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation persists.

First-aid Measures After Ingestion: Rinse mouth. Do not induce vomiting. Seek medical attention if a large amount is swallowed.

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

Symptoms/Injuries: Suspected of causing cancer. Toxic if swallowed. Harmful if inhaled.

Symptoms/Injuries After Inhalation: Harmful if inhaled. Respiratory tract irritation.

Symptoms/Injuries After Skin Contact: Prolonged contact with large amounts of dust may cause mechanical irritation.

Symptoms/Injuries After Eye Contact: Prolonged contact with large amounts of dust may cause mechanical irritation.

Symptoms/Injuries After Ingestion: Toxic if swallowed. May cause nausea, vomiting, and diarrhea.

Chronic Symptoms: Prolonged exposure may cause effects in specific organs such as the liver, kidneys, blood, and nervous system.

4.3. Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing Media

Suitable Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Unsuitable Extinguishing Media: Do not use a heavy water stream. Use of heavy stream of water may spread fire.

5.2. Special Hazards Arising From the Substance or Mixture

Fire Hazard: Not considered flammable but may burn at high temperatures. Dust explosion hazard in air.
Explosion Hazard: Avoid dust clouds in combination with static electricity. Dust explosion hazard in air.
Reactivity: Hazardous reactions will not occur under normal conditions. Dust clouds can be explosive.

5.3. Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire.
Firefighting Instructions: Use water spray or fog for cooling exposed containers. In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.
Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.
Other information: Risk of dust explosion. Do not allow the product to be released into the environment. Do not allow run-off from fire fighting to enter drains or water courses.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Use special care to avoid static electric charges. Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Handle in accordance with good industrial hygiene and safety practice. Do not breathe dust. Avoid generating dust. Avoid all contact with skin, eyes, or clothing.

6.1.1. For Non-emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Evacuate unnecessary personnel.

6.1.2. For Emergency Responders

Protective Equipment: Equip cleanup crew with proper protection. Use appropriate personal protection equipment (PPE).
Emergency Procedures: Ventilate area.

6.2. Environmental Precautions

Prevent entry to sewers and public waters. Do not allow to enter drains or water courses.

6.3. Methods and Material for Containment and Cleaning Up

For Containment: Avoid generation of dust during clean-up of spills. Use only non-sparking tools.
Methods for Cleaning Up: Clear up spills immediately and dispose of waste safely. Avoid generation of dust during clean-up of spills. Use only non-sparking tools. Use explosion proof vacuum during cleanup, with appropriate filter, do not mix with other materials. Contact competent authorities after a spill.

6.4. Reference to Other Sections

See heading 8, Exposure Controls and Personal Protection.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for Safe Handling

Additional Hazards When Processed: Avoid dust production. Accumulation and dispersion of dust with an ignition source can cause a combustible dust explosion, keep dust levels to a minimum and follow applicable regulations. Do not pressurize, cut, or weld containers. . On burning: release of harmful/irritant gases/vapours e.g.: (antimony oxides).
Precautions for Safe Handling: Use only non-sparking tools. Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Handle in accordance with good industrial hygiene and safety procedures.
Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work. Do no eat, drink or smoke when using this product.

7.2. Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Proper grounding procedures to avoid static electricity should be followed. Ground/bond container and receiving equipment. Use explosion-proof electrical, ventilating, and lighting equipment. Comply with applicable regulations.
Storage Conditions: Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep/Store away from extremely high or low temperatures, ignition sources, incompatible materials.
Incompatible Products: Strong acids. Strong bases. Strong oxidizers.

7.3. Specific End Use(s)

No additional information available

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control Parameters

Antimony (7440-36-0)		
USA ACGIH	ACGIH TWA (mg/m³)	0.5 mg/m³
USA NIOSH	NIOSH REL (TWA) (mg/m³)	0.5 mg/m³

USA IDLH	US IDLH (mg/m³)	50 mg/m³
USA OSHA	OSHA PEL (TWA) (mg/m³)	0.5 mg/m³

8.2. Exposure Controls

Appropriate Engineering Controls : Ensure all national/local regulations are observed. Proper grounding procedures to avoid static electricity should be followed. Use explosion-proof equipment. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment : Gloves. Protective goggles. Respiratory protection of the dependent type. Protective clothing.

Materials for Protective Clothing : Chemically resistant materials and fabrics.

Hand Protection : Wear chemically resistant protective gloves.

Eye Protection : Chemical goggles or safety glasses.

Skin and Body Protection : Wear suitable protective clothing.

Respiratory Protection : Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of dust are expected to exceed exposure limits.

Thermal Hazard Protection : Wear suitable protective clothing.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on Basic Physical and Chemical Properties

Physical State : Solid

Odor : No data available

Odor Threshold : No data available

pH : No data available

Relative Evaporation Rate (butylacetate=1) : No data available

Melting Point : No data available

Freezing Point : No data available

Boiling Point : No data available

Flash Point : No data available

Auto-ignition Temperature : No data available

Decomposition Temperature : No data available

Flammability (solid, gas) : No data available

Vapor Pressure : No data available

Relative Vapor Density at 20 °C : No data available

Relative Density : No data available

Specific Gravity : No data available

Solubility : No data available

Log Pow : No data available

Log Kow : No data available

Viscosity, Kinematic : No data available

Viscosity, Dynamic : No data available

Explosive Properties : No data available

Oxidizing Properties : No data available

Explosive Limits : No data available

9.2. Other Information No additional information available

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity: Hazardous reactions will not occur under normal conditions. Dust clouds can be explosive.

10.2 Chemical Stability: Dust clouds can be explosive.

10.3 Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

10.4 Conditions to Avoid: Direct sunlight. Extremely high or low temperatures. Open flame. Ignition sources. Incompatible materials.

10.5 Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. Halogenated compounds.

10.6 Hazardous Decomposition Products: Antimony and its oxides. Metal oxides. Inhalation of fumes may cause metal fume fever.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information On Toxicological Effects

Acute Toxicity: Toxic if swallowed. Harmful if inhaled.

Antimony	
ATE (Oral)	500.000 mg/kg body weight
ATE (Dust/Mist)	1.500 mg/l/4h

Antimony (7440-36-0)	
LD50 Oral Rat	100 mg/kg
ATE (Oral)	100.000 mg/kg body weight

Skin Corrosion/Irritation: Not classified

Serious Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Carcinogenicity: Suspected of causing cancer.

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: Harmful if inhaled. Respiratory tract irritation.

Symptoms/Injuries After Skin Contact: Prolonged contact with large amounts of dust may cause mechanical irritation.

Symptoms/Injuries After Eye Contact: Prolonged contact with large amounts of dust may cause mechanical irritation.

Symptoms/Injuries After Ingestion: Toxic if swallowed. May cause nausea, vomiting, and diarrhea.

Chronic Symptoms: Prolonged exposure may cause effects in specific organs such as the liver, kidneys, blood, and nervous system.

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecology - General : Toxic to aquatic life with long lasting effects.

12.2. Persistence and Degradability

Antimony	
Persistence and Degradability	May cause long-term adverse effects in the environment.

12.3. Bioaccumulative Potential No additional information available

12.4. Mobility in Soil No additional information available

12.5. Other Adverse Effects

Other Information : Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste Disposal Recommendations: Dispose of waste material in accordance with all local, regional, national, and international regulations.

Additional Information: The materials contained within this product are hazardous to the environment, do not release into the environment.

SECTION 14: TRANSPORT INFORMATION

14.1 In Accordance with DOT

Proper Shipping Name : ANTIMONY POWDER
Hazard Class : 6.1
Identification Number : UN2871
Label Codes : 6.1
Packing Group : III
Marine Pollutant : Marine pollutant
ERG Number : 170

14.2 In Accordance with IMDG

Proper Shipping Name : ANTIMONY POWDER
Hazard Class : 6.1
Identification Number : UN2871
Packing Group : III
Label Codes : 6.1
EmS-No. (Fire) : F-A
EmS-No. (Spillage) : S-A
MFAG Number : 171

14.3 In Accordance with IATA

Proper Shipping Name : ANTIMONY POWDER
Packing Group : III
Identification Number : UN2871
Hazard Class : 6
Label Codes : 6.1
ERG Code (IATA) : 6L

SECTION 15: REGULATORY INFORMATION

15.1 US Federal Regulations

Antimony	
SARA Section 311/312 Hazard Classes	Delayed (chronic) health hazard Immediate (acute) health hazard

Antimony (7440-36-0)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings)	
SARA Section 313 - Emission Reporting	1.0 %

15.2 US State Regulations

Antimony (7440-36-0)
U.S. - California - Priority Toxic Pollutants - Human Health Criteria
U.S. - California - Toxic Air Contaminant List (AB 1807, AB 2728)
U.S. - Colorado - Primary Drinking Water Regulations - Maximum Contaminant Level Goals (MCLGs)
U.S. - Colorado - Primary Drinking Water Regulations - Maximum Contaminant Levels (MCLs)
U.S. - Connecticut - Drinking Water Quality Standards - Maximum Contaminant Levels
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)
U.S. - Connecticut - Water Quality Standards - Consumption of Organisms Only
U.S. - Connecticut - Water Quality Standards - Consumption of Water and Organisms
U.S. - Connecticut - Water Quality Standards - Health Designations
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities
U.S. - Florida - Drinking Water Standards - Inorganic Contaminants - Maximum Contaminant Levels (MCLs)
U.S. - Georgia - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Emission Levels (ELs)
U.S. - Idaho - Occupational Exposure Limits - TWAs

U.S. - Illinois - Toxic Air Contaminants
U.S. - Louisiana - Reportable Quantity List for Pollutants
U.S. - Maine - Air Pollutants - Hazardous Air Pollutants
U.S. - Maryland - Surface Water Quality Standards - Consumption of Organisms Only
U.S. - Maryland - Surface Water Quality Standards - Consumption of Water and Organisms
U.S. - Massachusetts - Allowable Ambient Limits (AALs)
U.S. - Massachusetts - Allowable Threshold Concentrations (ATCs)
U.S. - Massachusetts - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Right To Know List
U.S. - Massachusetts - Threshold Effects Exposure Limits (TELs)
U.S. - Massachusetts - Toxics Use Reduction Act
U.S. - Michigan - Occupational Exposure Limits - TWAs
U.S. - Michigan - Polluting Materials List
U.S. - Minnesota - Chemicals of High Concern
U.S. - Minnesota - Groundwater Health Risk Limits
U.S. - Minnesota - Hazardous Substance List
U.S. - Minnesota - Permissible Exposure Limits - TWAs
U.S. - Missouri - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Nebraska - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - New Hampshire - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual
U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
U.S. - New Jersey - Environmental Hazardous Substances List
U.S. - New Jersey - Primary Drinking Water Standards - Maximum Contaminant Levels - MCLs
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Water Quality - Ground Water Quality Criteria
U.S. - New Jersey - Water Quality - Practical Quantitation Levels (PQLs)
U.S. - New York - Occupational Exposure Limits - TWAs
U.S. - New York - Reporting of Releases Part 597 - List of Hazardous Substances
U.S. - North Dakota - Air Pollutants - Guideline Concentrations - 8-Hour
U.S. - North Dakota - Water Quality Standards - Human Health Value for Class III
U.S. - North Dakota - Water Quality Standards - Human Health Value for Classes I, IA, II
U.S. - Oregon - Permissible Exposure Limits - TWAs
U.S. - Pennsylvania - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - 24-Hour
U.S. - Rhode Island - Water Quality Standards - Acute Freshwater Aquatic Life Criteria
U.S. - Rhode Island - Water Quality Standards - Chronic Freshwater Aquatic Life Criteria
U.S. - Rhode Island - Water Quality Standards - Human Health Criteria for Consumption of Aquatic Organisms Only
U.S. - Rhode Island - Water Quality Standards - Human Health Criteria for Consumption of Water and Aquatic Organisms
U.S. - South Carolina - Maximum Contaminant Levels (MCLs)
U.S. - Tennessee - Occupational Exposure Limits - TWAs
U.S. - Texas - Drinking Water Standards - Maximum Contaminant Levels (MCLs)
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term
U.S. - Utah - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Vermont - Hazardous Waste - Hazardous Constituents
U.S. - Vermont - Permissible Exposure Limits - TWAs
U.S. - Virginia - Water Quality Standards - Public Water Supply Effluent Limits
U.S. - Virginia - Water Quality Standards - Surface Waters Not Used for the Public Water Supply Effluent Limits

U.S. - Washington - Dangerous Waste - Dangerous Waste Constituents List
U.S. - Washington - Permissible Exposure Limits - STELs
U.S. - Washington - Permissible Exposure Limits - TWAs
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 25 Feet to Less Than 40 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 40 Feet to Less Than 75 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 75 Feet or Greater
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights Less Than 25 Feet

SECTION 16: OTHER INFORMATION

Revision date : 02/12/2014

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Acute Tox. 3 (Oral)	Acute toxicity (oral) Category 3
Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Inhalation:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 4
Aquatic Acute 2	Hazardous to the aquatic environment - Acute Hazard Category 2
Aquatic Chronic 2	Hazardous to the aquatic environment - Chronic Hazard Category 2
Carc. 2	Carcinogenicity Category 2
Comb. Dust	Combustible Dust
	May form combustible dust concentrations in air
H301	Toxic if swallowed
H332	Harmful if inhaled
H351	Suspected of causing cancer
H401	Toxic to aquatic life
H411	Toxic to aquatic life with long lasting effects

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

SDS US (GHS HazCom) - US

SAFETY DATA SHEET

Version 5.2
Revision Date 02/27/2015
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Aroclor 1254
Product Number	:	48586
Brand	:	Supelco
Index-No.	:	602-039-00-4
CAS-No.	:	11097-69-1

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 4), H302
Specific target organ toxicity - repeated exposure (Category 2), H373
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning

Hazard statement(s)

H302	Harmful if swallowed.
H373	May cause damage to organs through prolonged or repeated exposure.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

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.
P273	Avoid release to the environment.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth.

P314	Get medical advice/ attention if you feel unwell.
P391	Collect spillage.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

CAS-No. : 11097-69-1
Index-No. : 602-039-00-4

Hazardous components

Component	Classification	Concentration
Aroclor 1254		
	Acute Tox. 4; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H302, H373, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. 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

Nature of decomposition products not known.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

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

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

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
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
Aroclor 1254	11097-69-1	TWA	0.5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin designation		
		TWA	0.500000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Liver damage Chloracne Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Liver damage Chloracne Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		TWA	0.001000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen 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.

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

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid
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	No data available

temperature

r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
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 - 1,010 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
Rat
Liver
Unscheduled DNA synthesis

Rat
Liver
DNA damage

Mouse
fibroblast
Morphological transformation.

Rat
Morphological transformation.

Rat
DNA damage

Rat
DNA damage

Carcinogenicity

Carcinogenicity - Rat - Oral
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Gastrointestinal:Tumors.

Carcinogenicity - Rat - Oral
Tumorigenic:Carcinogenic by RTECS criteria. Liver:Tumors.

Carcinogenicity - Mouse - Skin
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Skin and Appendages: Other: Tumors.
Tumorigenic:Tumors at site or application.

Carcinogenicity - Rat - Oral
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Gastrointestinal:Tumors.

Carcinogenicity - Mouse - Oral
Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors.

Carcinogenicity - Mouse - Intraperitoneal
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Tumorigenic Effects: Uterine tumors. Lungs, Thorax, or Respiration:Tumors.

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

Reproductive toxicity - Rabbit - Oral
Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).
Effects on Fertility: Abortion. Effects on Embryo or Fetus: Fetal death.

Reproductive toxicity - Rabbit - Oral
Effects on Newborn: Biochemical and metabolic.

Reproductive toxicity - Rat - Oral
Effects on Newborn: Biochemical and metabolic.

Reproductive toxicity - Rat - Oral
Effects on Newborn: Behavioral.

Reproductive toxicity - Rat - Oral
Effects on Newborn: Delayed effects.

Reproductive toxicity - Rat - Intraperitoneal
Maternal Effects: Other effects. Effects on Newborn: Biochemical and metabolic.

Reproductive toxicity - Mouse - Oral
Effects on Newborn: Behavioral.

Reproductive toxicity - Mammal - Oral
Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated).

No data available

Developmental Toxicity - Rat - Oral

Specific Developmental Abnormalities: Hepatobiliary system.

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
May cause damage to organs through prolonged or repeated exposure.

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

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.22 µg/l - 96.0 h
Toxicity to algae	LC50 - Algae - 0.015 mg/l - 28 h

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation	Pimephales promelas (fathead minnow) - 8 Months - 1.8 µg/l Bioconcentration factor (BCF): 238,000

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: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid
Reportable Quantity (RQ): 1 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 2315 Class: 9 Packing group: II EMS-No: F-A, S-A

Proper shipping name: POLYCHLORINATED BIPHENYLS, LIQUID
Marine pollutant: yes

IATA

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

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.

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Aroclor 1254	11097-69-1	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Aroclor 1254	11097-69-1	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Aroclor 1254	11097-69-1	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Aroclor 1254	11097-69-1	1990-06-30
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Aroclor 1254	11097-69-1	1990-06-30

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.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
STOT RE	Specific target organ toxicity - repeated exposure

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

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: 5.2 Revision Date: 02/27/2015 Print Date: 05/01/2016

SAFETY DATA SHEET

Version 5.3
Revision Date 06/25/2015
Print Date 05/11/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	AROCLOR 1260
Product Number	:	CRM48736
Brand	:	Supelco

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 1B), H350

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.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Hazardous components

Component		Classification	Concentration
Distillates (petroleum), hydrotreated middle			
CAS-No. EC-No. Index-No.	64742-46-7 265-148-2 649-221-00-X	Carc. 1B; H350	>= 90 - <= 100 %
Baseoil - unspecified			
CAS-No. EC-No. Index-No.	64742-53-6 265-156-6 649-466-00-2	Carc. 1B; H350	>= 30 - < 50 %
2,6-di-tert-Butyl-p-cresol			
CAS-No. EC-No.	128-37-0 204-881-4	Aquatic Acute 1; Aquatic Chronic 1; H410	>= 0.1 - < 1 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Nature of decomposition products not known.

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid 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 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.
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
Distillates (petroleum), hydrotreated middle	64742-46-7	TWA	500.000000 ppm 2,000.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	The value in mg/m3 is approximate.		

		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10 mg/m3	USA. NIOSH Recommended Exposure Limits
Baseoil - unspecified	64742-53-6	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
		TWA	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits

8.2 Exposure controls

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

Personal protective equipment

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

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

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

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: 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

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:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (2,6-di-tert-Butyl-p-cresol)
IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Distillates (petroleum), hydrotreated middle)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

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

Nerves. - (Aroclor 1260)

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
Distillates (petroleum), hydrotreated middle	64742-46-7	1989-08-11
Baseoil - unspecified	64742-53-6	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Distillates (petroleum), hydrotreated middle	64742-46-7	1989-08-11
Baseoil - unspecified	64742-53-6	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Distillates (petroleum), hydrotreated middle	64742-46-7	1989-08-11
Baseoil - unspecified	64742-53-6	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
Aroclor 1260	11096-82-5	2008-08-01
Distillates (petroleum), hydrotreated middle	64742-46-7	2013-12-20

WARNING: This product contains a chemical known to the	CAS-No.	Revision Date

State of California to cause birth defects or other reproductive harm.	11096-82-5	2008-08-01
Aroclor 1260		

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.
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

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: 06/25/2015 Print Date: 05/11/2016

SAFETY DATA SHEET

Version 4.7
Revision Date 11/11/2015
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Aroclor 1242
Product Number	:	48585
Brand	:	Supelco
Index-No.	:	602-039-00-4
CAS-No.	:	53469-21-9

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)
Specific target organ toxicity - repeated exposure (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)

H372	Causes damage to organs through prolonged or repeated exposure.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

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.
P273	Avoid release to the environment.
P314	Get medical advice/ attention if you feel unwell.
P391	Collect spillage.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

CAS-No. : 53469-21-9
Index-No. : 602-039-00-4

Hazardous components

Component	Classification	Concentration
Aroclor 1242		
	STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; 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.

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

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

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

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
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
Aroclor 1242	53469-21-9	TWA	1.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Eye irritation Liver damage Chloracne Danger of cutaneous absorption		
		TWA	0.001000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	1.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Eye irritation Liver damage Chloracne Danger of cutaneous absorption		
		TWA	0.001 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		

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. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

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

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

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

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
Causes damage to organs through prolonged or repeated exposure.
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

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

12.2 Persistence and degradability

Biodegradability	Result: - According to the results of tests of biodegradability this product is not readily biodegradable. Remarks: No data available

12.3 Bioaccumulative potential

Bioaccumulation	Pimephales promelas (fathead minnow) - 8.5 Months - 0.86 µg/l Bioconcentration factor (BCF): 274,000

12.4 Mobility in soil
No data available

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

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

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

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2315 Class: 9 Packing group: II
Proper shipping name: Polychlorinated biphenyls, liquid
Reportable Quantity (RQ): 1 lbs

Poison Inhalation Hazard: No

IMDG

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

IATA

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

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.

Massachusetts Right To Know Components

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

Pennsylvania Right To Know Components

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

New Jersey Right To Know Components

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

California Prop. 65 Components

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

16. OTHER INFORMATION

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

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
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.
STOT RE	Specific target organ toxicity - repeated exposure

HMIS Rating

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

NFPA Rating

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

Further information

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: 11/11/2015 Print Date: 05/01/2016

CORNELL

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Section 1 - Product and Company Identification
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Product Identification: ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE
Date of MSDS: 08/01/1997 **Technical Review Date:** 09/01/1999
FSC: 6810 **NIIN: LIIN:** 00N092040
Submitter: N NF
Status Code: A
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: UNITED MINERAL & CHEMICAL CORP
Manufacturer's Address1: 1100 VALLEYBROOK AVE
Manufacturer's Address2: LYNDHURST, NJ 07071
Manufacturer's Country: US
General Information Telephone: 201-507-3300
Emergency Telephone: (800)424-9300
Emergency Telephone: (800)424-9300
Chemtec Telephone: (800)424-9300
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 87730

Contractor Information

Contractor's Name: UNITED MINERAL & CHEMICAL CORP
Contractor's Address1: 1100 VALLEYBROOK AVE
Contractor's Address2: LYNDHURST, NJ 07071
Contractor's Telephone: 201-507-3300
Contractor's CAGE: 87730

Section 2 - Compositon/Information on Ingredients
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Ingredient Name: ARSENIC; (ARSENIC METAL)
Ingredient CAS Number: 7440-38-2 **Ingredient CAS Code:** T
RTECS Number: CG0525000 **RTECS Code:** T
=WT: 100. **=WT Code:** M
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text:
% Enviromental Weight:
Other REC Limits: N/P
OSHA PEL: N/P **OSHA PEL Code:**
OSHA STEL: N/P **OSHA STEL Code:**
ACGIH TLV: 0.01 MG/M3 **ACGIH TLV Code:** T
ACGIH STEL: NOT ESTABLISHED **ACGIH STEL Code:** T
EPA Reporting Quantity: 1 LB
DOT Reporting Quantity: 1 LB
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Health Hazards Acute & Chronic: ARSENIC METAL IS NOT AS READILY AVAIL IN THE BODY AS ARSENIC IN THE FORM OF DUST OR VAP OR WHEN PROCESSED INTO ARSENIC CMPDS (ARSENICALS). INORGANIC ARSENICALS ARE MORE TOXIC THAN ORGANIC ARSENICALS. ACUTE EFTS: ARSENIC IS POISON BY SUBCUTANEOUS, INTRAMUSCULAR & INTRAPERITONEAL ROUTES. ACUTE ARSENIC POISONING FROM INGEST RSLTS IN MARKED IRRIT OF STOMACH & INTESTINES W/NAUS, VOMIT & DIARR. IN SEV C ASES STOOLS & VOMIT ARE BLOODY & PATIENT MAY GO INTO COLLAPSE & SHOCK W/WEAK, RAPID PULSE, COLD SWEATS, COMA & DEATH. INHAL MAY CAUSE ULCERATION OF NASAL SEPTUM, RESP IRRIT. SKIN/EYE CNTCT MAY CAUSE DERM, SKIN & EYE (EFTS OF OVEREXP)

Signs & Symptoms of Overexposure:
HLTH HAZS: IRRIT. CHRONIC EFTS: ARSENIC IS CONFIRMED HUMAN CARCIN PRODUCING LIVER TUMORS & AN EXPERIMENTAL TERATOGEN (MAY CAUSE DMG TO DEVELOPING FETUS). CHRONIC ARSENIC POISONING MAY INCL ANY/ALL OF FOLLOWING: DIGEST SYS DISTURBS, LOSS OFAPPETITE, CRAMPS, NAUS, CONSTIP, DIARR; LIVER DMG WHICH MAY RSLT IN JAUN; DISTURBS OF BLOOD, KIDNEYS & NERVOUS SYS; SKIN ABNORMS INCL ITCHING, PIGMENTATION & POS S CANCEROUS CHGS. TARGET ORGANS FOR INORGANIC CMPDS AS AS): LIVER, KIDNEYS, SKIN, LUNGS, LYMPHATIC SYS. TLV: 0.01 MG/M3 TWA ARSENIC, ELEMENTAL & INORGANIC CMPDS (EXCEPT ARSINE), AS AS. OSHA PEL: (SUPD AT)

Medical Conditions Aggravated by Exposure:
KNOWN EFFECTS ON OTHER ILLNESSES: GASTROINTESTINAL. NERVOUS SYSTEM. SKIN. LIVER & KIDNEY PROBLEMS. AFTER EXPOSURE HAVE URINE TEST.

LD50 LC50 Mixture: LD50: (ORAL, RAT) 763 MG/M3

Route of Entry Indicators:
- **Inhalation:** YES
- **Skin:** YES
- **Ingestion:** YES

Carcenogenicity Indicators
- **NTP:** YES
- **IARC:** YES
- **OSHA:** YES

Carcinogenicity Explanation: ARSENIC: IARC MONOGRAPHS, SUPPLEMENT, VOL 7, PG 100, 1987: GROUP 1. NTP 8TH ANNUAL REPORT ON CARCINOGENS, 1998: KNOWN TO BE CARCINOGEN. OSHA REGULATED: CFR 29 1910.1018.

Section 4 - First Aid Measures
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

First Aid:
SKIN: FLUSH WITH SOAP AND WATER. AVOID RUBBING INTO SKIN. CONTACT MD IMMEDIATELY. EYES: FLUSH WITH WATER FOR AT LEAST 15 MINUTES. CONTACT PHYSICIAN IMMEDIATELY. INHALATION: REMOVE TO FRESH AIR. PROVID E OXYGEN IF NECESSARY. CONTACT PHYSICIAN IMMEDIATELY. INGESTION: TREATMENT WITH BAS(DIMERCAPTOL) IS OF QUESTIONABLE EFFECTIVENESS IN TRIVALENT ARSENIC COMPOUNDS. INDUCE VOMITING AND DO GASTRIC LAVAGE. GET PERSONNEL TO HOSPITAL IMMEDIATELY. A PHYSICIAN CAN INITIATE AN EXCHANGE TRANSFUSION AND DIALYSIS. ALSO ABSORPTION AND REMOVAL WITH ANIMAL BONE COAL OR FE(OH)*2 SHOULD BE DONE.

Section 5 - Fire Fighting Measures
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Fire Fighting Procedures:
USE NIOSH APPRVD SCBA & FULL PROT EQUIP (FP N). RESTRICT PERS NOT WEARING PROT EQUIP FROM AREA. TRY TO SNUFF FIRE W/SAND, DRY MEDIA, FOAM OR CO*2. IF NO OTHER OPTIONS AVAILABLE, USE WATER & ALWAYS WEA R NIOSH APPRVD SCBA OR NIOSH TOXIC VAPOR RESP. POISONOUS GASES ARE PRODUCED IN FIRE, INCLUDING ARSENIC OXIDES.
Unusual Fire or Explosion Hazard:
ARSENIC, WHEN HEATED OR IN CONTACT W/ACID OR ACID FUMES, CAN PRODUCE HIGHLY TOXIC FUMES. ARSENIC REACTS VIGOROUSLY W/OXIDIZING MATLS. ARSENIC IS FLAMMABLE IN FORM OF DUST WHEN EXPOSED TO HEAT OR FLAME OR BY CHEMICAL RXN W/POWERFUL OXIDIZERS. SLIGHT EXPLOSION HAZ EXISTS IN FORM OF DUST WHEN EXPOSED TO (ECOLOGICAL INFO)
Extinguishing Media:
FOAM, CARBON DIOXIDE, DRY CHEMICAL.
Flash Point: Flash Point Text: NONE

Autoignition Temperature:
Autoignition Temperature Text: N/K
Lower Limit(s): N/A
Upper Limit(s): N/A

Section 6 - Accidental Release Measures
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Spill Release Procedures:
RESTRICT PERSONS NOT WEARING PROTECTIVE EQUIPMENT FROM AREA UNTIL CLEANUP IS COMPLETE. WEARING NIOSH APPROVED RESPIRATOR, GLOVES, GOGGLES, LAB COAT, GATHER UP CHUNKS, RODS OR GRANULES WITH VACUUM OR U TENSILS RESERVED FOR POISONOUS SOLIDS. AVOID RAISING DUST. VENTILATE THE AREA AFTER CLEANUP IS COMPLETE.

Section 7 - Handling and Storage
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Repiratory Protection:
NIOSH APPROVED, AIR PURIFYING, TOXIC VAPOR RESPIRATOR TO PARTICULATE AND FUME AIR LEVEL. FOR INORGANIC ARSENIC APPLICATIONS, SEE 29 CFR 1910.1018 FOR PROPER RESPIRATOR SELECTION.
Ventilation:
LOC EXHST/MECH (GEN) SCRUBBER OR TRAP IF POSS TO MAINTAIN EXPOS TO LESS THAN PERMISSIBLE LIMITS FOR ELEMENTAL ARSENIC & ANY CMPDS BEING GENERATED.

Protective Gloves:
NEOPRENE OR PLASTIC.
Eye Protection: ANSI APPROVED CHEMICAL WORKERS GOGGLES (FP N).
Other Protective Equipment: ANSI APPROVED EYE WASH AND DELUGE SHOWER (FP N). LAB COAT.
Work Hygenic Practices: N/P
Supplemental Health & Safety Information: EFTS OF OVEREXP: 0.01 MG/M3 AS AS & INORGANIC CMPDS; 0.5 AS AS ORGANIC CMPDS. ACGIH TLV: 0.01 MG/M3 TWA ARSENIC, ELEMENTAL & INORGANIC CMPDS (EXCEPT ARSINE), AS AS. ALSO SEE TOXICOLOGICAL INFO. WASTE DISP METH: HAZ DEPENDING ON LEVEL OF TOX CHARACT OF ARSENIC. SEE 40 CFR 261.24 FOR DETERMINATION. (OTHER INFO)

Section 9 - Physical & Chemical Properties
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: =612.C, 1133.6F **Boiling Point Text:** SUBLIMES
Melting/Freezing Point: =814.C, ######F **Melting/Freezing Text:** @ 36 ATM. FP:N/A
Decomposition Point: Decomposition Text: N/P
Vapor Pressure: 1 MMHG @ 372C **Vapor Density:** N/A
Percent Volatile Organic Content:
Specific Gravity: 5.727
Volatile Organic Content Pounds per Gallon:
pH: NONE-0% IN H*2O
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/A
Solubility in Water: INSOLUBLE
Appearance and Odor: SILVER GRAY CRYSTALLINE CHUNKS, RODS OR GRANULES; NO ODOR AS (ECOLOGICAL INFO)
Percent Volatiles by Volume: N/A (BY WT)
Corrosion Rate: N/P

Section 10 - Stability & Reactivity Data
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Stability Indicator: YES
Materials to Avoid:
INCOMPATIBLE W/BROMINE AZIDE, DIRUBIDIUM ACETYLIDE, HALOGENS, PALLADIUM ZINC, PLATINUM, NCL*3, AGNO*3, CRO*3, NA*2O*2, HEXAFLUOROISOPROPYLIDENEAMINO LITHIUM. CAN REACT W/ACIDS OR ACID FUMES & POWERFUL OXIDIZERS SUCH AS BROM
Stability Condition to Avoid:
AVOID OPEN CONTAINERS AND CONTACT WITH INCOMPATIBLE MATERIALS.
Hazardous Decomposition Products:
ARSENIC FUMES, ARSINE, OTHER ARSENIC COMPOUNDS.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
N/P

Section 11 - Toxicological Information

ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Toxicological Information:
LD50: TDLO 605 ?G/KG. ORAL-MAN TDLO 7857 MG/KG/55Y SKIN. DERMAL IRRITATION-RABBIT: UNKNOWN; SUBCUTANEOUS IMPLANT RABBIT LTLO 75 MG/KG. EYE IRRITATION-RABBIT: UNKNOWN.

Section 12 - Ecological Information
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Ecological Information:
N/P. EXPLO HAZ: FLAME. IN EVENT OF A FIRE OR SPILL CONTACT THE STATE DEPARTMENT OF THE ENVIRONMENT & YOUR REGIONAL OFFICE OF THE FEDERAL EPA. PHYSICAL DATA - APPEAR/ODOR: METAL AS COMPOUND, ASH*3, HAS GARLIC ODOR. ODOR THRESHOLD: N/A. MATLS TO AVOID: CHLORATES, IODATES, PEROXIDES, LITHIUM, NACL*3, KMNO*3, RB*2C*2, AGNO*4, NOCL, IF*5, CRO*3, CLF*3, CLO, BRF*3, BRF*5, BRN*3, RBC*3BCH, CSC*3BCH.

Section 13 - Disposal Considerations
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Waste Disposal Methods:
SOLID WASTES SHOULD BE VITRIFIED, PLACED IN LABELED CNTNR & BURIED IN EPA SUPERVISED FACILITY. ETCHING SOLNS & CUTTING WASTES SHOULD BE PRECIPITATED, CEMENTED/VITRIFIED & PLACED IN METAL/PLASTIC LABEL ED CNTNRS & BURIED IN EPA SUPERVISED FACILITY. PASS GAS THRU POTASSIUM PERMANGANATE, PRECIPITATE & T REAT AS ABOVE. WASTE MAY BE CONSIDERED (SUPDAT)

Section 14 - MSDS Transport Information
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Transport Information:
DOT REGULATED: YES. RQ: (NA - PIECES ARE LARGER THAN 100 MICROMETERS IN DIAMETER). IF REGULATED, PROPER SHIPPING NAME: ARSENIC. HAZARD CLASS: (6.1). IDENTIFICATION NO: (UN1558). PACKING GROUP: (III). LABEL REQUIRED: (POISON). INLAND B/L: ARSENIC, 6.1, UN1558, PACKING GROUP II, POISON. EMERGENCY RESPONSE GUIDE NO: (152).

Section 15 - Regulatory Information
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

SARA Title III Information:
SARA TITLE III, SECT 313: LISTED.
Federal Regulatory Information:
TSCA: WE CERTIFY THAT ALL COMPONENTS OF THIS PRODUCT ARE REGISTERED UNDER THE REGULATIONS OF THE TOXIC SUBSTANCES CONTROL ACT. HMIS: HEALTH (4); FLAMMABILITY (0); REACTIVITY (1).
State Regulatory Information:

Section 16 - Other Information
ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE

Other Information:
WASTE DISP METH: HAZARDOUS DEPENDING ON LEVEL OF TOXICITY CHARACTERISTIC OF ARSENIC. SEE 40 CFR 261.24 FOR DETERMINATION. RCRA HAZARDOUS WASTE: YES RCRA @: D004; IF TESTED POSITIVE AS CHARACT OF TOXIC ITY FOR ARSENIC. CERCLA: YES. RQ (1 LB RQ IS APPLICABLE ONLY IF DIAMETER OF PIECES OF SOLID METAL RELEASED IS LESS THAN 100 MICROMETERS OR 0.004 INCH. THIS PROD FORM IS LARGER THAN 100 MICROMETERS & H AS NO RQ IN ITS CURRENT FORM. IF AS HAZ WASTE CHARACT OF ARSENIC, THEN RQ=1LB. FOLLOW ALL LOCAL, STATE AND FEDERAL INFO & REGULATIONS.

HAZCOM Label Information

Product Identification: ARSENIC METAL-MBE CHARGES, ARSENIC CHUNK & GRANULE
CAGE: 87730
Assigned Individual: N
Company Name: UNITED MINERAL & CHEMICAL CORP
Company PO Box:
Company Street Address1: 1100 VALLEYBROOK AVE
Company Street Address2: LYNDHURST, NJ 07071 US
Health Emergency Telephone: (800)424-9300
Label Required Indicator: Y
Date Label Reviewed: 09/01/1999
Status Code: A
Manufacturer's Label Number:
Date of Label:
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: DANGER
Health Hazard: Severe
Contact Hazard: Severe
Fire Hazard: None
Reactivity Hazard: Slight

8/9/2002 10:40:46 AM

SAFETY DATA SHEET

Version 4.5
Revision Date 03/02/2015
Print Date 05/24/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Barium
Product Number	:	237094
Brand	:	Aldrich
CAS-No.	:	7440-39-3

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Substances and mixtures, which in contact with water, emit flammable gases (Category 2), H261
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

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)

H261	In contact with water releases flammable gases.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.

Precautionary statement(s)

P223	Keep away from any possible contact with water, because of violent reaction and possible flash fire.
P231 + P232	Handle under inert gas. Protect from moisture.
P261	Avoid breathing dust/ 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/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
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	:	Ba
Molecular weight	:	137.33 g/mol
CAS-No.	:	7440-39-3
EC-No.	:	231-149-1

Hazardous components

Component	Classification	Concentration
Barium		
	Water-react. 2; Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; H261, H315, H319, H335	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Dry powder

5.2 Special hazards arising from the substance or mixture
Barium oxide

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
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. 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.Keep away from sources of ignition - No smoking.
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.
Never allow product to get in contact with water during storage.

Store under inert gas.
Storage class (TRGS 510): Hazardous materials, which set free flammable gases upon contact with water

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
Barium	7440-39-3	TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Eye, skin, & Gastrointestinal irritation Muscular stimulation Not classifiable as a human carcinogen		

		TWA	0.500000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Eye irritation Muscular stimulation Skin irritation Gastrointestinal irritation Not classifiable as a human carcinogen		
		TWA	0.500000 mg/m3	USA. NIOSH Recommended Exposure Limits

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, Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance Form: Rods

		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: 725 °C (1,337 °F) - lit.
f)	Initial boiling point and boiling range	1,640 °C (2,984 °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	3.6 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
Reacts violently with water.

10.4 Conditions to avoid
Exposure to moisture

10.5 Incompatible materials
Oxidizing agents, Water, acids, Oxygen, Chlorinated solvents, Carbon dioxide (CO_2), Halogens, Halogenated hydrocarbon, Alcohols, Sulphur compounds, Hydrogen sulfide gas

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

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
Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: CQ8370000

Stomach/intestinal disorders, Nausea, Vomiting, Drowsiness, Dizziness, Gastrointestinal disturbance, Weakness, Tremors, Seizures.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 500 mg/l - 96 h
	LC50 - Cyprinodon variegatus (sheepshead minnow) - > 500 mg/l - 96 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

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: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1400 Class: 4.3 Packing group: II EMS-No: F-G, S-O
Proper shipping name: BARIUM

IATA
UN number: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium

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
Barium	7440-39-3	2007-07-01

SARA 311/312 Hazards
Reactivity Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date

Barium	7440-39-3	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.

Eye Irrit.	Eye irritation
H261	In contact with water releases flammable gases.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
Skin Irrit.	Skin irritation
STOT SE	Specific target organ toxicity - single exposure
Water-react.	Substances and mixtures, which in contact with water, emit flammable gases

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	3
Physical Hazard	1

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	1
Special hazard.I:	W

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 4.5 Revision Date: 03/02/2015 Print Date: 05/24/2016

SAFETY DATA SHEET

Benzene

Section 1. Identification

GHS product identifier : Benzene

Chemical name : benzene

Other means of identification : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

Product use : Synthetic/Analytical chemistry.

Synonym : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

SDS # : 001062

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 LIQUIDS - Category 2
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2
GERM CELL MUTAGENICITY - Category 1B
CARCINOGENICITY - Category 1
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (bone marrow) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Highly flammable liquid and vapor.
May form explosive mixtures with air.
Causes serious eye irritation.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
Causes damage to organs through prolonged or repeated exposure. (bone marrow)

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.

Section 2. Hazards identification

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Wear protective gloves. Wear eye or face protection. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : benzene

Other means of identification : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

CAS number/other identifiers

CAS number : 71-43-2

Product code : 001062

Ingredient name	%	CAS number
benzene	100	71-43-2

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 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.

Section 4. First aid measures

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. 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 necessary, call a poison center or physician. 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.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : Harmful if swallowed. Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Highly flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). 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 vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
benzene	**ACGIH TLV (United States, 3/2012).** **Absorbed through skin.** STEL: 8 mg/m³ 15 minutes. STEL: 2.5 ppm 15 minutes. TWA: 1.6 mg/m³ 8 hours. TWA: 0.5 ppm 8 hours. **NIOSH REL (United States, 1/2013).** STEL: 1 ppm 15 minutes. TWA: 0.1 ppm 10 hours. **OSHA PEL (United States, 6/2010).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL Z2 (United States, 11/2006).** AMP: 50 ppm 10 minutes. CEIL: 25 ppm TWA: 10 ppm 8 hours.

Section 8. Exposure controls/personal protection

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: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid. [Watery liquid.]

Color : Colorless. Yellowish.

Molecular weight : 78.12 g/mole

Molecular formula : C6-H6

Boiling/condensation point : 80.09°C (176.2°F)

Melting/freezing point : 5.49°C (41.9°F)

Critical temperature : 288.95°C (552.1°F)

Odor : Characteristic.

Odor threshold : Not available.

Section 9. Physical and chemical properties

pH	:	Not available.
Flash point	:	Closed cup: -11°C (12.2°F)
Burning time	:	Not applicable.
Burning rate	:	Not applicable.
Evaporation rate	:	3.5 (butyl acetate = 1)
Flammability (solid, gas)	:	Not available.
Lower and upper explosive (flammable) limits	:	Lower: 1.2% Upper: 7.8%
Vapor pressure	:	10 kPa (75.006094245 mm Hg) [room temperature]
Vapor density	:	2.7 (Air = 1)
Specific Volume (ft ^{3}/lb)	:	1.1403
Gas Density (lb/ft ^{3})	:	0.877 (20°C / 68 to °F)
Relative density	:	0.88
Solubility	:	Not available.
Solubility in water	:	1.88 g/l
Partition coefficient: n-octanol/water	:	2.13
Auto-ignition temperature	:	498°C (928.4°F)
Decomposition temperature	:	Not available.
SADT	:	Not available.
Viscosity	:	Dynamic (room temperature): 0.604 mPa·s (0.604 cP)

Section 10. Stability and reactivity

Reactivity	:	No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	:	Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.
Incompatibility with various substances	:	Highly 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.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
benzene	LC50 Inhalation Gas. LD50 Oral	Rat Rat	10000 ppm 930 mg/kg	7 hours -

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
benzene	Eyes - Moderate irritant Eyes - Severe irritant Skin - Mild irritant Skin - Mild irritant Skin - Moderate irritant	Rabbit Rabbit Rat Rabbit Rabbit	- - - - -	88 milligrams 24 hours 2 milligrams 8 hours 60 microliters 24 hours 15 milligrams 24 hours 20 milligrams	- - - - -

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
benzene	+	1	Known to be a human carcinogen.

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
benzene	Category 1	Not determined	bone marrow

Aspiration hazard

Not available.

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.

Section 11. Toxicological information

Skin contact : Causes skin irritation.

Ingestion : Harmful if swallowed. 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

Not available.

General : Causes damage to organs through prolonged or repeated exposure.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : May cause genetic defects.

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

Section 12. Ecological information

Product/ingredient name	$LogP_{ow}$	BCF	Potential
benzene	2.13	11	low

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. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Benzene (I,T)	71-43-2	Listed	U019

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1114	UN1114	UN114	UN1114	UN1114
UN proper shipping name	BENZENE	BENZENE	BENZENE	BENZENE	BENZENE
Transport hazard class(es)	3 	3 	3 	3 	3 
Packing group	II	II	II	II	II
Environment	No.	No.	No.	No.	No.
Additional information	**Reportable quantity** 10 lbs / 4.54 kg [1.3675 gal / 5.1767 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.	**Explosive Limit and Limited Quantity Index** 1 **Passenger Carrying Road or Rail Index** 5	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 5 L **Cargo Aircraft Only** Quantity limitation: 60 L **Limited Quantities - Passenger Aircraft** Quantity limitation: 1 L

Section 14. Transport information

	Limited quantity Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 5 L **Cargo aircraft** Quantity limitation: 60 L **Special provisions** IB2, T4, TP1				

"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: benzene
Clean Water Act (CWA) 311: benzene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

Composition/information on ingredients

Section 15. Regulatory information

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
benzene	100	Yes.	No.	No.	Yes.	Yes.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	benzene	71-43-2	100
Supplier notification	benzene	71-43-2	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 cancer and birth defects or other reproductive harm.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
benzene	Yes.	Yes.	6.4 µg/day (ingestion) 13 µg/day (inhalation)	24 µg/day (ingestion) 49 µg/day (inhalation)

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

Section 15. Regulatory information

WHMIS (Canada) : Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

Hazardous Material Information System (U.S.A.)

Health	*	2
Flammability		3
Physical hazards		0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

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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

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Date of previous issue : 10/16/2014.
Version : 0.03

Section 16. Other information

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.

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

Based on Directive 2001/58/EC et seq. of the Commission of the European Communities

BENZO[b]FLUORANTHENE

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Synonyms: benz[e]acephenanthrylene

CAS No.	: 205-99-2	**BCR number**	: BCR-47
EC index No.	: 601-034-00-4	**NFPA code**	: N.D.
EINECS No.	: 205-911-9	**Molecular weight**	: 252.32
RTECS No.	: CU1400000	**Formula**	: $C_{20}H_{12}$

1.2 Use of the substance or the preparation:
Certified reference material for laboratory use only

1.3 Company/undertaking identification:
Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel. : +32 14 57 12 11
Fax : +32 14 58 42 73

1.4 Telephone number for emergency:
+32 70 245 245
Antigifcentrum
p/a Militair Hospitaal Koningin Astrid, Bruynstraat, B-1120 Brussel

2. Composition/information on ingredients

Hazardous ingredients	CAS No. EINECS No.	Conc. in %	Hazard symbol	Risks (R-phrases)
benzo[b]fluoranthene	205-99-2 205-911-9	100	T;N	45-50/53 (1)

(1) For R-phrases in full: see heading 16

3. Hazards identification

- May cause cancer
- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

4. First aid measures

4.1 Eye contact:
- Consult a doctor/medical service if irritation persists
- Rinse immediately with water
- Do not apply neutralizing agents

4.2 Skin contact:
- Consult a doctor/medical service if irritation persists
- Wash with water and soap
- Remove clothing before washing
- Do not apply (chemical) neutralizing agents

4.3 After inhalation:
- Consult a doctor/medical service if breathing problems develop
- Remove the victim into fresh air
- Unconscious: maintain adequate airway and respiration

4.4 After ingestion:
- Consult a doctor/medical service if you feel unwell

- Immediately give lots of water to drink
-- Never give water to an unconscious person
- Do not induce vomiting

5. Fire-fighting measures

5.1 Suitable extinguishing media:
- Water spray
- Polymer foam
- ABC powder
- Carbon dioxide

5.2 Unsuitable extinguishing media:
- Solid water jet ineffective as extinguishing medium

5.3 Special exposure hazards:
- Not easily combustible
- Upon combustion CO and CO2 are formed

5.4 Instructions:
- Take account of toxic firefighting water
- Use firefighting water moderately and contain it

5.5 Special protective equipment for firefighters:
- Heat/fire exposure: compressed air/oxygen apparatus
- Dust cloud production: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal protection/precautions: see 8.1/8.3/10.3

6.2 Environmental precautions:
- Prevent soil and water pollution
- Substance must not be discharged into the sewer
- Dam up the solid spill

6.3 Methods for cleaning up:
- Stop dust cloud by covering with sand/earth
- Carefully collect the spill/leftovers
- Scoop solid spill into closing containers
- Take collected spill to manufacturer/competent authority
- Clean contaminated surfaces with an excess of water
- Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:
- Observe strict hygiene
- Avoid prolonged and repeated contact with skin
- Avoid raising dust
- Do not discharge the waste into the drain
- Clean contaminated clothing

7.2 Storage:
- Keep container tightly closed.
- Store in a cool area
- Store in a dry area
- Store in a dark area
- Keep away from: heat sources, ignition sources, oxidizing agents, acids

Storage temperature	:	N.D.	**°C**
Quantity limits	:	N.D.	**kg**
Storage life	:	N.D.	
Materials for packaging	:	N.D.	

7.3 Specific uses: N.D.

8. Exposure controls/Personal protection

8.1 Exposure limit values:

TLV-TWA	:	not listed
TLV-STEL	:	not listed
TLV-Ceiling	:	not listed
OES-LTEL	:	not listed
OES-STEL	:	not listed
MEL-LTEL	:	not listed
MEL-STEL	:	not listed
MAK	:	not listed
TRK	:	not listed
MAC-TGG 8 h	:	not listed
MAC-TGG 15 min.	:	not listed
MAC-Ceiling	:	not listed
VME-8 h	:	not listed
VLE-15 min.	:	not listed
GWBB-8 h	:	not listed
GWK-15 min.	:	not listed
Momentary value	:	not listed

Sampling methods:

- Benzo(b)fluoranthene (Polynuclear aromatic hydrocarbons) NIOSH 5515
- Benzo(b)fluoranthene (Polynuclear aromatic hydrocarbons) NIOSH 5506

8.2 Exposure controls:

8.2.1 Occupational exposure controls:
- Measure the concentration in the air regularly
- Work under local exhaust/ventilation

8.2.2 Environmental exposure controls: see 13

8.3 Personal protection:

8.3.1 respiratory protection:
- Dust production: dust mask with filter type P3
- High dust production: compressed air/oxygen apparatus

8.3.2 hand protection:
- Gloves
  Suitable materials: No data available
- Breakthrough time: N.D.

8.3.3 eye protection:
- Safety glasses
- In case of dust production: protective goggles

8.3.4 skin protection:
- Protective clothing
- In case of dust production: head/neck protection
  Suitable materials: No data available

9. Physical and chemical properties

9.1 General information:

Appearance (at 20°C)	:	Crystalline solid / Needles
Odour	:	Odourless
Colour	:	Colourless to off-white

9.2 Important health, safety and environmental information:

pH value	:	N.D.	
Boiling point/boiling range	:	N.D.	**°C**
Flashpoint	:	N.D.	**°C**
Explosion limits	:	N.D.	**vol%** (**°C**)
Vapour pressure (at 20°C)	:	0.00000067	**hPa**
Vapour pressure (at 50°C)	:	N.D.	**hPa**
Relative density (at 20°C)	:	N.D.	
Water solubility	:	0.00000012	**g/100 ml**
Soluble in	:	Acetone, oils/fats	
Relative vapour density	:	N.D.	
Viscosity	:	N.D.	**Pa.s**
Partition coëfficient n-octanol/water	:	6.57	
Evaporation rate			
ratio butyl acetate	:	N.D.	
ratio ether	:	N.D.	

9.3 Other information:

Melting point/melting range	:	168	**°C**
Auto-ignition point	:	N.D.	**°C**
Saturation concentration	:	N.D.	**g/m^3**

10. Stability and reactivity

10.1 Conditions to avoid/reactivity:
- Stable under normal conditions

10.2 Materials to avoid:
- Keep away from: heat sources, ignition sources, oxidizing agents, acids

10.3 Hazardous decomposition products:
- Upon combustion CO and CO2 are formed
- Reacts violently with (strong) oxidizers
- Decomposes on exposure to (strong) acids

11. Toxicological information

11.1 Acute toxicity:

LD50 oral rat	:	N.D.	**mg/kg**
LD50 dermal rat	:	N.D.	**mg/kg**
LD50 dermal rabbit	:	N.D.	**mg/kg**
LC50 inhalation rat	:	N.D.	**mg/l/4 h**
LC50 inhalation rat	:	N.D.	**ppm/4 h**

11.2 Chronic toxicity:

benzo[b]fluoranthene

EC carc. cat.	:	2
EC muta. cat.	:	not listed
EC repr. cat.	:	not listed
Carcinogenicity (TLV)	:	A2
Carcinogenicity (MAC)	:	K
Carcinogenicity (VME)	:	not listed
Carcinogenicity (GWBB)	:	not listed
Carcinogenicity (MAK)	:	2
Mutagenicity (MAK)	:	not listed
Teratogenicity (MAK)	:	-
IARC classification	:	2B

11.3 Routes of exposure: ingestion, inhalation, eyes and skin
Caution! Substance is absorbed through the skin

11.4 Acute effects/symptoms:

- **AFTER SKIN CONTACT**
  Slight irritation

11.5 Chronic effects:

- Probably human carcinogenic
- Not classified as toxic to reproduction (EC)

- **ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:**
  No specific information available

- SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
  Feeling of weakness
  Cracking of the skin
  Skin rash/inflammation
  Photoallergy
  Skin cancer
  Lung tissue affection/degeneration
  Enlargement/affection of the liver
  Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

- - No data available

12.2 Mobility:

- **Volatile organic compounds (VOC):** 0%

- Photolysis in water
- Forming sediments in water
- Insoluble in water

For other physicochemical properties see heading 9.

12.3 Persistence and degradability:

- **biodegradation BOD_5** : N.D. **% ThOD**
- **water** : - Not readily biodegradable in water
  - test: E 1/2 > 100 d.
- **soil** : **T ½:** > 87 **days**

12.4 Bioaccumulative potential:

- **log P_{ow}** : 6.57
- **BCF** : 168 h : 2800 (LAMELLIBRANCHIATA)
- Highly bioaccumulative

12.5 Other adverse effects:

- **WGK** : 3 (Classification based on the R-phrases in compliance with Verwaltungsvorschrift wassergefährdender Stoffe (VwVwS) of 17 May 1999)
- **Effect on the ozone layer** : Not dangerous for the ozone layer (Council Regulation (EC) No 3093/94, O.J. L333 of 22/12/94)
- **Greenhouse effect** : no data available
- **Effect on waste water purification** : no data available

13. Disposal considerations

13.1 Provisions relating to waste:

- Waste material code (91/689/EEC, Council Decision 201/118/EC, O.J. L47 of 16/2/2001):16 05 06 (laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory)
- Waste material code (Flanders): 001, 045, 691
- Waste code (Germany): 59302
- Hazardous waste (91/689/EEC)

13.2 Disposal methods:

- Dissolve or mix with a combustible solvent
- Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber
- Do not discharge into surface water (2000/60/EEC, Council Decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

- Waste material code packaging (91/689/EEC, Council Decision 2001/118/EC, O.J. L47 of 16/2/2001): 15 01 10 (packaging containing residues of or contaminated by dangerous substances)

14. Transport information

90
3077

14.1 Classification of the substance in compliance with UN Recommendations

UN number	: 3077
CLASS	: 9
SUB RISKS	: -
PACKING	: III
PROPER SHIPPING NAME	: UN 3077, Environmentally hazardous substance, solid, n.o.s. (benz[e]acephenanthrylene)

14.2 ADR (transport by road)

CLASS	: 9
PACKING	: III
DANGER LABEL TANKS	: 9
DANGER LABEL PACKAGES	: 9

14.3 RID (transport by rail)

CLASS	: 9
PACKING	: III
DANGER LABEL TANKS	: 9
DANGER LABEL PACKAGES	: 9

14.4 ADNR (transport by inland waterways)

CLASS	: 9
PACKING	: III
DANGER LABEL TANKS	: 9
DANGER LABEL PACKAGES	: 9

14.5 IMDG (maritime transport)

CLASS	: 9
SUB RISKS	: -
PACKING	: III
MFAG	: -
EMS	: -
MARINE POLLUTANT	: P

14.6 ICAO (air transport)

CLASS	: 9
SUB RISKS	: -
PACKING	: III
PACKING INSTRUCTIONS PASSENGER AIRCRAFT	:
PACKING INSTRUCTIONS CARGO AIRCRAFT	:

14.7 Special precautions in connection with transport : none

When substances and their packaging meet the conditions established by ADR/RID/ADNR in chapter 3.4, **only** the following prescriptions shall be complied with:
each package shall display a diamond-shaped figure with the following inscription:
- 'UN 3077'
or, in the case of different goods with different identification numbers within a single package:
- the letters 'LQ'

15. Regulatory information

Enumerated in substance list Annex I of directive 67/548/EEC et sequens

Toxic

Dangerous for the environment

R45 : May cause cancer
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

S53 : Avoid exposure - obtain special instructions before use
S45 : In case of accident or if you feel unwell, seek medical advice (show the label where possible)
S60 : This material and/or its container must be disposed of as hazardous waste
S61 : Avoid release to the environment. Refer to special instructions/safety data sheets.

16. Other information

The information provided on this MSDS 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 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.

N.A. = NOT APPLICABLE
N.D. = NOT DETERMINED
***** = INTERNAL CLASSIFICATION

Full text of any R-phrases referred to under heading 2:

R45 : May cause cancer
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Exposure limits:
TLV : Threshold Limit Value - ACGIH USA 2000
OES : Occupational Exposure Standards - United Kingdom 1999
MEL : Maximum Exposure Limits - United Kingdom 1999
MAK : Maximale Arbeitsplatzkonzentrationen - Germany 2001
TRK : Technische Richtkonzentrationen - Germany 2001
MAC : Maximale aanvaarde concentratie - The Netherlands 2002
VME : Valeurs limites de Moyenne d'Exposition - France 1999
VLE : Valeurs limites d'Exposition à court terme - France 1999
GWBB : Grenswaarde beroepsmatige blootstelling - Belgium 1998
GWK : Grenswaarde kortstondige blootstelling - Belgium 1998
EC : Indicative occupational exposure limit values - directive 2000/39/EC

Chronic toxicity:
K : List of the carcinogenic substances and processes - The Netherlands 2002

SAFETY DATA SHEET

Based on Regulation (EC) No. 1907/2006 (REACH) Article 31 and Annex II

BCR-048R: benzo[k]fluoranthene

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Product name: BCR-048R: benzo[k]fluoranthene

CAS number	207-08-9
EC index number	601-036-00-5
EINECS number	205-916-6
RTECS number	DF6350000
Molecular mass	252.32 g/mol
Formula	C20H12

1.2 Use of the substance/preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel: +32 14 57 12 11
Fax: +32 14 59 04 06
JRC-IRMM-RM-Sales@ec.europa.eu

1.4 Emergency telephone:

Poison Centre: +32 70 245 245

2. Hazards identification

NFPA: 1-1-2(*)

DSD/DPD

May cause cancer

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

No certainty about human mutagenic properties

Highly bioaccumulative

Not readily biodegradable in water

CLP

Carc. 1B	May cause cancer. (H350)
Aquatic Acute 1	Very toxic to aquatic life. (H400)
Aquatic Chronic 1	Very toxic to aquatic life with long lasting effects. (H410)

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

No certainty about human mutagenic properties

Highly bioaccumulative

Not readily biodegradable in water

3. Composition/information on ingredients

Name	CAS No EINECS/ELINCS	Conc.	Classification according to DSD/DPD	Classification according to CLP	Note
benzo[k]fluoranthene	207-08-9 205-916-6		Carc. Cat. 2; R45 N; R50-53	Carc. 1B; H350 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	

4. First aid measures

4.1 After inhalation:

Remove the victim into fresh air

Respiratory problems: consult a doctor/medical service

4.2 Skin contact:

Rinse with water

Do not apply (chemical) neutralizing agents

Take victim to a doctor if irritation persists

4.3 Eye contact:

Rinse with water

Do not apply neutralizing agents

Take victim to an ophthalmologist if irritation persists

4.4 After ingestion:

Rinse mouth with water

Immediately after ingestion: give lots of water to drink

Do not induce vomiting

Consult a doctor/medical service if you feel unwell

5. Fire-fighting measures

5.1 Suitable extinguishing media:

Water spray

Polyvalent foam

ABC powder

Carbon dioxide

5.2 Unsuitable extinguishing media:

No unsuitable extinguishing media known

5.3 Special exposure hazards:

Heating increases the fire hazard

Dust cloud can be ignited by a spark

Upon combustion CO and CO2 are formed

5.4 Instructions:

Take account of toxic fire-fighting water

Use water moderately and if possible collect or contain it

5.5 Special protective equipment for fire-fighters:

Gloves

Protective clothing

Heat/fire exposure: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal precautions:

See heading 8.2

6.2 Environmental precautions:

Dam up the solid spill

Prevent soil and water pollution

Prevent spreading in sewers

See heading 13

6.3 Methods for cleaning up:

Scoop solid spill into closing containers
Carefully collect the spill/leftovers
Clean contaminated surfaces with an excess of water
Take collected spill to manufacturer/competent authority
Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

Avoid raising dust
Warning! Avoid exposure
Keep away from naked flames/heat
Obtain special instructions before use
Observe strict hygiene
Keep container tightly closed
Do not discharge the waste into the drain

7.2 Storage:

Safe storage requirements:

Store in a cool area
Store in a dry area
Keep container in a well-ventilated place
Keep locked up
Unauthorized persons are not admitted
Meet the legal requirements

Keep away from:

oxidizing agents
(strong) acids

7.3 Specific use(s):

See information supplied by the manufacturer for the identified use(s)

8. Exposure controls/Personal protection

8.1 Exposure limit values:

8.1.1 Occupational exposure:

If limit values are applicable and available these will be listed below.

8.1.2 Sampling methods:

Product name	Test	Number	Sampling method	Remarks
Benz(a)Anthracene	OSHA	CSI		
Benz(a)Anthracene (Polynuclear aromatic hydrocarbons)	NIOSH	5506	adsorption tubes	
Benz(a)Anthracene (Polynuclear aromatic hydrocarbons)	NIOSH	5515	adsorption tubes	

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

Measure the concentration in the air regularly
Carry operations in the open/under local exhaust/ventilation or with respiratory protection
Personal protective equipment:

a) Respiratory protection:

Dust production: dust mask with filter type P3

b) Hand protection:

Gloves

c) Eye protection:

Safety glasses
In case of dust production: protective goggles

d) Skin protection:

Protective clothing

8.2.2 Environmental exposure controls:

See headings 6.2, 6.3 and 13

9. Physical and chemical properties

9.1 General information:

Physical form	Crystalline solid
	Needles
Colour	Light yellow

9.2 Important health, safety and environmental information:

Boiling point	480 °C
Vapour pressure (20°C)	< 0.00001 hPa
Solubility in water	< 0.00001 g/100 ml
Solubility in solvents	Soluble in ethanol
	Soluble in acetic acid
	Soluble in oils/fats
Log Pow	6.84

9.3 Other information:

Melting point	217 °C

10. Stability and reactivity

10.1 Conditions to avoid:

Possible fire hazard

heat sources
ignition sources

Stability

No data available

Reactions

Reacts violently with (strong) oxidizers

10.2 Materials to avoid:

oxidizing agents
(strong) acids

10.3 Hazardous decomposition products:

Upon combustion CO and CO2 are formed

11. Toxicological information

11.1 Acute toxicity:

No (test)data available.

11.2 Chronic toxicity:

Probably human carcinogenic
No certainty about human mutagenic properties
Not classified as toxic to reproduction (EC)

BCR-048R: benzo[k]fluoranthene

EC carc cat	2
Listed in SZW - List of carcinogenic substances	yes
IARC - classification	2B
MAK - Krebserzeugend Kategorie	2
MAK - Keimzellmutagen Kategorie	3B
MAK - Schwangerschaft Gruppe	-
CLP carc cat	category 1B

11.3 Acute effects/symptoms:

Inhalation:

No data available

Skin contact:

Slight irritation

Eye contact:

Slight irritation

Ingestion:

No data available

11.4 Chronic effects:

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
No specific information available
SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
Feeling of weakness
Cracking of the skin
Skin rash/inflammation
Photoallergy
Skin cancer
Lung tissue affection/degeneration
Enlargement/affection of the liver
Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

No (test)data available.

12.2 Mobility:

Volatile organic compounds (VOC)	0 %
Solubility in/reaction with water	Insoluble in water
Water physicochemical processes	Forming sediments in water
Soil physicochemical processes	Adsorbs into the soil

12.3 Persistence and degradability:

Water abiotic degradation processes	Ozonation in water
Half-life soil	65 - 1400 days

Not readily biodegradable in water

12.4 Bioaccumulative potential:

Log Pow	6.84

Highly bioaccumulative

12.5 Results of PBT assessment:

Not applicable, based on available data

12.6 Other adverse effects:

Not dangerous for the ozone layer (Council Regulation (EC) no 1005/2009)

13. Disposal considerations

13.1 Provisions relating to waste:

Waste material code (Directive 2008/98/EC, decision 2001/118/EC)
16 05 06* : laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals
Depending on branch of industry and production process, also other EURAL codes may be applicable
Hazardous waste according to Directive 2008/98/EC

13.2 Disposal methods:

Dissolve or mix with a combustible solvent
Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery
Remove waste in accordance with local and/or national regulations
Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

Waste material code packaging (Directive 2008/98/EC)
15 01 10* : packaging containing residues of or contaminated by dangerous substances

{13.4 Entsorgung verschmutzter Gebinde:}

14. Transport information

ADR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADR	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Hazard identification number	90
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

RID

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name RID	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

ADNR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADNR	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

IMO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name IMO	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Labels	9
Marine pollutant	P
Environmentally hazardous substance mark	yes

ICAO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ICAO	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Labels	9
Environmentally hazardous substance mark	yes

15. Regulatory information

15.1 EU Legislation:

DSD/DPD

Enumerated in substance list Annex I of directive 67/548/EEC et sequens

Dangerous for the environment

R-phrases

45	May cause cancer
50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

S-phrases

53	Avoid exposure - obtain special instructions before use
45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)
60	This material and its container must be disposed of as hazardous waste
61	Avoid release to the environment. Refer to special instructions/safety data sheets.

Additional recommendations

	Restricted to professional users.

CLP

Classification and labelling according to Regulation (EC) No 1272/2008 – Annex VI and after evaluation of available test data

Signal word

Dgr	Danger

H-statements

H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.

P-statements

P202	Do not handle until all safety precautions have been read and understood.
P281	Use personal protective equipment as required.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P391	Collect spillage.
P405	Store locked up.

Supplemental information

	Restricted to professional users.

15.2 National provisions:

15.3 Specific community rules:

Enumerated in Annex XVII of Regulation (EC) No. 1907/2006: Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

Legislation	Reference legislation
EG/552/2009	See column 1: 28.
EG/552/2009	See column 1: 50. g)

16. Other information

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question.

Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. BIG does not guarantee the accuracy or exhaustiveness of the information provided. Use of this safety data sheet is subject to the licence and liability limiting conditions as stated in your BIG licence agreement. All intellectual property rights to this sheet are the property of BIG and its distribution and reproduction are limited. Consult your BIG licence agreement for details.

(*) = INTERNAL CLASSIFICATION (NFPA)

PBT-substances = persistent, bioaccumulative and toxic substances

DSD Dangerous Substance Directive
DPD Dangerous Preparation Directive
CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

Full text of any R-phrases referred to under headings 2 and 3:

R45	May cause cancer
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Full text of any H-statements referred to under headings 2 and 3:

H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of any classes referred to under headings 2 and 3:

Aquatic Acute	Hazardous to the aquatic environment - acute
Aquatic Chronic	Hazardous to the aquatic environment - chronic
Carc.	Carcinogenicity

SAFETY DATA SHEET

Based on Directive 2001/58/EC et seq. of the Commission of the European Communities

BENZ[a]ANTHRACENE

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Synonyms: benzo(a)anthracene

CAS No.	: 56-55-3	**BCR number**	: BCR-271
EC index No.	: 601-033-00-9	**NFPA code**	: N.D.
EINECS No.	: 200-280-6	**Molecular weight**	: 228.30
RTECS No.	: CV9275000	**Formula**	: C18H12

1.2 Use of the substance or the preparation:
Certified reference material for laboratory use only

1.3 Company/undertaking identification:
Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel. : +32 14 57 12 11
Fax : +32 14 58 42 73

1.4 Telephone number for emergency:
+32 70 245 245
Antigifcentrum
p/a Militair Hospitaal Koningin Astrid, Bruynstraat, B-1120 Brussel

2. Composition/information on ingredients

Hazardous ingredients	CAS No. EINECS No.	Conc. in %	Hazard symbol	Risks (R-phrases)
Benzo[a]anthracene	56-55-3 200-280-6	100	T;N	45-50/53 (1)

(1) For R-phrases in full: see heading 16

3. Hazards identification

- May cause cancer
- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

4. First aid measures

4.1 Eye contact:
- Consult a doctor/medical service if irritation persists
- Rinse immediately with water

4.2 Skin contact:
- Consult a doctor/medical service if irritation persists
- Wash with water and soap
- Remove clothing before washing

4.3 After inhalation:
- Consult a doctor/medical service if breathing problems develop
- Remove the victim into fresh air
- Unconscious: maintain adequate airway and respiration

4.4 After ingestion:
- Consult a doctor/medical service if you feel unwell
- Immediately give lots of water to drink
- Never give water to an unconscious person

5. Fire-fighting measures

5.1 Suitable extinguishing media:
- Water spray
- Alcohol foam
- Polymer foam
- ABC powder
- Carbon dioxide

5.2 Unsuitable extinguishing media:
- Solid water jet ineffective as extinguishing medium

5.3 Special exposure hazards:
- Not easily combustible
- Upon combustion CO and CO2 are formed

5.4 Instructions:
- Take account of toxic firefighting water
- Use firefighting water moderately and contain it

5.5 Special protective equipment for firefighters:
- Heat/fire exposure: compressed air/oxygen apparatus
- Dust cloud production: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal protection/precautions: see heading 8.1/8.3/10.3

6.2 Environmental precautions:
- Prevent soil and water pollution
- Substance must not be discharged into the sewer
- Dam up the solid spill

6.3 Methods for cleaning up:
- Stop dust cloud by covering with sand/earth
- Carefully collect the spill/leftovers
- Scoop solid spill into closing containers
- Take collected spill to manufacturer/competent authority
- Clean contaminated surfaces with an excess of water
- Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:
- Observe strict hygiene
- Avoid prolonged and repeated contact with skin
- Avoid raising dust
- Do not discharge the waste into the drain
- Remove contaminated clothing immediately

7.2 Storage:
- Keep container tightly closed. Store in a cool area. Store in a dry area.
- Store in a dark area.
- Keep away from: heat sources, ignition sources, oxidizing agents, acids

Storage temperature	:	N.D.	**°C**
Quantity limits	:	N.D.	**kg**
Storage life	:	N.D.	
Materials for packaging	:		

- suitable : no data available
- to avoid : no data available

7.3 Specific uses:
See information supplied by the manufacturer

8. Exposure controls/Personal protection

8.1 Exposure limit values:

TLV-TWA	:	**mg/m^3**	-	**ppm**
TLV-STEL	:	**mg/m^3**	-	**ppm**
TLV-Ceiling	:	**mg/m^3**		**ppm**
OES-LTEL	:	**mg/m^3**		**ppm**
OES-STEL	:	**mg/m^3**		**ppm**
MAK	:	**mg/m^3**		**ppm**
TRK	:	**mg/m^3**		**ppm**
MAC-TGG 8 h	:	**mg/m^3**		
MAC-TGG 15 min.	:	**mg/m^3**		
MAC-Ceiling	:	**mg/m^3**		
VME-8 h	:	**mg/m^3**		**ppm**
VLE-15 min.	:	**mg/m^3**		**ppm**
GWBB-8 h	:	**mg/m^3**		**ppm**
GWK-15 min.	:	**mg/m^3**		**ppm**
Momentary value	:	**mg/m^3**		**ppm**
EC	:	**mg/m^3**		**ppm**
EC-STEL	:	**mg/m^3**		**ppm**

Sampling methods:

- Benz(a)Anthracene (Polynuclear aromatic hydrocarbons) NIOSH 5506
- Benz(a)Anthracene (Polynuclear aromatic hydrocarbons) NIOSH 5515
- Benz(a)Anthracene OSHA CSI

8.2 Exposure controls:

8.2.1 Occupational exposure controls:
- Measure the concentration in the air regularly
- Work under local exhaust/ventilation

8.2.2 Environmental exposure controls: see heading 13

8.3 Personal protection:

8.3.1 respiratory protection:
- Dust production: dust mask with filter type P3
- High dust production: compressed air/oxygen apparatus

8.3.2 hand protection:
- Gloves
  Suitable materials: No data available
- Breakthrough time: N.D.

8.3.3 eye protection:
- Safety glasses
- In case of dust production: protective goggles

8.3.4 skin protection:
- Protective clothing
- In case of dust production: head/neck protection
  Suitable materials: No data available

9. Physical and chemical properties

9.1 General information:

Appearance (at 20°C)	: Crystalline solid / Scales	
Odour	: Odourless	
Colour	: Colourless to fluorescent yellow-green	

9.2 Important health, safety and environmental information:

pH value	: N.D.	
Boiling point/boiling range	: N.A.	**°C**
Flashpoint	: N.D.	**°C**
Explosion limits	: N.D.	**vol% (°C)**
Vapour pressure (at 20°C)	: 0.00007	**hPa**
Vapour pressure (at 50°C)	: N.D.	**hPa**
Relative density (at 20°C)	: 1.3	
Water solubility	: 0.00001	**g/100 ml**
Soluble in	: Ether, acetone, oils/fats	
Relative vapour density	: N.D.	
Viscosity	: N.D.	**Pa.s**
Partition coëfficient n-octanol/water	: 5.61/5.79	
Evaporation rate		
ratio to butyl acetate	: N.D.	
ratio to ether	: N.D.	

9.3 Other information:

Melting point/melting range	: 160	**°C**
Auto-ignition point	: N.D.	**°C**
Saturation concentration	: N.D.	**g/m^3**

10. Stability and reactivity

10.1 Conditions to avoid/reactivity:
- Stable under normal conditions

10.2 Materials to avoid:
- Keep away from: heat sources, ignition sources, oxidizing agents, acids

10.3 Hazardous decomposition products:
- Upon combustion CO and CO2 are formed
- Reacts violently with (strong) oxidizers
- Decomposes on exposure to (strong) acids

11. Toxicological information

11.1 Acute toxicity:

LD50 oral rat	: N.D.	**mg/kg**
LD50 dermal rat	: N.D.	**mg/kg**
LD50 dermal rabbit	: N.D.	**mg/kg**
LC50 inhalation rat	: N.D.	**mg/l/4 h**
LC50 inhalation rat	: N.D.	**ppm/4 h**

11.2 Chronic toxicity:

EC carc. cat.	:	2
EC muta. cat.	:	not listed
EC repr. cat.	:	not listed
Carcinogenicity (TLV)	:	A2
Carcinogenicity (MAC)	:	K
Carcinogenicity (VME)	:	not listed
Carcinogenicity (GWBB)	:	not listed
Carcinogenicity (MAK)	:	2
Mutagenicity (MAK)	:	not listed
Teratogenicity (MAK)	:	-
IARC classification	:	2A

11.3 Routes of exposure: ingestion, inhalation, eyes and skin
Caution! Substance is absorbed through the skin

11.4 Acute effects/symptoms:

AFTER SKIN CONTACT
- Slight irritation

11.5 Chronic effects:

- Probably human carcinogenic
- Mutagenicity: AMES test positive
- Probably human mutagenic

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
- No specific information available

SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
- Feeling of weakness
- Photoallergy
- Skin rash/inflammation
- Cracking of the skin
- Skin cancer
- Lung tissue affection/degeneration
- Enlargement/affection of the liver
- Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

- LC50 (65 h) : 0.0018 mg/l (PIMEPHALES PROMELAS)
- EC50 (96 h) : 0.01 mg/l (DAPHNIA PULEX)

12.2 Mobility:

- **Volatile organic compounds (VOC):** 0%

- Photolysis in water
- Ozonation in water
- Insoluble in water

For other physicochemical properties see heading 9.

12.3 Persistence and degradability:

- biodegradation BOD_5	:		N.D.	**% ThOD**
- water	:	-	Not readily biodegradable in water	
- soil	:	**T ½:**	> 100	**days**

12.4 Bioaccumulative potential:
- **log P_{ow}** : 5.61/5.79
- **BCF** : 72 h : 350 (LEUCISCUS IDUS)
- Highly bioaccumulative

12.5 Other adverse effects:

- **WGK** : 3 (Classification based on the R-phrases in compliance with Verwaltungsvorschrift wassergefährdender Stoffe (VwVwS) of 17 May 1999)
- **Effect on the ozone layer** : Not dangerous for the ozone layer (Council Regulation (EC) 3093/94)
- **Greenhouse effect** : no data available
- **Effect on waste water purification** : no data available

13. Disposal considerations

13.1 Provisions relating to waste:

- Waste material code (91/689/EEC, Council Decision 2001/118/EC, O.J. L47 of 16/2/2001): 16 05 06 (laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals)
- Waste material code (Flanders): 001, 045, 691
- Waste code (Germany): 59302
- Hazardous waste (91/689/EEC)

13.2 Disposal methods:

- Dissolve or mix with a combustible solvent
- Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber
- Do not discharge into surface water (2000/60/EEC, Council Decision 2455/2001/EC)

13.3 Packaging/Container:

- Waste material code packaging (91/689/EEC, Council Decision 2001/118/EC, O.J. L47 of 16/2/2001): 15 01 10 (packaging containing residues of or contaminated by dangerous substances)

14. Transport information

90
3077

14.1 Classification of the substance in compliance with UN Recommendations

UN number	: 3077
CLASS	: 9
SUB RISKS	: -
PACKING	: III
PROPER SHIPPING NAME	: UN 3077, Environmentally hazardous substance, solid, n.o.s. (benzo[a]anthracene)

14.2 ADR (transport by road)

CLASS	: 9
PACKING	: III
DANGER LABEL TANKS	: 9
DANGER LABEL PACKAGES	: 9

14.3 RID (transport by rail)

CLASS	: 9
PACKING	: III
DANGER LABEL TANKS	: 9
DANGER LABEL PACKAGES	: 9

14.4 ADNR (transport by inland waterways)

CLASS	: 9
PACKING	: III
DANGER LABEL TANKS	: 9
DANGER LABEL PACKAGES	: 9

14.5 IMDG (maritime transport)

CLASS	: 9
SUB RISKS	: -
PACKING	: III
MFAG	: -
EMS	: -
MARINE POLLUTANT	: P

14.6 ICAO (air transport)

CLASS	: 9
SUB RISKS	: -
PACKING	: III
PACKING INSTRUCTIONS PASSENGER AIRCRAFT	:
PACKING INSTRUCTIONS CARGO AIRCRAFT	:

14.7 Special precautions in connection with transport : none

14.8 Limited quantities (LQ) :

When substances and their packaging meet the conditions established by ADR/RID/ADNR in chapter 3.4, **only** the following prescriptions shall be complied with:
each package shall display a diamond-shaped figure with the following inscription:
- 'UN 3077'
or, in the case of different goods with different identification numbers within a single package:
- the letters 'LQ'

15. Regulatory information

Enumerated in substance list Annex I of directive 67/548/EEC et sequens

Toxic

Dangerous for the environment

R45 : May cause cancer
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

S53 : Avoid exposure - obtain special instructions before use
S45 : In case of accident or if you feel unwell, seek medical advice (show the label where possible)
S60 : This material and/or its container must be disposed of as hazardous waste
S61 : Avoid release to the environment. Refer to special instructions/safety data sheets.

16. Other information

The information provided on this MSDS 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 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.

N.A. = NOT APPLICABLE
N.D. = NOT DETERMINED
***** = INTERNAL CLASSIFICATION

Full text of any R-phrases referred to under heading 2:

R45 : May cause cancer
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Exposure limits:

TLV : Threshold Limit Value - ACGIH USA 2000
OES : Occupational Exposure Standards - United Kingdom 1999
MEL : Maximum Exposure Limits - United Kingdom 1999
MAK : Maximale Arbeitsplatzkonzentrationen - Germany 2001
TRK : Technische Richtkonzentrationen - Germany 2001
MAC : Maximale aanvaarde concentratie - The Netherlands 2002
VME : Valeurs limites de Moyenne d'Exposition - France 1999
VLE : Valeurs limites d'Exposition à court terme - France 1999
GWBB : Grenswaarde beroepsmatige blootstelling - Belgium 1998
GWK : Grenswaarde kortstondige blootstelling - Belgium 1998
EC : Indicative occupational exposure limit values - directive 2000/39/EC

Chronic toxicity:

K : List of the carcinogenic substances and processes - The Netherlands 2002

Material Safety Data Sheet

Benzo[a]pyrene, 98%

ACC# 37175

Section 1 - Chemical Product and Company Identification

MSDS Name: Benzo[a]pyrene, 98%
Catalog Numbers: AC105600000, AC105600010, AC105601000, AC377200000, AC377200010, AC377201000 AC377201000
Synonyms: 3,4-Benzopyrene; 3,4-Benzpyrene; Benzo[def]chrysene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
50-32-8	Benzo[a]pyrene	>96	200-028-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: yellow to brown powder.
Danger! May cause harm to the unborn child. May impair fertility. May cause eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Cancer hazard. May cause allergic skin reaction. May cause heritable genetic damage.
Target Organs: Reproductive system, skin.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation. May be harmful if absorbed through the skin. May cause an allergic reaction in certain individuals.
Ingestion: May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated. May be harmful if swallowed.
Inhalation: May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. May be harmful if inhaled.
Chronic: May cause cancer in humans. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs

Benzo[a]pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Benzo[a]pyrene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Powder
Appearance: yellow to brown
Odor: faint aromatic odor
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 495 deg C @ 760 mm Hg
Freezing/Melting Point:175 - 179 deg C
Decomposition Temperature: Not available.
Solubility: 1.60x10-3 mg/l @25°C
Specific Gravity/Density: Not available.
Molecular Formula:C20H12
Molecular Weight:252.31

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 50-32-8: DJ3675000
LD50/LC50:

Not available.

Carcinogenicity:
CAS# 50-32-8:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.
Mutagenicity: Mutagenic effects have occurred in humans.Mutagenic effects have occurred in experimental animals.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 50-32-8: waste number U022.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	NOT REGULATED FOR DOMESTIC TRANSPORT	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOL (Benzo{a} pyrene)
Hazard Class:		9
UN Number:		UN3077
Packing Group:		III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 50-32-8 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 50-32-8: 1 lb final RQ; 0.454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 50-32-8: immediate, delayed.

Section 313

This material contains Benzo[a]pyrene (CAS# 50-32-8, >96%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 50-32-8 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 50-32-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Benzo[a]pyrene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 50-32-8: 0.06 æg/day NSRL

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T N

Risk Phrases:

R 43 May cause sensitization by skin contact.
R 45 May cause cancer.
R 46 May cause heritable genetic damage.
R 60 May impair fertility.
R 61 May cause harm to the unborn child.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 53 Avoid exposure - obtain special instructions before use.
S 60 This material and its container must be disposed of as hazardou
s waste.
S 61 Avoid release to the environment. Refer to special instructions
/safety data sheets.

WGK (Water Danger/Protection)
CAS# 50-32-8: No information available.
Canada - DSL/NDSL
CAS# 50-32-8 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D2A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 50-32-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #7 Date: 6/30/2006

SAFETY DATA SHEET

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

1. Identification

Product Name **Benzo[ghi]perylene**

Cat No. : **AC105550000; AC105550050; AC105550250; AC105551000**

Synonyms 1,12-Benzoperylene

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
Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements
None required

Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects

3. Composition / information on ingredients

Component	CAS-No	Weight %
Benzo(ghi)perylene	191-24-2	> 98

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. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. 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

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
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
0	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 Avoid dust formation. 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 breathe vapors or spray mist.

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.

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	Yellow
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	276 - 280 °C / 528.8 - 536 °F
Boiling Point/Range	No information available > @ 760 mmHg
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	No information available
Vapor Density	No information available
Relative Density	No information available
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	C22 H12
Molecular Weight	276.33

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable.
Conditions to Avoid	Excess heat. Exposure to light. Incompatible products.
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	No acute toxicity information is available for this product
Component Information	
Toxicologically Synergistic	No information available

Products

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(ghi)perylene	191-24-2	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 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 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 .

Component	log Pow
Benzo(ghi)perylene	7.23

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

Benzo(ghi)perylene	-	-	-	205-883-8	-		-	-	-	-	-

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(ghi)perylene	191-24-2	> 98	1.0

SARA 311/312 Hazardous Categorization

Acute Health Hazard	No
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
Benzo(ghi)perylene	-	-	X	X

Clean Air Act Not applicable

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
Benzo(ghi)perylene	5000 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
Benzo(ghi)perylene	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 Non-controlled

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

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 01-May-2012 **Revision Date** 23-Jan-2015 **Revision Number** 2

1. Identification

Product Name **Benzoic acid**

Cat No. : **A63-500; A65-500; A68-30**

Synonyms Benzenecarboxylic acid; Benzenemethanoic acid; Phenylcarboxylic acid; Phenylformic acid; Benzeneformic acid; Carboxybenzene

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)

Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Lungs.	

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye damage
Causes damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Do not eat, drink or smoke when using this product
Response
Get medical attention/advice if you feel unwell
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
Immediately call a POISON CENTER or doctor/physician
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 %
Benzoic acid	65-85-0	>95

4. First-aid measures

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

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. Obtain medical attention.

Ingestion Do not induce vomiting. Obtain medical attention.

Most important symptoms/effects Causes eye burns. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons.

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 121 °C / 249.8 °F
Method - No information available

Autoignition Temperature Not applicable 570 °C / 1058 °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.

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	1	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation.
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.

7. Handling and storage

Handling Avoid contact with skin and eyes. Avoid ingestion and inhalation. Do not breathe dust.

Storage Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat and sources of ignition.

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	Off-white
Odor	aromatic
Odor Threshold	No information available
pH	2.5-3.5 2.9 g/l water
Melting Point/Range	121 - 123 °C / 249.8 - 253.4 °F
Boiling Point/Range	249 °C / 480.2 °F @ 760 mmHg
Flash Point	121 °C / 249.8 °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	1.3 hPa @ 96 °C
Vapor Density	Not applicable
Relative Density	No information available
Solubility	soluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	Not applicable 570 °C / 1058 °F
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	C7 H6 O2
Molecular Weight	122.12

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Avoid dust formation.

Incompatible Materials Strong acids, Strong bases, Strong oxidizing agents, Strong reducing agents, Metals

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions Aqueous solution, May react with metals and lead to the formation of flammable hydrogen gas.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Benzoic acid	1700 mg/kg (Rat) 2565 mg/kg (Rat)	Not listed	26 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 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
Benzoic acid	65-85-0	Not listed	Not listed	Not listed	Not listed	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 None known
STOT - repeated exposure Lungs

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

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Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Benzoic acid	5 mg/L EC50 = 3 h	180 mg/L LC50 96 h	EC50 = 16.85 mg/L 30 min EC50 = 16.9 mg/L 15 min	300 mg/L EC50 = 24 h 860 mg/L EC50 = 48 h

Persistence and Degradability Soluble 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 water solubility.

Component	log Pow
Benzoic acid	1.93

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
Benzoic acid	X	X	-	200-618-2	-		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

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Benzoic acid	X	5000 lb	-	-

Clean Air Act Not applicable

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
Benzoic acid	5000 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
Benzoic acid	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 E Corrosive material
D2A Very toxic materials

16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Creation Date	01-May-2012
Revision Date	23-Jan-2015
Print Date	23-Jan-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 5.4
Revision Date 01/02/2015
Print Date 02/18/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Benzyl butyl phthalate
Product Number	:	308501
Brand	:	Aldrich
Index-No.	:	607-430-00-3
CAS-No.	:	85-68-7

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)
Reproductive toxicity (Category 1B), H360
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)

H360	May damage fertility or the unborn child.
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	:	$C_{19}H_{20}O_4$
Molecular weight	:	312.36 g/mol
CAS-No.	:	85-68-7
EC-No.	:	201-622-7
Index-No.	:	607-430-00-3

Hazardous components

Component	Classification	Concentration
Benzyl butyl phthalate Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Repr. 1B; Aquatic Acute 1; Aquatic Chronic 1; H360, 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 breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid 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.
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: 0.4 mm
Break through time: 480 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact
Material: Nature latex/chloroprene
Minimum layer thickness: 0.6 mm
Break through time: 60 min

Material tested:Lapren® (KCL 706 / Aldrich Z677558, 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 respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/freezing point: < -34.99 °C (< -30.98 °F)
f)	Initial boiling point and boiling range	370 °C (698 °F)
g)	Flash point	113.0 °C (235.4 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	19.2 hPa (14.4 mmHg) at 250.0 °C (482.0 °F) 0.3 hPa (0.2 mmHg) at 150.0 °C (302.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.1 g/cm3 at 25 °C (77 °F)
n)	Water solubility	0.00269 g/l at 25 °C (77 °F) - OECD Test Guideline 105 - slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 4.91 at 20 °C (68 °F)
p)	Auto-ignition temperature	232.0 °C (449.6 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available

t) Oxidizing properties No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Strong bases

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 2,330 mg/kg
(OECD Test Guideline 401)

Inhalation: No data available

LD50 Dermal - Rabbit - > 10,000 mg/kg

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
- Guinea pig
Result: Does not cause skin sensitisation.

Germ cell mutagenicity
Ames test
S. typhimurium
Result: negative

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.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Benzyl butyl phthalate)
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
Presumed human reproductive toxicant

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

Repeated dose toxicity - Rat - male - Oral - No observed adverse effect level - 550 mg/kg
RTECS: TH9990000

May cause endocrine disruption.

pancreas -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 1.7 mg/l - 96.0 h
	NOEC - Oncorhynchus mykiss (rainbow trout) - 0.48 mg/l - 96.0 h
	flow-through test LC50 - Pimephales promelas (fathead minnow) - 2.1 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test LC50 - Daphnia magna (Water flea) - 1.8 mg/l - 48 h
Toxicity to algae	Growth inhibition EC50 - Desmodesmus subspicatus (green algae) - 0.31 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 14 d Result: 81 % - Readily biodegradable

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 21 d - 0.00973 mg/l Bioconcentration factor (BCF): 663

12.4 Mobility in soil
No data available

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

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

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

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. (Benzyl butyl phthalate)
Reportable Quantity (RQ): 100 lbs
Marine pollutant:yes
Poison Inhalation Hazard: No

IMDG
UN number: 3082 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Benzyl butyl phthalate)
Marine pollutant:yes

IATA
UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (Benzyl butyl phthalate)

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.

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzyl butyl phthalate	85-68-7	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzyl butyl phthalate	85-68-7	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benzyl butyl phthalate	85-68-7	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Benzyl butyl phthalate	85-68-7	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
H360	May damage fertility or the unborn child.

H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
Repr.	Reproductive toxicity

HMIS Rating

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

NFPA Rating

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

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 5.4 Revision Date: 01/02/2015 Print Date: 02/18/2016

SAFETY DATA SHEET

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

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	2.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z27.29-1970		
		CEIL	5.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000microgram 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) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	2.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	2.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000microgram 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) Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen 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 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 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

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. 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

Preparation Information

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

SAFETY DATA SHEET

Version 5.11
Revision Date 06/18/2015
Print Date 02/11/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Bis(2-ethylhexyl) phthalate
Product Number	:	80030
Brand	:	Sigma-Aldrich
Index-No.	:	607-317-00-9
CAS-No.	:	117-81-7

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)
Reproductive toxicity (Category 1B), H360

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)	
H360	May damage fertility or the unborn child.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
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

Endocrine disrupting chemical(s)

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	'Dioctyl' phthalate Phthalic acid bis(2-ethylhexyl ester) DEHP
Formula	:	$C_{24}H_{38}O_4$
Molecular weight	:	390.56 g/mol
CAS-No.	:	117-81-7
EC-No.	:	204-211-0
Index-No.	:	607-317-00-9
Registration number	:	01-2119484611-38-XXXX

Hazardous components

Component	Classification	Concentration
bis(2-Ethylhexyl) phthalate Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Repr. 1B; H360	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid 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.

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
bis(2-Ethylhexyl) phthalate	117-81-7	TWA	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Lower Respiratory Tract irritation Confirmed animal carcinogen with unknown relevance to humans		
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		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
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: 0.2 mm
Break through time: 480 min
Material tested:Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 230 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 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	-50.0 °C (-58.0 °F)
f)	Initial boiling point and boiling range	386 °C (727 °F) - lit.
g)	Flash point	207.0 °C (404.6 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Lower explosion limit: 0.3 %(V)
k)	Vapour pressure	1.6 hPa (1.2 mmHg) at 93.0 °C (199.4 °F)
l)	Vapour density	No data available
m)	Relative density	0.985 g/cm3 at 20 °C (68 °F)
n)	Water solubility	insoluble

o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	390.0 °C (734.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 30,000 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 25,000 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation - 24 h

Respiratory or skin sensitisation
Maximisation Test (GPMT) - Guinea pig
Result: Does not cause skin sensitisation.
(OECD Test Guideline 406)

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.

IARC:	2B - Group 2B: Possibly carcinogenic to humans (bis(2-Ethylhexyl) phthalate)
NTP:	Reasonably anticipated to be a human carcinogen (bis(2-Ethylhexyl) phthalate)
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
May cause congenital malformation in the fetus.
Presumed human reproductive toxicant

May cause reproductive disorders.

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: TI0350000

Effects due to ingestion may include:, Gastrointestinal disturbance

Kidney -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - > 0.67 mg/l - 96 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - > 0.32 mg/l - 96 h
	LC50 - Cyprinodon variegatus (sheepshead minnow) - > 0.17 mg/l - 96 h
	LC50 - Lepomis macrochirus (Bluegill) - > 0.20 mg/l - 96 h
	NOEC - other fish - > 0.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - > 0.16 mg/l - 48 h

12.2 Persistence and degradability

Biodegradability	Result: - Readily biodegradable (OECD Test Guideline 301)

12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 100 d - 0.014 mg/l Bioconcentration factor (BCF): 113 Remarks: Does not bioaccumulate.

12.4 Mobility in soil
No data available

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

12.6 Other adverse effects

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: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (bis(2-Ethylhexyl) phthalate)
Reportable Quantity (RQ): 100 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
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. bis(2-Ethylhexyl) phthalate	117-81-7	2009-02-01
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. bis(2-Ethylhexyl) phthalate	117-81-7	2009-02-01

16. OTHER INFORMATION

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

H360	May damage fertility or the unborn child.
Repr.	Reproductive toxicity

HMIS Rating

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

NFPA Rating

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

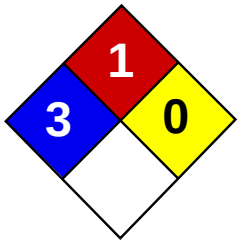
Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 5.11 Revision Date: 06/18/2015 Print Date: 02/11/2016



Health	3
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Cadmium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cadmium

Catalog Codes: SLC3484, SLC5272, SLC2482

CAS#: 7440-43-9

RTECS: EU9800000

TSCA: TSCA 8(b) inventory: Cadmium

CI#: Not applicable.

Synonym:

Chemical Name: Cadmium

Chemical Formula: Cd

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Cadmium	7440-43-9	100

Toxicological Data on Ingredients: Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: No known effect on eye contact, rinse with water for a few minutes.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: 570°C (1058°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

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

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits:
TWA: 0.01 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 112.4 g/mole

Color: Silvery.

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

Boiling Point: 765°C (1409°F)

Melting Point: 320.9°C (609.6°F)

Critical Temperature: Not available.

Specific Gravity: 8.64 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Reacts violently with potassium.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 890 mg/kg [Mouse]. Acute toxicity of the dust (LC50): 229.9 mg/m3 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. The substance is toxic to kidneys, lungs, liver.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans: May cause allergic reactions, exzema and/or dehydration of the skin.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport:

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium Pennsylvania RTK: Cadmium Massachusetts RTK: Cadmium TSCA 8(b) inventory: Cadmium SARA 313 toxic chemical notification and release reporting: Cadmium CERCLA: Hazardous substances.: Cadmium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R26- Very toxic by inhalation. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 04:29 PM

Last Updated: 11/01/2010 12:00 PM

Material Safety Data Sheet

Calcium

MSDS# 03840

Section 1 - Chemical Product and Company Identification

MSDS Name:	Calcium
Catalog Numbers:	AC201180000, AC201180050, AC201181000, AC201185000, AC201380000, AC201381000 AC201381000, AC201385000, AC318100000, AC318100050, AC365740000, AC365741000 AC365741000, AC365745000
Synonyms:	Calcium metal, turnings, crystals, granular; Calcicat.
Company Identification:	Fisher Scientific One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	201-796-7100
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#:	7440-70-2
Chemical Name:	Calcium
%:	99+
EINECS#:	231-179-5

Hazard Symbols: F

Risk Phrases: 15

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Danger! Flammable solid. Causes burns by all exposure routes. Contact with water liberates extremely flammable gases.
Target Organs: Respiratory system, gastrointestinal system, eyes, skin.

Potential Health Effects

Eye:	Causes eye burns.
Skin:	Causes skin burns. May be harmful if absorbed through the skin.
Ingestion:	Causes gastrointestinal tract burns. May be harmful if swallowed.
Inhalation:	Causes chemical burns to the respiratory tract. May be harmful if inhaled.
Chronic:	No information found.

Section 4 - First Aid Measures

Eyes:	Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin:	Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion:	Do not induce vomiting. Get medical aid immediately. Call a poison control center.
	Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance;

Inhalation: induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Notes to Physician:

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Will burn if involved in a fire. Water reactive. Material will react with water and may release a flammable and/or toxic gas. Flammable solid.

Extinguishing Media: Use foam, dry chemical, or carbon dioxide. DO NOT USE WATER!

Autoignition Temperature: Not applicable.

Flash Point: Not applicable.

Explosion Limits: Lower: Not available

Explosion Limits: Upper: Not available

NFPA Rating: ; Special Hazard: -W-

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: 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). Avoid generating dusty conditions. Remove all sources of ignition. Use a spark-proof tool. Do not expose spill to water. Place under an inert atmosphere. Do not get water inside containers. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Do not allow water to get into the container because of violent reaction. Minimize dust generation and accumulation. Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Keep away from heat, sparks and flame. Do not ingest or inhale. Handle under an inert atmosphere. Do not allow contact with water. Use only in a chemical fume hood.

Storage: Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Water free area. Store protected from moisture. Store under an inert atmosphere.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Calcium	none listed	none listed	none listed

OSHA Vacated PELs: Calcium: None listed

Engineering Controls:

Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.

Exposure Limits

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: 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.

Section 9 - Physical and Chemical Properties

Physical State:	Solid
Color:	grey
Odor:	none reported
pH:	14 (4g/L aq.sol.)
Vapor Pressure:	13 mbar @ 983 deg C
Vapor Density:	Not available
Evaporation Rate:	Not available
Viscosity:	Not available
Boiling Point:	1484 deg C @ 760 mmHg (2,703.20°F)
Freezing/Melting Point:	845 deg C (1,553.00°F)
Decomposition Temperature:	Not available
Solubility in water:	Reacts
Specific Gravity/Density:	Not available.
Molecular Formula:	Ca
Molecular Weight:	40.07

Section 10 - Stability and Reactivity

Chemical Stability:	Reacts with water. Water contact produces hydrogen gas.
Conditions to Avoid:	Incompatible materials, ignition sources, dust generation, excess heat, exposure to moist air or water.
Incompatibilities with Other Materials	Strong oxidizing agents, acids, alcohols, ammonia, halogens, sulfur, oxygen, phosphorus oxide, mercury, alkali hydroxides, metal oxides, alkali halides, nitrogen oxide.
Hazardous Decomposition Products	Hydrogen gas.
Hazardous Polymerization	Has not been reported.

Section 11 - Toxicological Information

RTECS#:	CAS# 7440-70-2: EV8500000
LD50/LC50:	RTECS: Not available.
Carcinogenicity:	Calcium - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.
Other:	See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Other: Do not empty into drains.

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: CALCIUM
Hazard Class: 4.3
UN Number: UN1401
Packing Group: II
Canada TDG
Shipping Name: CALCIUM
Hazard Class: 4.3
UN Number: UN1401
Packing Group: II

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: F

Risk Phrases:

R 15 Contact with water liberates extremely flammable gases.

Safety Phrases:

S 8 Keep container dry.

S 24/25 Avoid contact with skin and eyes.

S 43C In case of fire, use limestone powder, sodium chloride or dry sand (never use water).

WGK (Water Danger/Protection)

CAS# 7440-70-2: 1

Canada

CAS# 7440-70-2 is listed on Canada's DSL List

Canadian WHMIS Classifications: E, B6

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

CAS# 7440-70-2 is not listed on Canada's Ingredient Disclosure List.

US Federal

TSCA

CAS# 7440-70-2 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 5/19/1999

Revision #7 Date 7/20/2009

SAFETY DATA SHEET

Version 3.8
Revision Date 10/12/2015
Print Date 01/29/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Carbazole
Product Number	:	C5132
Brand	:	Sigma
CAS-No.	:	86-74-8

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)
Carcinogenicity (Category 2), H351
Chronic aquatic toxicity (Category 4), H413

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.
H413	May cause long lasting harmful effects to aquatic life.
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.
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	:	$C_{12}H_9N$
Molecular weight	:	167.21 g/mol
CAS-No.	:	86-74-8
EC-No.	:	201-696-0

Hazardous components

Component	Classification	Concentration
Carbazole		
	Carc. 2; Aquatic Chronic 4; H351, H413	<= 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, Nitrogen oxides (NOx)

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.

Keep in a dry place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

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

Personal protective equipment

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
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: powder Colour: beige
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 243 - 246 °C (469 - 475 °F)
f)	Initial boiling point and boiling range	355 °C (671 °F)
g)	Flash point	220.0 °C (428.0 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	The product is not flammable.
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	533 hPa (400 mmHg) at 323 °C (613 °F)
l)	Vapour density	No data available
m)	Relative density	1.1 g/cm3 at 18 °C (64 °F)
n)	Water solubility	0.00091 g/l at 25 °C (77 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 3.72 at 22 °C (72 °F)
p)	Auto-ignition temperature	> 600 °C (> 1,112 °F) at 1,013 hPa (760 mmHg)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Oxidizing agents

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
LD0 Oral - Rat - > 16,000 mg/kg
(OECD Test Guideline 401)

Inhalation: No data available

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

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

Carcinogenicity - Mouse - male and female - Oral
hepatocellular carcinoma

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Carbazole)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: FE3150000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - > 0.93 mg/l - 96.0 h Remarks: No toxicity at the limit of solubility
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 2.30 - 4.90 mg/l - 48 h Remarks: No toxicity at the limit of solubility
Toxicity to algae	Growth inhibition NOEC - Scenedesmus acuminatus - > 0.4 mg/l - 96 h Remarks: No toxicity at the limit of solubility

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential

Bioaccumulation	Cyprinus carpio (Carp) - 42 d - 0.05 mg/l Bioconcentration factor (BCF): 241 Cyprinus carpio (Carp) - 42 d - 0.005 mg/l Bioconcentration factor (BCF): 200

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.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
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. (Carbazole)
Marine pollutant:yes
IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Carbazole)

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

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Carbazole	86-74-8	2009-07-17

New Jersey Right To Know Components

	CAS-No.	Revision Date
Carbazole	86-74-8	2009-07-17

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Carbazole	86-74-8	2007-09-28

16. OTHER INFORMATION

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

Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H351	Suspected of causing cancer.
H413	May cause long lasting harmful effects to aquatic life.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0
Health hazard:	2
Fire Hazard:	1
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 3.8 Revision Date: 10/12/2015 Print Date: 01/29/2016

SAFETY DATA SHEET

Version 5.6
Revision Date 12/10/2015
Print Date 02/09/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Carbon disulfide
Product Number	:	180173
Brand	:	Sigma-Aldrich
Index-No.	:	006-003-00-3
CAS-No.	:	75-15-0

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)
Flammable liquids (Category 2), H225
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), H372
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

Signal word: Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.

H401	Toxic to aquatic life.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ 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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
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	:	CS_2
Molecular weight	:	76.14 g/mol
CAS-No.	:	75-15-0
EC-No.	:	200-843-6
Index-No.	:	006-003-00-3

Hazardous components

Component	Classification	Concentration
Carbon disulphide		
	Flam. Liq. 2; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Repr. 2; STOT RE 1; Aquatic Acute 2; H225, H315, H319, H332, H361, H372, 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. 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
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
Carbon oxides, Sulphur oxides
Flash back possible over considerable distance., Container explosion may occur under fire conditions., Vapours may form explosive mixture with air., May explode when heated.

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. Discharge into the environment must be avoided.

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.

Refrigerate before opening.
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
Carbon disulphide	75-15-0	TWA	1 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	1.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	20.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		CEIL	30.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		Peak	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		TWA	1.000000 ppm 3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		ST	10.000000 ppm 30.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		See Table Z-2		
		TWA	20 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		CEIL	30 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		

		Peak	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Carbon disulphide	75-15-0	2-Thiothiazolidine-4-carboxylix acid (TTCA)	0.5000 mg/g	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.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, 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. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	Stench.
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -112 °C (-170 °F) - lit.
f)	Initial boiling point and boiling range	46 °C (115 °F) - lit.
g)	Flash point	-30 °C (-22 °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: 50 %(V) Lower explosion limit: 1.3 %(V)
k)	Vapour pressure	394.956 hPa (296.241 mmHg) at 20 °C (68 °F) 1,342.711 hPa (1,007.116 mmHg) at 55 °C (131 °F)
l)	Vapour density	2.63 - (Air = 1.0)
m)	Relative density	1.266 g/mL at 25 °C (77 °F)
n)	Water solubility	2.9 g/l at 20 °C (68 °F) - OECD Test Guideline 105
o)	Partition coefficient: n-octanol/water	log Pow: 2.7 at 25 °C (77 °F)
p)	Auto-ignition temperature	97 - 107 °C (207 - 225 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	71.9 mN/m at 19.5 °C (67.1 °F)
Relative vapour density	2.63 - (Air = 1.0)

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
Alkali metals, Zinc, Amines, Azides, Oxidizing agents

10.6 Hazardous decomposition products

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - female - > 2,000 mg/kg
(OECD Test Guideline 423)

LC50 Inhalation - Rat - male and female - 4 h - 10.35 mg/l
(OECD Test Guideline 403)

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
- Mouse
Result: Does not cause skin sensitisation.
(OECD Test Guideline 429)

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.

Ames test
Salmonella typhimurium
Result: negative

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
Suspected human reproductive toxicant

May cause reproductive disorders.

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: FF6650000

May cause convulsions.

Liver - Irregularities - Based on Human Evidence
Liver - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Poecilia reticulata (guppy) - 4 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 2.1 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	Growth inhibition EC50 - Chlorella pyrenoidosa - 21 mg/l - 96 h (OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: > 80 % - Readily biodegradable (OECD Test Guideline 301D)

12.3 Bioaccumulative potential

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.

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: 1131 Class: 3 (6.1) Packing group: I
Proper shipping name: Carbon disulfide
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1131 Class: 3 (6.1) Packing group: I EMS-No: F-E, S-D
Proper shipping name: CARBON DISULPHIDE

IATA

UN number: 1131 Class: 3 (6.1)
Proper shipping name: Carbon disulphide
IATA Passenger: Not permitted for transport
IATA Cargo: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Carbon disulphide	75-15-0	2008-06-17

16. OTHER INFORMATION

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

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H401	Toxic to aquatic life.
Repr.	Reproductive toxicity

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

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: 12/10/2015 Print Date: 02/09/2016

SAFETY DATA SHEET

Version 5.10
Revision Date 01/06/2016
Print Date 03/03/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Carbon tetrachloride
Product Number	:	319961
Brand	:	Sigma-Aldrich
Index-No.	:	602-008-00-5
CAS-No.	:	56-23-5

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 toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Skin sensitisation (Sub-category 1B), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), Liver, Kidney, H372
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412
Hazardous to the ozone layer (Category 1), H420

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 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled
H317	May cause an allergic skin reaction.
H351	Suspected of causing cancer.
H372	Causes damage to organs (Liver, Kidney) 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.
P271	Use only outdoors or in a well-ventilated area.
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.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: 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.
P502	Refer to manufacturer/ supplier for information on recovery/ recycling.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Rapidly absorbed through skin.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Tetrachloromethane
Formula	:	CCl_4CCl_4
Molecular weight	:	153.82 g/mol
CAS-No.	:	56-23-5
EC-No.	:	200-262-8
Index-No.	:	602-008-00-5

Hazardous components

Component	Classification	Concentration
Tetrachloromethane		
	Acute Tox. 3; Skin Sens. 1B; Carc. 2; STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; Ozone 1; H301 + H311 + H331, 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

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. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

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

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

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
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
Tetrachloromethane	56-23-5	TWA	5.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		STEL	10.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		ST	2.000000 ppm 12.600000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	10.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		CEIL	25.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		Peak	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		See Table Z-2		
		TWA	5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		STEL	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		ST	2 ppm 12.6 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	10 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		CEIL	25 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		Peak	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		TWA	2 ppm 12.6 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

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: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 240 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
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	sweet
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -23 °C (-9 °F) - lit.
f)	Initial boiling point and boiling range	76 - 77 °C (169 - 171 °F) - lit.
g)	Flash point	does not flash
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower	No data available

	flammability or explosive limits	
k)	Vapour pressure	45 hPa (34 mmHg) at 0.3 °C (32.5 °F) 120 hPa (90 mmHg) at 19.8 °C (67.6 °F) 14,549 hPa (10,913 mmHg) at 24 °C (75 °F)
l)	Vapour density	No data available
m)	Relative density	1.594 g/cm3 at 25 °C (77 °F)
n)	Water solubility	0.8461 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 2.83 at 25 °C (77 °F)
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	26.7 mN/m at 20 °C (68 °F) 19.5 mN/m at 80 °C (176 °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

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 - 2,350 mg/kg

LC50 Inhalation - Rat - 4 h - 8000 ppm

LD50 Dermal - Rabbit - > 20,000 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation - 24 h
(Draize Test)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation - 24 h
(Draize Test)

Respiratory or skin sensitisation
- Mouse
Result: The product is a skin sensitiser, sub-category 1B.
(OECD Test Guideline 429)

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. Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Tetrachloromethane)
NTP:	Reasonably anticipated to be a human carcinogen (Tetrachloromethane)
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. - Liver, Kidney

Aspiration hazard
No data available

Additional Information
RTECS: FG4900000

Vomiting, Diarrhoea, Abdominal pain, Nausea, Dizziness, Headache, Damage to the eyes., Liver injury may occur., Kidney injury may occur., Exposure to and/or consumption of alcohol may increase toxic effects., Contact with skin can cause:, Pain, Erythema, hyperemia

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	mortality LC50 - Danio rerio (zebra fish) - 24.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 35 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	Growth inhibition EC50 - Algae - 20 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 21 d - 52.3 µg/l Bioconcentration factor (BCF): 30

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)
UN number: 1846 Class: 6.1 Packing group: II
Proper shipping name: Carbon tetrachloride
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1846 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: CARBON TETRACHLORIDE
Marine pollutant: yes
IATA
UN number: 1846 Class: 6.1 Packing group: II
Proper shipping name: Carbon tetrachloride

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
Tetrachloromethane	56-23-5	2007-07-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Tetrachloromethane	56-23-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Tetrachloromethane	56-23-5	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Tetrachloromethane	56-23-5	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer.	56-23-5	2007-09-28

Tetrachloromethane

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	Toxic if swallowed.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled
H311	Toxic in contact with skin.
H317	May cause an allergic skin reaction.
H331	Toxic if inhaled.
H351	Suspected of causing cancer.

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

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: 5.10 Revision Date: 01/06/2016 Print Date: 03/03/2016

Safety Data Sheet

Revision Date: 05/11/15
www.restek.com

1. IDENTIFICATION

Catalog Number / Product Name:	**32207, 32207-5XX, & 32307 / alpha-Chlordane Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	1-800-424-9300 (CHEMTREC) +1 703-741-5970 (Outside the US)
Email:	sds@restek.com
Revision Number:	6
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 - Inhalation Vapour Category 3
Acute Toxicity - Inhalation Gas 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.
Toxic 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 no 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 if you feel unwell.
Specific treatment see section 4.

Specific measures see section 4.
Rinse mouth.
Remove/Take off immediately all contaminated clothing.
Wash contaminated clothing 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
cis-chlordane	5103-71-9		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 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
cis-chlordane	5103-71-9	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: 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 Density: 1.1 (air = 1)
Melting Point: -98 °C
Flash Point: 52
Flammability: Highly Flammable
Upper Flammable/Explosive Limit, % in air: 36.0
Lower Flammable/Explosive Limit, % in air: 6.0
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: 99.90
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:	No data.
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	Oral LD50 Rat 5628 mg/kg (Source: NLM_CIP); Inhalation LC50 Rat 83.2 mg/L 4 h (Source: IUCLID)

Component Carcinogenic Data:

OSHA:

Chemical Name	CAS No.
No data available.	

ACGIH:

Chemical Name	CAS No.
No data available.	

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
cis-Chlordane	5103-71-9	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
cis-chlordane	5103-71-9	X	-	-	-

The following chemicals are listed on CA Prop 65:

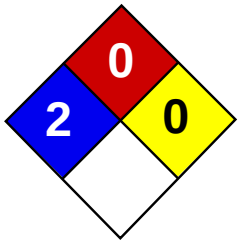
Chemical Name	CAS #	Regulation
Methanol	67-56-1	Prop 65 Devolop Tox

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
methanol	67-56-1	X	X	X	X
cis-chlordane	5103-71-9	-	-	-	-

16. OTHER INFORMATION

Prior Version Date: 04/22/14
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.



Health	2
Fire	0
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Chloroform MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chloroform

Catalog Codes: SLC1888, SLC5044

CAS#: 67-66-3

RTECS: FS9100000

TSCA: TSCA 8(b) inventory: Chloroform

CI#: Not available.

Synonym: Trichloromethane; Methane, trichlor-

Chemical Name: Chloroform

Chemical Formula: CHCl3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chloroform	67-66-3	100

Toxicological Data on Ingredients: Chloroform: ORAL (LD50): Acute: 695 mg/kg [Rat]. 36 mg/kg [Mouse]. 820 mg/kg [Guinea pig]. DERMAL (LD50): Acute: >20000 mg/kg [Rabbit]. VAPOR (LC50): Acute: 47702 mg/m 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, heart. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

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

Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

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

Serious Inhalation: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances: Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: May explode if it comes in contact with aluminum powder, lithium, perchlorate, pentoxide, bis(dimethylamino)dimethylstannane, potassium, potassium-sodium alloy, sodium (or sodium hydroxide or sodium methoxide), and methanol

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions: Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as metals, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill: Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: TWA: 10 (ppm) [Australia] Inhalation TWA: 2 (ppm) from OSHA (PEL) [United States] Inhalation STEL: 9.78 (mg/m3) from NIOSH Inhalation STEL: 2 (ppm) from NIOSH Inhalation TWA: 9.78 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 10 (ppm) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 2 (ppm) [United Kingdom (UK)] Inhalation TWA: 9.9 (mg/m3) [United Kingdom (UK)] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pleasant. Sweetish. Etheric. Non-irritating

Taste: Burning. Sweet.

Molecular Weight: 119.38 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 61°C (141.8°F)

Melting Point: -63.5°C (-82.3°F)

Critical Temperature: 263.33°C (506°F)

Specific Gravity: 1.484 (Water = 1)

Vapor Pressure: 21.1 kPa (@ 20°C)

Vapor Density: 4.36 (Air = 1)

Volatility: Not available.

Odor Threshold: 85 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, Light

Incompatibility with various substances: Reactive with metals, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Light Sensitive. Incompatible with triisopropyl phosphine, acetone, disilane, fluorine, strong bases and reactive metals (aluminum, magnesium in powdered form), light.

Special Remarks on Corrosivity: It will attack some forms of plastics, rubber, and coatings.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation.

Toxicity to Animals: WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 36 mg/kg [Mouse]. Acute dermal toxicity (LD50): >20000 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 47702 mg/m 4 hours [Rat]. 3

Chronic Effects on Humans: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, heart.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May affect genetic material (possible mutangen) and cause adverse reproductive effects(embryotoxicity and fetotoxicity) Suspected carcinogen (tumorigenic) and teratogen based on animal data. Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans: Acute Potential Health Effects: Skin: Causes skin irritation and may cause chemical burns. Eye: Causes eye irritation, burning pain and reversible injury to corneal epithelium. Inhalation: Causes irritation of the respiratory system (mucous membranes). May affect behavior/Nervous system (CNS depressant, fatigue, dizziness, nervousness, giddiness, euphoria, loss of coordination and judgement, weakness, hallucinations, muscle contraction/spasticity, general anesthetic, spastic paralysis, headache), anorexia (neurological and gastrointestinal symtoms resembling chronic alcoholism), and possibly coma and death. May affect the liver, kidneys and gastrointestinal tract (nausea, vomiting). Ingestion: Causes gastrointestinal tract irritation (nausea, vomiting). May affect the liver, urinary system (kidneys), respiration, behavior/nervous system (symptoms similar to inhalation),and heart. Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect the liver (hepatitis, jaundice, hepatocellular necrosis), metabolism (weight loss), respiration (fibrosis, pneumoconoisis), behavior/central nervous system (symptoms similar to acute inhalation), blood, musculoskeletal system, and kidneys. Ingestion: Prolonged or repeated ingestion may affect the liver, kidneys, metabolism (weight loss), endocrine system (spleen), blood (changes in cell count).

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 43.8 mg/l 96 hours [Trout].

BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal: Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Chloroform UNNA: UN1888 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Chloroform California prop. 65 (no significant risk level): Chloroform: 0.02 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Chloroform New York release reporting list: Chloroform Rhode Island RTK hazardous substances: Chloroform Pennsylvania RTK: Chloroform Massachusetts RTK: Chloroform New Jersey: Chloroform California Director's List of Hazardous Subtances (8 CCR 339): Chloroform Tennessee: Chloroform TSCA 8(b) inventory: Chloroform TSCA 8(d) H and S data reporting: Chloroform: effective: 6/1/87; sunset: 6/1/97 SARA 302/304/311/312 extremely hazardous substances: Chloroform SARA 313 toxic chemical notification and release reporting: Chloroform CERCLA: Hazardous substances.: Chloroform: 10 lbs. (4.536 kg)

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R20/22- Harmful by inhalation and if swallowed. R38- Irritating to skin. R40- Possible risks of irreversible effects. S36/37- Wear suitable protective clothing and gloves.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment: Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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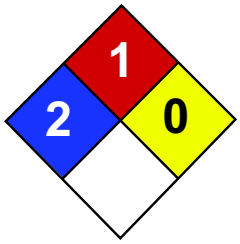

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chromium	7440-47-3	100

Toxicological Data on Ingredients: Chromium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

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

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

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

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:
Powdered Chromium metal +fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.5 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 (mg/m3) from OSHA (PEL) [United States] TWA: 0.5 (mg/m3) from NIOSH [United States] TWA: 0.5 (mg/m3) [United Kingdom (UK)] TWA: 0.5 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

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

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Not available.

Special Remarks on Reactivity:
Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride. It may react violently or ignite with bromine pentafluoride. Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate. Potentially hazardous incompatibility with strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: May cause skin irritation. Eyes: May cause mechanical eye irritation. Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea. Chronic Potential Health Effects: Inhalation: The effects of chronic exposure include irritation , sneezing, reddness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconoisis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur. Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Chromium Illinois toxic substances disclosure to employee act: Chromium Illinois chemical safety act: Chromium New York release reporting list: Chromium Rhode Island RTK hazardous substances: Chromium Pennsylvania RTK: Chromium Minnesota: Chromium Michigan critical material: Chromium Massachusetts RTK: Chromium Massachusetts spill list: Chromium New Jersey: Chromium New Jersey spill list: Chromium Louisiana spill reporting: Chromium California Director's List of Hazardous Substances: Chromium TSCA 8(b) inventory: Chromium SARA 313 toxic chemical notification and release reporting: Chromium CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Limited evidence of carcinogenic effect S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

SAFETY DATA SHEET

Based on Directive 2001/58/EC of the Commission of the European Communities

CHRYSENE

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Synonyms: none

CAS No.	: 218-01-9	**BCR number**	: BCR-269
EC index No.	: 601-048-00-0	**NFPA code**	: N.D.
EINECS No.	: 205-923-4	**Molecular weight**	: 228.30
RTECS No.	: GC0700000	**Formula**	: C18H12

1.2 Use of the substance or the preparation:
Certified reference material for laboratory use only

1.3 Company/undertaking identification:
Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel. : +32 14 57 12 11
Fax : +32 14 58 42 73

1.4 Telephone number for emergency:
+32 70 245 245
Antigifcentrum
p/a Militair Hospitaal Koningin Astrid, Bruynstraat, B-1120 Brussel

2. Composition/information on ingredients

Hazardous ingredients	CAS No. EINECS No.	Conc. in %	Hazard symbol	Risks (R-phrases)
chrysene	218-01-9 205-923-4	100	T;N	45-50/53 (1)

(1) For R-phrases in full: see heading 16

3. Hazards identification

- May cause cancer
- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

4. First aid measures

4.1 Eye contact:
- Consult a doctor/medical service if irritation persists
- Rinse immediately with water

4.2 Skin contact:
- Consult a doctor/medical service if irritation persists
- Wash with water and soap
- Wipe off dry product from skin
- Remove clothing before washing

4.3 After inhalation:
- Consult a doctor/medical service if breathing problems develop
- Remove the victim into fresh air
- Unconscious: maintain adequate airway and respiration

4.4 After ingestion:
- Consult a doctor/medical service if you feel unwell
- Immediately give lots of water to drink
- Never give water to an unconscious person

- Do not induce vomiting

5. Fire-fighting measures

5.1 Suitable extinguishing media:
- Water spray
- Alcohol foam
- Polymer foam
- ABC powder
- Carbon dioxide

5.2 Unsuitable extinguishing media:
- Solid water jet ineffective as extinguishing medium

5.3 Special exposure hazards:
- Not easily combustible
- Upon combustion CO and CO2 are formed

5.4 Instructions:
- Take account of toxic firefighting water
- Use firefighting water moderately and contain it

5.5 Special protective equipment for firefighters:
- Heat/fire exposure: compressed air/oxygen apparatus
- Dust cloud production: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal protection/precautions: see heading 8.1/8.3/10.3

6.2 Environmental precautions:
- Prevent soil and water pollution
- Substance must not be discharged into the sewer
- Dam up the solid spill

6.3 Methods for cleaning up:
- Stop dust cloud by covering with sand/earth
- Carefully collect the spill/leftovers
- Scoop solid spill into closing containers
- Spill must not return in its original container
- Take collected spill to manufacturer/competent authority
- Clean contaminated surfaces with an excess of water
- Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:
- Observe strict hygiene
- Avoid prolonged and repeated contact with skin
- Avoid raising dust
- Do not discharge the waste into the drain
- Remove contaminated clothing immediately

7.2 Storage:
- Keep container tightly closed. Store only in a limited quantity. Store in a dry area. Store in a dark area.
- Keep away from: heat sources, ignition sources, oxidizing agents, acids

Storage temperature	:	N.D.	**°C**
Quantity limits	:	N.D.	**kg**
Storage life	:	N.D.	
Materials for packaging	:		

- suitable : no data available
- to avoid : no data available

7.3 Specific uses:
- See information supplied by the manufacturer

8. Exposure controls/Personal protection

8.1 Exposure limit values:

TLV-TWA	:	not listed
TLV-STEL	:	not listed
TLV-Ceiling	:	not listed
OES-LTEL	:	not listed
OES-STEL	:	not listed
MEL-LTEL	:	not listed
MEL-STEL	:	not listed
MAK	:	not listed
TRK	:	not listed
MAC-TGG 8 h	:	not listed
MAC-TGG 15 min.	:	not listed
MAC-Ceiling	:	not listed
VME-8 h	:	not listed
VLE-15 min.	:	not listed
GWBB-8 h	:	not listed
GWK-15 min.	:	not listed
Momentary value	:	not listed
EC	:	not listed
EC-STEL	:	not listed

Sampling methods:

- Chrysene (Polynuclear aromatic Hydrocarbons)	NIOSH 5515
- Chrysene	OSHA 58
- Chrysene (Polynuclear aromatic Hydrocarbons)	NIOSH 5506

8.2 Exposure controls:

8.2.1 Occupational exposure controls:
- Measure the concentration in the air regularly
- Work under local exhaust/ventilation

8.2.2 Environmental exposure controls: see heading 13

8.3 Personal protection:

8.3.1 respiratory protection:
- Dust production: dust mask with filter type P3
- High dust production: compressed air/oxygen apparatus

8.3.2 hand protection:
- Gloves
  Suitable materials: No data available
- Breakthrough time: N.D.

8.3.3 eye protection:
- Safety glasses
- In case of dust production: protective goggles

8.3.4 skin protection:
- Protective clothing
- In case of dust production: head/neck protection
  Suitable materials: No data available

9. Physical and chemical properties

9.1 General information:

Appearance (at 20°C)	: Crystalline solid / Flakes	
Odour	: Odourless	
Colour	: White	

9.2 Important health, safety and environmental information:

pH value	: N.D.	
Boiling point/boiling range	: 448	**°C**
Flashpoint	: N.D.	**°C**
Explosion limits	: N.D.	**vol% (°C)**
Vapour pressure (at 20°C)	: N.D.	**hPa**
Vapour pressure (at 50°C)	: N.D.	**hPa**
Relative density (at 20°C)	: 1.27	
Water solubility	: < 0.001	**g/100 ml**
Soluble in	: N.D.	
Relative vapour density	: N.D.	
Viscosity	: N.D.	**Pa.s**
Partition coëfficient n-octanol/water	: 5.61/5.73	
Evaporation rate		
ratio to butyl acetate	: N.D.	
ratio to ether	: N.D.	

9.3 Other information:

Melting point/melting range	: 256	**°C**
Auto-ignition point	: N.D.	**°C**
Saturation concentration	: N.D.	**g/m^3**

10. Stability and reactivity

10.1 Conditions to avoid/reactivity:
- Stable under normal conditions

10.2 Materials to avoid:
- Keep away from: heat sources, ignition sources, oxidizing agents, acids

10.3 Hazardous decomposition products:
- Upon combustion CO and CO2 are formed
- Reacts violently with (strong) oxidizers
- Decomposes on exposure to (strong) acids

11. Toxicological information

11.1 Acute toxicity:

LD50 oral rat	: N.D.	**mg/kg**
LD50 dermal rat	: N.D.	**mg/kg**
LD50 dermal rabbit	: N.D.	**mg/kg**
LC50 inhalation rat	: N.D.	**mg/l/4 h**
LC50 inhalation rat	: N.D.	**ppm/4 h**

11.2 Chronic toxicity:

EC carc. cat.	:	2
EC muta. cat.	:	3
EC repr. cat.	:	not listed
Carcinogenicity (TLV)	:	A3
Carcinogenicity (MAC)	:	K
Carcinogenicity (VME)	:	not listed
Carcinogenicity (GWBB)	:	not listed
Carcinogenicity (MAK)	:	2
Mutagenicity (MAK)	:	not listed
Teratogenicity (MAK)	:	-
IARC classification	:	3

11.3 Routes of exposure: ingestion, inhalation, eyes and skin
Caution! Substance is absorbed through the skin

11.4 Acute effects/symptoms:

AFTER SKIN CONTACT
- Slight irritation

11.5 Chronic effects:

- Probably human carcinogenic
- No certainty about human mutagenic properties

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
- No specific information available

SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
- Feeling of weakness
- Photoallergy
- Cracking of the skin
- Skin rash/inflammation
- Skin cancer
- Lung tissue affection/degeneration
- Enlargement/affection of the liver
- Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

- LC50 (24 h) : 0.0007 mg/l (DAPHNIA MAGNA)
- LC50 (24 h) : >6.7 mg/l (RANA SP.)

12.2 Mobility:

- **Volatile organic compounds (VOC):** N.D.%

- Forming sediments in water
- Adsorbs into the soil
- Insoluble in water

For other physicochemical properties see heading 9.

12.3 Persistence and degradability:

- biodegradation BOD_5	:	N.D.	**% ThOD**
- water	:	- Not readily biodegradable in water	
- soil	:	**T ½:** > 77	**days**

12.4 Bioaccumulative potential:
- **log P_{ow}** : 5.61/5.73
- **BCF** : 4440 (LAMELLIBRANCHIATA)
- Highly bioaccumulative

12.5 Other adverse effects:

- **WGK** : 3 (Classification based on the R-phrases in compliance with Verwaltungsvorschrift wassergefährdender Stoffe (VwVwS) of 17 May 1999)
- **Effect on the ozone layer** : Not dangerous for the ozone layer (Council Regulation (EC) 3093/94)
- **Greenhouse effect** : no data available
- **Effect on waste water purification** : no data available

13. Disposal considerations

13.1 Provisions relating to waste:

- Waste material code (91/689/EEC, Council Decision
- 2001/118/EC, O.J. L47 of 16/2/2001): 16 05 06 (laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory)
- Waste material code (Flanders): 001, 045, 691
- Waste code (Germany): 59302
- Hazardous waste (91/689/EEC)

13.2 Disposal methods:

- Dissolve or mix with a combustible solvent
- Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber
- Do not discharge into surface water (2000/60/EEC, Council

13.3 Packaging/Container:

- Waste material code packaging (91/689/EEC, Council Decision
- 2001/118/EC, O.J. L47 of 16/2/2001): 15 01 10 (packaging containing residues of or contaminated by dangerous substances)

14. Transport information

90
3077

14.1 Classification of the substance in compliance with UN Recommendations

UN number	: 3077
CLASS	: 9
SUB RISKS	: -
PACKING	: III
PROPER SHIPPING NAME	: UN 3077, Environmentally hazardous substance, solid, n.o.s. (chrysene)

14.2 ADR (transport by road)

CLASS	: 9
PACKING	: III
DANGER LABEL TANKS	: 9
DANGER LABEL PACKAGES	: 9

14.3 RID (transport by rail)

CLASS	: 9
PACKING	: III
DANGER LABEL TANKS	: 9
DANGER LABEL PACKAGES	: 9

14.4 ADNR (transport by inland waterways)

CLASS	: 9
PACKING	: III
DANGER LABEL TANKS	: 9
DANGER LABEL PACKAGES	: 9

14.5 IMDG (maritime transport)

CLASS	: 9
SUB RISKS	: -
PACKING	: III
MFAG	: -
EMS	: -
MARINE POLLUTANT	: P

14.6 ICAO (air transport)

CLASS	: 9
SUB RISKS	: -
PACKING	: III
PACKING INSTRUCTIONS PASSENGER AIRCRAFT	:
PACKING INSTRUCTIONS CARGO AIRCRAFT	:

14.7 Special precautions in connection with transport : none

14.8 Limited quantities (LQ) :

When substances and their packaging meet the conditions established by ADR/RID/ADNR in chapter 3.4, **only** the following prescriptions shall be complied with:
each package shall display a diamond-shaped figure with the following inscription:
- 'UN 3077'
or, in the case of different goods with different identification numbers within a single package:
- the letters 'LQ'

15. Regulatory information

Enumerated in substance list Annex I of directive 67/548/EEC et sequens

Toxic

Dangerous for the environment

R45 : May cause cancer
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

S53 : Avoid exposure - obtain special instructions before use
S45 : In case of accident or if you feel unwell, seek medical advice (show the label where possible)
S60 : This material and/or its container must be disposed of as hazardous waste
S61 : Avoid release to the environment. Refer to special instructions/safety data sheets.

16. Other information

The information provided on this MSDS 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 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.

N.A. = NOT APPLICABLE
N.D. = NOT DETERMINED
***** = INTERNAL CLASSIFICATION

Full text of any R-phrases referred to under heading 2:

R45 : May cause cancer
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Exposure limits:

TLV : Threshold Limit Value - ACGIH USA 2000
OES : Occupational Exposure Standards - United Kingdom 1999
MEL : Maximum Exposure Limits - United Kingdom 1999
MAK : Maximale Arbeitsplatzkonzentrationen - Germany 2001
TRK : Technische Richtkonzentrationen - Germany 2001
MAC : Maximale aanvaarde concentratie - The Netherlands 2002
VME : Valeurs limites de Moyenne d'Exposition - France 1999
VLE : Valeurs limites d'Exposition à court terme - France 1999
GWBB : Grenswaarde beroepsmatige blootstelling - Belgium 1998
GWK : Grenswaarde kortstondige blootstelling - Belgium 1998
EC : Indicative occupational exposure limit values - directive 2000/39/EC

Chronic toxicity:

K : List of the carcinogenic substances and processes - The Netherlands 2002

Material Safety Data Sheet

Product Name: COBALT-BASED ALLOYS **ID: 1147**

* * * Section 1 - Chemical Product and Company Identification * * *

Chemical Formula: Cobalt (Co), chromium (Cr) and other alloying elements
Product Use: Cast aerospace parts
Other Designations: 694, 98M2, CoCrNiMoFe, ECY 768, F75, FSX 414, G34, How 1, How 3, How 6, How 12, How 19, How 21, How 25 (L605), How 31 (X40), How 36, How F, How J, Mar-M 302, Mar-M 509, Mar-M 918, Merle 72, MP35N, S 816, PT1377, PT1508, WI 52, X 45 and other Cobalt-Based Alloys

Alcoa Inc.
201 Isabella Street
Pittsburgh, PA 15212-5858

Phone: Health and Safety: 1-412-553-4649

Emergency Information: USA: Chemtrec: 1-800-424-9300 or 1-703-527-3887 Alcoa: 1-412-553-4001
Website: For a current MSDS, refer to Alcoa websites: www.alcoa.com or Internally at my.alcoa.com EHS Community

* * * Section 2 - Hazards Identification * * *

EMERGENCY OVERVIEW

Solid. Metallic appearance. Odorless. Non-combustible as supplied.

Explosion/fire hazards may be present when (See Sections 5, 7 and 10 for additional information):
* Molten metal is in contact with water/moisture.
* Heavily concentrated dust clouds are dispersed in the air.

Dust and fume from processing can cause irritation of eyes, skin and upper respiratory tract.

POTENTIAL HEALTH EFFECTS

The following statements summarize the health effects generally expected in cases of overexposures. User specific situations should be assessed by a qualified individual. Additional health information can be found in Section 11.
The health effects listed below are not likely to occur unless processing or recycling/combustion generate dusts or fumes.

Eyes Dust or fume from processing: Can cause irritation.
Skin Dust or fume from processing: Can cause irritation, sensitization and allergic contact dermatitis.
Inhalation Health effects from mechanical processing (e.g., cutting, grinding): Can cause upper respiratory tract irritation. **Chronic overexposures:** Can cause asthma, respiratory sensitization, scarring of the lungs (pulmonary fibrosis), central nervous system damage, secondary Parkinson's disease and reproductive harm in males.
Additional health effects from elevated temperature processing (e.g., welding, melting): **Acute overexposures:** Can cause nausea, fever, chills, shortness of breath and malaise (metal fume fever). **Chronic overexposures:** Can cause the accumulation of fluid in the lungs (pulmonary edema) and lung cancer.

Carcinogenicity and Reproductive Hazard

Product as shipped: Does not present any cancer or reproductive hazards.
Dust and fumes from mechanical processing: Can present a cancer hazard (nickel, cobalt). Can present a reproductive hazard for males (manganese).
Dust and fumes from welding or elevated temperature processing: Can present a cancer hazard (hexavalent chromium compounds, nickel compounds, welding fumes, cobalt compounds). Can present a reproductive hazard for males (manganese).

Medical Conditions Aggravated By Exposure to Product, Components or Compounds Formed During Processing

Dust or fume from processing: Asthma, chronic lung disease, skin rashes and secondary Parkinson's disease.

* * * Section 3 - Composition / Information on Ingredients * * *

Complete composition is provided below and may include some components classified as non-hazardous.

CAS #	Component	Percent
7440-48-4	Cobalt	35-65
7440-47-3	Chromium	15-35
7440-02-0	Nickel	0-35
7440-33-7	Tungsten	0-25
7439-89-6	Iron	0-20
7439-98-7	Molybdenum	0-15
7440-25-7	Tantalum	0-10
7440-62-2	Vanadium	0-5
7439-96-5	Manganese	0-5
7429-90-5	Aluminum	0-5
7440-03-1	Niobium	0-5
7440-21-3	Silicon	0-5
7440-44-0	Carbon	0-5

Component Information

Additional compounds which may be formed during processing are listed in Section 8.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

Dust or fume from processing: Flush eyes with plenty of water or saline for at least 15 minutes. Consult a physician.

First Aid: Skin

Dust or fume from processing: Wash skin with soap and water for at least 15 minutes. Consult a physician if irritation persists.

First Aid: Inhalation

Dust or fume from processing: Remove to fresh air. If unconscious or severely injured, check for clear airway, breathing and presence of pulse. Perform CPR if there is no pulse or respiration. Consult a physician.

* * * Section 5 - Fire Fighting Measures * * *

Flammable/Combustible Properties

This product does not present fire or explosion hazards as shipped. Dust and fines may be ignitable.

Fire/Explosion

May be a potential hazard under the following conditions:

***** Molten metal in contact with water/moisture. Moisture entrapped by molten metal can be explosive. ***** Dust or fines dispersed in the air can be explosive. Heavily concentrated dusts in air can be explosive if subjected to a strong ignition source.

Extinguishing Media

Use a Class D agent, fluxing salts, graphite or dry sand on dust or fine fires. Otherwise, use fire fighting methods and materials that are appropriate for surrounding fire.

Unsuitable Extinguishing Media

DO NOT USE:

***** Water around molten metal.

These agents will react with the burning material.

Fire Fighting Equipment/Instructions

Fire fighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.

* * * Section 6 - Accidental Release Measures * * *

Small/Large Spill: Avoid generating dust. Recover using mechanical means. Collect scrap for recycling.

* * * Section 7 - Handling and Storage * * *

Handling/Storage

Avoid generating dust. Avoid contact with sharp edges or heated metal. Product should be kept dry. Do not eat, drink, apply cosmetics, or smoke when handling or using.

Requirements for Remelting of Scrap Material and/or Ingot

Molten metal and water can be an explosive combination. The risk is greatest when there is sufficient molten metal to entrap or seal off the water. Water and other forms of contamination on or contained in scrap or remelt ingot are known to have caused explosions in melting operations. While the products may have minimal surface roughness and internal voids, there remains the possibility of moisture contamination or entrapment. If confined, even a few drops of water can lead to violent explosions.

During melting operations, the following minimum guidelines should be observed:

***** Inspect all materials prior to furnace charging and completely remove surface contamination such as water, ice, snow, deposits of grease and oil or other surface contamination resulting from weather exposure, shipment, or storage.

***** Store materials in dry, heated areas with any cracks or cavities pointed downwards.

***** Preheat and dry large or heavy items such as ingot adequately before charging into a furnace containing molten metal. This is typically done by use of a drying oven or homogenizing furnace. The drying cycle should bring the internal metal temperature of the coldest item of the batch to 400°F and then hold at that temperature for 6 hours.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Engineering Controls

If dust or fumes are generated through processing: Use with adequate ventilation to meet the limits listed in Section 8, Exposure Guidelines.

Personal Protective Equipment

Respiratory Protection

If dust or fumes are generated through processing: Use NIOSH-approved respiratory protection as specified by an Industrial Hygienist or other qualified professional if concentrations exceed the limits listed in Section 8, Exposure Guidelines. Suggested respiratory protection: N95

Eye Protection Wear safety glasses/goggles to avoid eye injury.

Skin Protection Wear appropriate gloves to avoid any skin injury.

General

Personnel who handle and work with **molten metal** should utilize primary protective clothing like polycarbonate face shields, fire resistant tapper's jackets, neck shades (snoods), leggings, spats and similar equipment to prevent burn injuries. In addition to primary protection, secondary or day-to-day work clothing that is fire resistant and sheds metal splash is recommended for use with molten metal. Synthetic materials should never be worn even as secondary clothing (undergarments).

Exposure Guidelines

A: General Product Information

No Occupational Exposure Limit has been developed specifically for this product.

Alcoa recommends an Occupational Exposure Limit for **Cobalt** of 0.02 mg/m3 TWA.

Alcoa recommends an Occupational Exposure Limit for **Chromium (VI) Compounds [both soluble and insoluble forms]** of 0.25 ug/m3 TWA as chromium.

Alcoa recommends an Occupational Exposure Limit for **Nickel Compounds** of 0.1 mg/m3 TWA.

Alcoa recommends Occupational Exposure Limits for **Manganese** of 0.05 mg/m3 TWA (total particulate) and 0.02 mg/m3 TWA (respirable fraction).

B: Component Exposure Limits

Cobalt (7440-48-4)
ACGIH 0.02 mg/m3 TWA
OSHA 0.1 mg/m3 TWA (dust and fume)

Chromium (7440-47-3)
ACGIH 0.5 mg/m3 TWA
OSHA 1 mg/m3 TWA

Nickel (7440-02-0)
ACGIH 1.5 mg/m3 TWA (inhalable fraction)
OSHA 1 mg/m3 TWA

Tungsten (7440-33-7)
ACGIH 5 mg/m3 TWA
ACGIH 10 mg/m3 STEL

Molybdenum (7439-98-7)
ACGIH 10 mg/m3 TWA (inhalable fraction); 3 mg/m3 TWA (respirable fraction)
OSHA 15 mg/m3 TWA (total dust)

Tantalum (7440-25-7)
ACGIH 5 mg/m3 TWA (dust)
OSHA 5 mg/m3 TWA

Vanadium (7440-62-2)
OSHA 0.5 mg/m3 Ceiling (respirable dust, as V2O5); 0.1 mg/m3 Ceiling (fume, as V2O5)

Manganese (7439-96-5)
ACGIH 0.2 mg/m3 TWA
OSHA 5 mg/m3 Ceiling (fume)

Aluminum (7429-90-5)
ACGIH 10 mg/m3 TWA (metal dust)
OSHA 15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable fraction)

Silicon (7440-21-3)
OSHA 15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable fraction)

C: Exposure Limits for Additional Compounds Which May Be Formed During Processing

Chromium (II) compounds (Not Available)
OSHA 0.5 mg/m3 TWA (as Cr)

Chromium (III) Compounds (Not Available)
ACGIH 0.5 mg/m3 TWA (as Cr)
OSHA 0.5 mg/m3 TWA (as Cr)

Chromium (VI) compounds- water soluble (Not Available)
ACGIH 0.05 mg/m3 TWA (as Cr)

Chromium (VI) compounds (certain water insoluble forms) (Not Available)
ACGIH 0.01 mg/m3 TWA (as Cr)

Chromium (VI) (18540-29-9)
OSHA 2.5 µg/m3 Action Level; 5 µg/m3 TWA (Cancer hazard - See 29 CFR 1910.1026)

Nickel insoluble compounds (Not Available)
ACGIH 0.2 mg/m3 TWA (inhalable fraction, as Ni)
OSHA 1 mg/m3 TWA (as Ni)

Tungsten, insoluble compounds (Not Available)
ACGIH 5 mg/m3 TWA (as W)
ACGIH 10 mg/m3 STEL (as W)

Iron oxide (1309-37-1)
ACGIH 5 mg/m3 TWA (respirable fraction)
OSHA 10 mg/m3 TWA

Molybdenum insoluble compounds (Not Available)
ACGIH 10 mg/m3 TWA (inhalable fraction, as Mo); 3 mg/m3 TWA (respirable fraction, as Mo)
OSHA 15 mg/m3 TWA (total dust)
Tantalum oxide (1314-61-0)
ACGIH 5 mg/m3 TWA (dust, as Ta)
OSHA 5 mg/m3 TWA (dust)
Vanadium pentoxide (1314-62-1)
ACGIH 0.05 mg/m3 TWA (dust or fume, respirable fraction)
OSHA 0.5 mg/m3 Ceiling (respirable dust, as V2O5); 0.1 mg/m3 Ceiling (fume, as V2O5)
Manganese compounds, inorganic (Not Available)
ACGIH 0.2 mg/m3 TWA (as Mn)
OSHA 5 mg/m3 Ceiling (as Mn) (related to Manganese compounds)
Aluminum oxide (1344-28-1)
ACGIH 10 mg/m3 TWA (particulate matter containing no asbestos and <1% crystalline silica)
OSHA 15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable fraction)

* * * Section 9 - Physical & Chemical Properties * * *

Physical State:	Solid	**Appearance:**	Metallic appearance
Boiling Point:	Not determined	**Melting Point:**	2719ºF (1493ºC) Cobalt
Vapor Pressure:	Not applicable	**Vapor Density:**	Not applicable
Solubility in Water:	Not soluble	**Specific Gravity:**	See Density
Density:	550 lb/ft3 (8.8 g/cm3)	**pH Level:**	Not applicable
Odor:	Odorless	**Odor Threshold:**	Not applicable
Octanol-Water Coefficient:	Not applicable		

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Stability Stable under normal conditions of use, storage, and transportation.
Conditions to Avoid
In powder form, can react with strong oxidizers such as concentrated nitric acid. Molten metal can react violently/explosively with water or moisture, particularly when the water is entrapped.

* * * Section 11 - Toxicological Information * * *

Health Effects Associated with Individual Ingredients
Cobalt Can cause irritation of eyes, skin and respiratory tract. Skin contact: Can cause allergic reactions. Acute and chronic overexposures: Can cause respiratory sensitization, asthma, scarring of the lungs (pulmonary fibrosis) and damage to the heart muscle (cardiomyopathy). **Cobalt and certain cobalt compounds** IARC/NTP: Listed as possibly carcinogenic to humans by IARC (Group 2B)*.

Chromium dust and mist Can cause irritation of eyes, skin and respiratory tract. **Chromium and trivalent chromium** IARC/NTP: Listed as "unclassifiable as to carcinogenicity in humans" by IARC (Group 3).

Nickel dust and fumes Can cause irritation of eyes, skin and respiratory tract. Eye contact: Can cause inflammation of the eyes and eyelids (conjunctivitis). Skin contact: Can cause sensitization and allergic contact dermatitis. Chronic overexposures: Can cause perforation of the nasal septum, inflammation of the nasal passages (sinusitis), respiratory sensitization, asthma and scarring of the lungs (pulmonary fibrosis). **Nickel alloys** IARC/NTP: Reviewed but not recommended for listing by the NTP. Listed as possibly carcinogenic to humans by IARC (Group 2B)*.

Tungsten dust Can cause irritation of eyes, skin and upper respiratory tract.

Molybdenum dust and fumes Can cause irritation of mucous membranes, skin and respiratory tract. Acute overexposures: Can cause headache, backache and sore joints. Chronic overexposures: Can cause deformities of the joints, blood disorders, kidney damage, lung damage and liver damage.

Tantalum and tantalum oxide Can cause mechanical irritation of eyes, skin and upper respiratory tract. Generally of low toxicity.

Manganese dust or fumes Chronic overexposures: Can cause inflammation of the lung tissue, scarring of the lungs (pulmonary fibrosis), central nervous system damage, secondary Parkinson's disease and reproductive harm in males.

Aluminum dust, fines and fumes Low health risk by inhalation. Generally considered to be biologically inert.

Niobium dust and fumes Acute overexposures: Generally of low toxicity. Chronic overexposures: Can cause lung damage.

Silicon, inert dusts Chronic overexposures: Can cause chronic bronchitis and narrowing of the airways.

Health Effects Associated with Individual Compounds Formed During Processing

(The following could be expected if welded, remelted or otherwise processed at elevated temperatures.)

Hexavalent chromium (Chrome VI) Can cause irritation of eyes, skin and respiratory tract. Skin contact: Can cause irritant dermatitis, allergic reactions and skin ulcers. Chronic overexposures: Can cause perforation of the nasal septum, respiratory sensitization, asthma, the accumulation of fluid in the lungs (pulmonary edema), lung damage, kidney damage, lung cancer, nasal cancer and cancer of the gastrointestinal tract. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1)*.

Nickel compounds Associated with lung cancer, cancer of the vocal cords and nasal cancer. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1)*.

Iron oxide Chronic overexposures: Can cause benign lung disease (siderosis). Ingestion: Can cause irritation of gastrointestinal tract, bleeding, changes in the pH of the body fluids (metabolic acidosis) and liver damage.

Molybdenum trioxide Can cause irritation of eyes, mucous membranes and upper respiratory tract. Chronic overexposures: Can cause reduction in the number of red blood cells (anemia), predisposition to gout, thyroid function changes, liver damage and lung damage. Additional information: Studies with experimental animals by inhalation have found lung cancer.

Vanadium pentoxide Can cause irritation of eyes, skin and respiratory tract. Skin contact (prolonged or repeated): Can cause sensitization and dermatitis. Acute overexposures: Can cause inflammation of the eyes and eyelids (conjunctivitis), bronchitis and the accumulation of fluid in the lungs (pulmonary edema). Effects can be delayed for several days. Chronic overexposures: Can cause kidney damage, blindness, asthma and emphysema. IARC/NTP: Listed as possibly carcinogenic to humans by IARC (Group 2B)*.

Manganese oxide fumes Can cause irritation of eyes, skin and respiratory tract. Acute overexposures: Can cause nausea, fever, chills, shortness of breath and malaise (metal fume fever).

Alumina (aluminum oxide) Low health risk by inhalation. Generally considered to be biologically inert.

Silica, amorphous Acute overexposures: Can cause dryness of eyes, nose and upper respiratory tract.

Acute Toxicity of Ingredients/Formed Compounds

A: General Product Information No information available for product.

B: Component Analysis - LD50/LC50

Cobalt (7440-48-4) Inhalation LC50 Rat: >10 mg/L/1H; Oral LD50 Rat:6170 mg/kg

Nickel (7440-02-0) Oral LD50 Rat: >9000 mg/kg
Iron (7439-89-6) Oral LD50 Rat: 984 mg/kg
Manganese (7439-96-5) Oral LD50 Rat: 9 g/kg
Silicon (7440-21-3) Oral LD50 Rat: 3160 mg/kg
Carbon (7440-44-0) Oral LD50 Rat: >10000 mg/kg

C: Formed Compound Toxicity - LD50s/LC50s

Iron oxide (1309-37-1) Oral LD50 Rat: >10000 mg/kg
Tantalum oxide (1314-61-0) Oral LD50 Rat: 8 g/kg
Vanadium pentoxide (1314-62-1)
Inhalation LC50 Rat: 2.21 mg/L/4H; Oral LD50 Rat:10 mg/kg; Dermal LD50 Rat:>2500 mg/kg
Aluminum oxide (1344-28-1) Oral LD50 Rat: >5000 mg/kg
Silicon dioxide (amorphous) (69012-64-2)
Oral LD50 Rat: >5000 mg/kg; Inhalation LC50 Rat:>2.2 mg/L/1H; Dermal LD50 Rabbit:>2000 mg/kg (related to Silica, amorphous)

Carcinogenicity of Ingredients
A: Ingredient Carcinogenicity - IARC/NTP

Component	CAS	IARC 1	IARC 2A	IARC 2B	IARC 3	IARC 4	NTP K	NTP RA
Cobalt	7440-48-4	No	No	Yes	No	No	No	No
Chromium	7440-47-3	No	No	No	Yes	No	No	No
Nickel	7440-02-0	No	No	Yes	No	No	No	No

B: Ingredient Carcinogenicity - ACGIH

Cobalt (7440-48-4)
ACGIH A3 - Confirmed animal carcinogen with unknown relevance to humans
Chromium (7440-47-3)
ACGIH A4 - Not Classifiable as a Human Carcinogen
Nickel (7440-02-0)
ACGIH A5 - Not Suspected as a Human Carcinogen

C: Ingredient References

Cobalt (7440-48-4)
IARC Monograph 86 [2006] (without tungsten carbide), Monograph 52 [1991]
Chromium (7440-47-3)
IARC Monograph 49 [1990] (listed under Chromium and Chromium compounds), Supplement 7 [1987]
Nickel (7440-02-0)
IARC Monograph 49 [1990], Supplement 7 [1987]

Carcinogenicity of Compounds Formed During Processing
A: Formed Compound Carcinogenicity - IARC/NTP

Component	CAS	IARC 1	IARC 2A	IARC 2B	IARC 3	IARC 4	NTP K	NTP RA
Chromium (III) Compounds	Not Available	No	No	No	Yes	No	No	No
Chromium (VI) compounds (certain water insoluble forms)	Not Available	Yes	No	No	No	No	Yes	No
Nickel compounds	Not Available	Yes	No	No	No	No	Yes	No
Iron oxide	1309-37-1	No	No	No	Yes	No	No	No
Vanadium pentoxide	1314-62-1	No	No	Yes	No	No	No	No
Silicon dioxide (amorphous) (related to Silica, amorphous)	69012-64-2	No	No	No	Yes	No	No	No

B: Formed Compound Carcinogenicity - ACGIH

Chromium (III) Compounds (Not Available)
ACGIH A4 - Not Classifiable as a Human Carcinogen
Chromium (VI) compounds- water soluble (Not Available)
ACGIH A1 - Confirmed Human Carcinogen
Chromium (VI) compounds (certain water insoluble forms) (Not Available)
ACGIH A1 - Confirmed Human Carcinogen
Nickel insoluble compounds (Not Available)
ACGIH A1 - Confirmed Human Carcinogen
Iron oxide (1309-37-1)
ACGIH A4 - Not Classifiable as a Human Carcinogen
Vanadium pentoxide (1314-62-1)
ACGIH A4 - Not Classifiable as a Human Carcinogen (dust and fume)
Aluminum oxide (1344-28-1)
ACGIH A4 - Not Classifiable as a Human Carcinogen

C: Formed Compound References

Chromium (III) Compounds (Not Available)
IARC Monograph 49 [1990] (listed under Chromium and Chromium compounds), Supplement 7 [1987]
Chromium (VI) compounds (certain water insoluble forms) (Not Available)
IARC Monograph 49 [1990] (evaluated as a group)
Chromium (VI) (18540-29-9)
IARC Monograph 49 [1990] (evaluated as a group)
Nickel compounds (Not Available)
IARC Monograph 49 [1990] (evaluated as a group)
Iron oxide (1309-37-1)
IARC Supplement 7 [1987], Monograph 1 [1972]
Vanadium pentoxide (1314-62-1)
IARC Monograph 86 [2006]
Silicon dioxide (amorphous) (69012-64-2)
IARC Monograph 68 [1997], Supplement 7 [1987] (related to Silica, amorphous)

Descriptions of IARC and NTP Classifications

IARC 1: The agent is carcinogenic to humans. There is sufficient evidence that a causal relationship existed between exposure to the agent and human cancer.
IARC 2A: The agent is probably carcinogenic to humans. Generally includes agents for which there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals.
IARC 2B: The agent is possibly carcinogenic to humans. Generally includes agents for which there is limited evidence in humans and less than sufficient evidence in experimental animals.
IARC 3: The agent is not classifiable as to its carcinogenicity to humans. Generally includes agents for which there is inadequate evidence in humans and inadequate or limited evidence in experimental animals.
IARC 4: The agent is probably not carcinogenic to humans. Generally includes agents for which there is evidence suggesting lack of carcinogenicity in humans and in experimental animals.
NTP K: Known to be a human carcinogen.
NTP RA: Reasonably anticipated to be a human carcinogen.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information No information available for product.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Cobalt (7440-48-4) 96 Hr LC50 Brachydanio rerio: >100 mg/L [static]

Nickel (7440-02-0)
96 Hr LC50 Oncorhynchus mykiss: 31.7 mg/L (adult); 96 Hr LC50 Pimephales promelas: 3.1 mg/L; 96 Hr LC50 Brachydanio rerio: >100 mg/L
72 Hr EC50 freshwater algae (4 species): 0.1 mg/L; 72 Hr EC50 Selenastrum capricornutum: 0.18 mg/L
96 Hr EC50 water flea: 510 µg/L
Iron (7439-89-6) 96 Hr LC50 Morone saxatilis: 13.6 mg/L [static]

Environmental Fate No information available for product.

* * * Section 13 - Disposal Considerations * * *

Disposal Instructions Reuse or recycle material whenever possible.
US EPA Waste Number & Descriptions
A: General Product Information
If reuse or recycle is not possible, then characterize in accordance with applicable regulations (40 CFR 261 or state equivalent in the U.S.) prior to disposal. TCLP testing is recommended for chromium.
B: Component Waste Numbers
RCRA waste codes other than described under Section A may apply depending on use of product. Refer to 40 CFR 261 or state equivalent in the U.S.

* * * Section 14 - Transportation Information * * *

Special Transportation

	PSN #1	PSN #2	PSN #3	PSN #4
Notes:	(1)			
UN NA Number:	-			
Proper Shipping Name:	Not regulated			
Hazard Class:	-			
Packing Group:	-			
RQ:	-			
Other - Tech Name:	-			
Other - Marine Pollutant:	-			

Notes:
(1) When "Not regulated," enter the proper freight classification, "MSDS Number," and "Product Name" on the shipping paperwork.

Canadian Controlled Products Regulation PIN:	Not regulated

* * * Section 15 - Regulatory Information * * *

US Federal Regulations
A: General Product Information
In reference to Title VI of the Clean Air Act of 1990, this material does not contain nor was it manufactured using ozone-depleting chemicals.
B: Component Analysis
This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).
Cobalt (7440-48-4)
SARA 313: 0.1 % de minimis concentration
Chromium (7440-47-3)
SARA 313: 1.0 % de minimis concentration
CERCLA: 5000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers);
2270 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers)

Nickel (7440-02-0)
SARA 313: 0.1 % de minimis concentration
CERCLA: 100 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers); 45.4 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers)

Vanadium (7440-62-2)
SARA 313: 1.0 % de minimis concentration (except when contained in an alloy)

Manganese (7439-96-5)
SARA 313: 1.0 % de minimis concentration

Aluminum (7429-90-5)
SARA 313: 1.0 % de minimis concentration (dust or fume only)

SARA 311/312 Physical and Health Hazard Categories:

Immediate (acute) Health Hazard: Yes, if particulates/fumes generated during processing
Delayed (chronic) Health Hazard: Yes, if particulates/fumes generated during processing
Fire Hazard: No
Sudden Release of Pressure: No
Reactive: No

State Regulations

A: General Product Information PENNSYLVANIA "Special Hazardous Substance": Chromium, Nickel
Chemical(s) known to the State of California to cause cancer: Chromium (hexavalent compounds), Cobalt metal powder, Nickel (metallic) and nickel compounds

B: Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS #	CA	FL	MA	MN	NJ	PA
Cobalt	7440-48-4	Yes	No	Yes	Yes	Yes	Yes
Chromium	7440-47-3	Yes	No	Yes	Yes	Yes	Yes
Nickel	7440-02-0	Yes	No	Yes	Yes	Yes	Yes
Tungsten	7440-33-7	Yes	No	Yes	Yes	Yes	Yes
Iron	7439-89-6	Yes	No	No	No	No	No
Molybdenum	7439-98-7	Yes	No	Yes	Yes	Yes	Yes
Tantalum	7440-25-7	Yes	No	Yes	Yes	Yes	Yes
Vanadium	7440-62-2	Yes	No	Yes	No	Yes	Yes
Manganese	7439-96-5	Yes	No	Yes	Yes	Yes	Yes
Aluminum	7429-90-5	Yes	No	Yes	Yes	Yes	Yes
Silicon	7440-21-3	No	No	Yes	Yes	Yes	Yes

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):
WARNING! This product contains a chemical known to the state of California to cause cancer.

Other Regulations

A: General Product Information Material meets the criteria for inclusion in WHMIS Class D2A.

B: Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Cobalt	7440-48-4	0.1 %
Chromium	7440-47-3	0.1 %
Nickel	7440-02-0	0.1 %
Tungsten	7440-33-7	1 %
Molybdenum	7439-98-7	1 %
Tantalum	7440-25-7	1 %
Vanadium	7440-62-2	1 %
Manganese	7439-96-5	1 %
Aluminum	7429-90-5	1 %

C: Component Analysis - Inventory

Component	CAS #	TSCA	DSL	EINECS	AUST.	MITI
Cobalt	7440-48-4	Yes	Yes	Yes	Yes	No
Chromium	7440-47-3	Yes	Yes	Yes	Yes	No
Nickel	7440-02-0	Yes	Yes	Yes	Yes	No
Tungsten	7440-33-7	Yes	Yes	Yes	Yes	No
Iron	7439-89-6	Yes	Yes	Yes	Yes	No
Molybdenum	7439-98-7	Yes	Yes	Yes	Yes	No
Tantalum	7440-25-7	Yes	Yes	Yes	Yes	No
Vanadium	7440-62-2	Yes	Yes	Yes	Yes	No
Manganese	7439-96-5	Yes	Yes	Yes	Yes	No
Aluminum	7429-90-5	Yes	Yes	Yes	Yes	No
Niobium	7440-03-1	Yes	Yes	Yes	Yes	No
Silicon	7440-21-3	Yes	Yes	Yes	Yes	No
Carbon	7440-44-0	Yes	Yes	Yes	Yes	No

Inventory information

MITI Inventory: Pure metals are not specifically listed by CAS or MITI number on the MITI Inventory. However, the class of compounds for each of these metals is listed.

* * * Section 16 - Other Information * * *

MSDS History

Original: June 18, 2001
Supersedes: October 11, 2004
Revised: April 22, 2008

MSDS Status

04/22/2008: Reviewed on a periodic basis in accordance with Alcoa policy. Changes in Sections 1, 2, 3, 4, 5, 8, 11, 12, 13, 14 & 15.
10/11/2004: Combined with Alcoa MSDS #'s 1148 and 1149. Changes in Sections 1, 2, 3, 8 and 15. Covers some products formerly on Howmet MSDSs 201, 202, 203, 204, 205, 206 and 504.
06/18/2001: New MSDS; covers some products formerly on Howmet MSDS 201.

Prepared By

Hazardous Materials Control Committee
Preparer: Stephanie Williams, 412-553-1479/Jon N. Peace, 412-553-2293

MSDS System Number

159242

Other Information

* Guide to Occupational Exposure Values-2007, Compiled by the American Conference of Governmental Industrial Hygienists (ACGIH).
* Documentation of the Threshold Limit Values and Biological Exposure Indices, Sixth Edition, 1991, Compiled by the American Conference of Governmental Industrial Hygienists, Inc. (ACGIH).
* NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, February 2004.
* Patty's Industrial Hygiene and Toxicology: Volume II: Toxicology, 4th ed., 1994, Patty, F. A.; edited by Clayton, G. D. and Clayton, F. E.: New York: John Wiley & Sons, Inc.
* expub, www.expub.com, Expert Publishing, LLC.

Key-Legend:

ACGIH	American Conference of Governmental Industrial Hygienists
AICS	Australian Inventory of Chemical Substances
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CPR	Cardio-pulmonary Resuscitation
DOT	Department of Transportation
DSL	Domestic Substances List (Canada)
EC	Effective Concentration
ED	Effective Dose
EINECS	European Inventory of Existing Commercial Chemical Substances
EPA	Environmental Protection Act
IARC	International Agency for Research on Cancer
LC_{50}	Lethal concentration (50 percent kill)
LC_{Lo}	Lowest published lethal concentration
LD_{50}	Lethal dose (50 percent kill)
LD_{Lo}	Lowest published lethal dose
LFL	Lower Flammable Limit
MITI	Ministry of International Trade & Industry
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NORM	Naturally Occurring Radioactive Materials
NTP	National Toxicology Program
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PIN	Product Identification Number
PSN	Proper Shipping Name
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
STEL	Short Term Exposure Limit
TCLP	Toxic Chemicals Leachate Program
TDG	Transportation of Dangerous Goods
TLV	Threshold Limit Value
TSCA	Toxic Substance Control Act
TWA	Time Weighted Average
UFL	Upper Flammable Limit
WHMIS	Workplace Hazardous Materials Information System
atm	atmosphere
cm	centimeter
g, gm	gram
in	inch
kg	kilogram
lb	pound
m	meter
mg	milligram
ml, ML	milliliter
mm	millimeter
mppcf	million particles per cubic foot
n.o.s.	not otherwise specified
ppb	parts per billion
ppm	parts per million
psia	pounds per square inch absolute
u	micron
ug	microgram

INFORMATION HEREIN IS GIVEN IN GOOD FAITH AS AUTHORITATIVE AND VALID; HOWEVER, NO WARRANTY, EXPRESS OR IMPLIED, CAN BE MADE.

This is the end of MSDS # 1147

COBALT-BASED ALLOYS

⚠ WARNING

Physical Hazards: Non-combustible as supplied. Dust and fines from processing may be ignitable. Explosion/fire hazards may be present when (1) molten metal is in contact with water or moisture or (2) heavily concentrated dust clouds are dispersed in air.

Health Hazards: Health effects generally expected in cases of overexposures:
EYES: Dust or fume from processing: Can cause irritation.
SKIN: Dust or fume from processing: Can cause irritation, sensitization and allergic contact dermatitis.
INHALATION: Health effects from mechanical processing (e.g., cutting, grinding): Can cause upper respiratory tract irritation. **Chronic overexposures:** Can cause asthma, respiratory sensitization, scarring of the lungs (pulmonary fibrosis), central nervous system damage, secondary Parkinson's disease and reproductive harm in males. Additional health effects from elevated temperature processing (e.g., welding, melting): **Acute overexposures:** Can cause nausea, fever, chills, shortness of breath and malaise (metal fume fever). **Chronic overexposures:** Can cause the accumulation of fluid in the lungs (pulmonary edema) and lung cancer.

WARNING: Cobalt metal powder, Chromium (hexavalent compounds) and nickel (metallic) and nickel compounds are chemicals known to the State of California to cause cancer (Proposition 65).

Precautions: Avoid generating dust. Use with adequate ventilation. Keep material dry. Use appropriate personal protective equipment (safety glasses/gloves) to avoid injury. Use appropriate NIOSH approved respiratory protection (N95) if concentrations exceed the permissible limits.

First Aid (dust or fume from processing): EYES: Flush eyes with plenty of water or saline for at least 15 minutes. Consult a physician. SKIN: Wash skin with soap and water for at least 15 minutes. Consult a physician if irritation persists. INHALATION: Remove to fresh air. If unconscious or severely injured, check for clear airway, breathing and presence of pulse. Perform CPR if there is no pulse or respiration. Consult a physician.

In case of fire: Use a Class D agent, fluxing salts, graphite or dry sand on dust or fine fires. Otherwise, use fire fighting methods and materials that are appropriate for surrounding fire. Do NOT use water around molten metal. This will react with the burning material.

Read Alcoa Material Safety Data Sheet No. 1147 for more information about use and disposal.

Emergency Phone: (412) 553-4001.

INGREDIENTS:	CAS No:	INGREDIENTS:	CAS No:
Cobalt	(7440-48-4)	Vanadium	(7440-62-2)
Chromium	(7440-47-3)	Manganese	(7439-96-5)
Nickel	(7440-02-0)	Aluminum	(7429-90-5)
Tungsten	(7440-33-7)	Niobium	(7440-03-1)
Iron	(7439-89-6)	Silicon	(7440-21-3)
Molybdenum	(7439-98-7)	Carbon	(7440-44-0)
Tantalum	(7440-25-7)		

Alcoa Inc.
201 Isabella Street, Pittsburgh, PA 15212-5858 USA

ALCOA

4/08 1147

```
ERROR: undefined
OFFENDING COMMAND: get

STACK:

/quit
-dictionary-
-mark-
```

ISO9001:2000 Certified

Material Safety Data Sheet
Cyanide Standard, 1000 ppm

Section 1 - Chemical Product and Company Identification

MSDS Name:
Cyanide Standard, 1000 ppm
Catalog Numbers:
LC13545
Synonyms:
None
Company Identification:
LabChem Inc
200 William Pitt Way
Pittsburgh, PA 15238
Company Phone Number:
(412) 826-5230
Emergency Phone Number:
(800) 424-9300
CHEMTREC Phone Number:
(800) 424-9300

Section 2 – Composition, Information on Ingredients

CAS#	Chemical Name:	Percent
7732-18-5	Water	balance
1310-73-2	Sodium hydroxide	<0.16
151-50-8	Potassium cyanide	0.25

Section 3 - Hazards Identification

Emergency Overview

Appearance: *Clear, colorless solution*

Danger! May be fatal if inhaled, swallowed, or absorbed through the skin. Contact with acids liberates toxic gas. May cause long-term effects in the aquatic environment. May cause irritation to eyes, skin, respiratory, and gastrointestinal tracts.

Target Organs: *Central nervous system, lungs, eyes, thyroid, skin*

Potential Health Effects

Eye:
Causes eye irritation.
Skin:
Causes skin irritation. If absorbed through the skin, causes symptoms similar to those of ingestion.
Ingestion:
May be fatal if swallowed. Causes tissue anoxia, characterized by weakness, headache, dizziness, confusion, cyanosis, weak and irregular heartbeat, collapse, unconsciousness, convulsions and

death, sometimes within 1-15 minutes. May cause gastrointestinal irritation with nausea, vomiting and diarrhea.

Inhalation:

Causes respiratory tract irritation. Inhalation of high concentrations of vapors may cause effects similar to those of ingestion.

Chronic:

Exposure to low levels over long periods of time may cause loss of appetite, headache, nausea, dizziness, upper respiratory tract irritation. Prolonged skin contact may cause dermatitis and "cyanide rash" characterized by itching. Prolonged eye contact may cause conjunctivitis and corrosion of cornea.

Section 4 - First Aid Measures

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids until chemical is gone. Get medical aid at once.

Skin:

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid at once.

Ingestion:

SPEEDY ACTION IS CRITICAL. NOTIFY MEDICAL PERSONNEL IMMEDIATELY. Call a poison control center. If conscious, drink water, then induce vomiting with syrup of ipecac. If unconscious, immediately take victim to a physician and do NOT attempt to induce vomiting.

Inhalation:

SPEEDY ACTION IS CRITICAL. NOTIFY MEDICAL PERSONNEL IMMEDIATELY. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation.

Notes to Physician:

Exposure should be treated as a cyanide poisoning.

Section 5 - Fire Fighting Measures

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Combustion generates toxic fumes.

Extinguishing Media:

Substance is noncombustible; use agent most appropriate to extinguish surrounding fire. Do NOT use carbon dioxide.

Autoignition Temperature:

Not applicable

Flash Point:

Not applicable

NFPA Rating:

CAS# 7732-18-5: Health- 0, Flammability- 0, Instability- 0.
CAS# 1310-73-2: Health- 3, Flammability- 0, Instability- 1.
CAS# 151-50-8: Health- 4, Flammability- 0, Instability- 1.

Explosion Limits:

Lower: n/a Upper: n/a

Material Safety Data Sheet
Cyanide Standard, 1000 ppm

Section 6 - Accidental Release Measures

General Information:

Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spills with absorbent (vermiculite, sand, fuller's earth) and place in plastic bags for later disposal. Clean up spills immediately, observing precautions in the Protective Equipment section.

Section 7 - Handling and Storage

Handling:

Wash thoroughly after handling. Use with adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Do not ingest or inhale. Wash clothing before reuse.

Storage:

Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from acids.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits:

Chemical Name:	ACGIH	NIOSH	OSHA
Water	none listed	none listed	none listed
Sodium hydroxide	2 mg/m3 Ceiling	10 mg/m3 IDLH	2 mg/m3 TWA
Potassium cyanide	5 mg/m3 Ceiling (as CN) (listed as Hydrogen cyanide and cyanide salts)	25 mg/m3 IDLH (as CN)	5 mg/m3 TWA (listed under Cyanide anion)

OSHA Vacated PELs:

None.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:

Wear appropriate gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

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.

Material Safety Data Sheet
Cyanide Standard, 1000 ppm

Section 9 - Physical and Chemical Properties

Physical State:	Clear liquid
Color:	Colorless
Odor:	Odorless to slight odor of bitter almond
pH:	Alkaline
Vapor Pressure:	Not available
Vapor Density:	Not available
Evaporation Rate:	Not available
Viscosity:	Not available
Boiling Point:	>100°C (>212°F)
Freezing/Melting Point:	<0°C (<32°F)
Decomposition Temperature:	Not available
Solubility in water:	Soluble
Specific Gravity/Density:	1.0
Molecular Formula:	Not applicable
Molecular Weight:	Not applicable

Section 10 - Stability and Reactivity

Chemical Stability:

Absorbs carbon dioxide from the air.

Conditions to Avoid:

Incompatible materials, excess heat.

Incompatibilities with Other Materials:

Acids, bases, aluminum, chlorates, permanganates, peroxides, zinc, aldehydes, metallic salts, chloral hydrate, iodine.

Hazardous Decomposition Products:

Hydrogen cyanide, nitrogen oxides, potassium oxides.

Hazardous Polymerization:

Has not been reported.

Section 11 - Toxicological Information

RTECS:

CAS# 7732-18-5: ZC0110000.
CAS# 1310-73-2: WB4900000.
CAS# 151-50-8: TS8750000.

LD50/LC50:

CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg.

CAS# 1310-73-2:
Draize test, rabbit, eye: 50ug/24h Severe,
Draize test, rabbit, skin: 500mg/24h Severe

CAS# 151-50-8:
Oral, mouse: LD50 = 8500 ug/kg
Oral, rabbit: LD50 = 5 mg/kg
Oral, rat: LD50 = 5 mg/kg

Carcinogenicity:

CAS# 7732-18-5: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA, or CA Prop 65.
CAS# 1310-73-2: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA, or CA Prop 65.
CAS# 151-50-8: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA, or CA Prop 65.

Epidemiology:

Workers exposed to cyanide long-term experienced headaches, weakness, changes in taste and smell, irritation of the throat, vomiting, and effort dyspnea. Enlargement of the thyroid occurred in 50% of the workers.

Teratogenicity:

Animal studies have only shown harmful effects in the offspring of animals exposed to doses that also produced significant maternal toxicity.

Reproductive:

See actual entry in RTECS for complete information.

Mutagenicity:

See actual entry in RTECS for complete information.

Neurotoxicity:

No information found

Section 12 - Ecological Information

No information found

Section 13 - Disposal Considerations

Dispose of in accordance with Federal, State, and local regulations.

Section 14 - Transport Information

US DOT

Shipping Name: Not regulated.
Hazard Class:
UN Number:
Packing Group:

Section 15 - Regulatory Information

US Federal

TSCA:

CAS# 7732-18-5 is listed on the TSCA Inventory.
CAS# 1310-73-2 is listed on the TSCA Inventory.
CAS# 151-50-8 is listed on the TSCA Inventory.

SARA Reportable Quantities (RQ):

CAS# 1310-73-2: final RQ = 1000 pounds (454 kg)
CAS# 151-50-8: final RQ = 10 pounds (4.54 kg)

CERCLA/SARA Section 313:

None of the components are on this list.

OSHA - Highly Hazardous:

None of the chemicals in this product are considered highly hazardous by OSHA.

US State

State Right to Know:

Sodium hydroxide can be found on the following state Right-to-Know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

Potassium cyanide can be found on the following state Right-to-Know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

California Regulations:

None.

European/International Regulations

Canadian DSL/NDSL:

CAS# 7732-18-5 is listed on Canada's DSL List.
CAS# 1310-73-2 is listed on Canada's DSL List.
CAS# 151-50-8 is listed on Canada's DSL List.

Canada Ingredient Disclosure List:

CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.
CAS# 1310-73-2 is listed on Canada's Ingredient Disclosure List.
CAS# 151-50-8 is not listed on Canada's Ingredient Disclosure List as Cyanides, inorganic salts.

Section 16 - Other Information

MSDS Creation Date: July 20, 1998
Revision Date: October 13, 2009

Information in this MSDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc. assumes no liability resulting from the use of this MSDS. The user must determine suitability of this information for his application.

SAFETY DATA SHEET

Version 5.8
Revision Date 03/07/2015
Print Date 02/23/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Cyclohexane
Product Number	:	320633
Brand	:	Aldrich
Index-No.	:	601-017-00-1
CAS-No.	:	110-82-7

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 1), H400

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.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H400	Very toxic to aquatic life.

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.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P331	Do NOT induce vomiting.
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.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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_6H_{12}
Molecular weight	:	84.16 g/mol
CAS-No.	:	110-82-7
EC-No.	:	203-806-2
Index-No.	:	601-017-00-1

Hazardous components

Component	Classification	Concentration
Cyclohexane		
	Flam. Liq. 2; Skin Irrit. 2; STOT SE 3; Asp. Tox. 1; Aquatic Acute 1; H225, H304, H315, H336, H400	<= 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. Discharge into the environment must be avoided.

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
Cyclohexane	110-82-7	TWA	100.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment		
		TWA	300.000000 ppm 1,050.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	300.000000 ppm 1,050.000000 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: 0.11 mm
Break through time: 35 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 4 - 7 °C (39 - 45 °F) - lit.
f)	Initial boiling point and boiling range	80.7 °C (177.3 °F) - lit.
g)	Flash point	-17.99 °C (-0.38 °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: 9 %(V) Lower explosion limit: 1 %(V)
k)	Vapour pressure	225.0 hPa (168.8 mmHg) at 37.7 °C (99.9 °F) 102.7 hPa (77.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.779 g/cm3 at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 3.44
p)	Auto-ignition temperature	260.0 °C (500.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 12,705 mg/kg

LC50 Inhalation - Rat - 4 h - 34,000 mg/l
(OECD Test Guideline 403)

LD50 Dermal - Rabbit - > 2,000 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Additional Information
RTECS: GU6300000

Central nervous system depression, Drowsiness, Irritability, Dizziness, Gastrointestinal disturbance, Lung irritation, chest pain, pulmonary edema

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 4.53 mg/l -

	96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.9 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 3.4 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability Result: - Readily biodegradable

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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: 1145 Class: 3 Packing group: II
Proper shipping name: Cyclohexane
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1145 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: CYCLOHEXANE
Marine pollutant:yes

IATA

UN number: 1145 Class: 3 Packing group: II
Proper shipping name: Cyclohexane

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
Cyclohexane	110-82-7	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Cyclohexane	110-82-7	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Cyclohexane	110-82-7	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Cyclohexane	110-82-7	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
Asp. Tox.	Aspiration hazard
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H400	Very toxic to aquatic life.
Skin Irrit.	Skin irritation
STOT SE	Specific target organ toxicity - single exposure

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

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: 03/07/2015 Print Date: 02/23/2016

Chem Service Inc.

MATERIAL SAFETY DATA SHEET

Last Revision Date: 1/11/2012

SECTION 1 - CHEMICAL PRODUCT and COMPANY IDENTIFICATION

Catalog Number: M-CSM8080U99
Description: Pesticide Control Sample Mixture in Toluene
Product is: Mixture

Supplied by CHEM SERVICE, Inc. PO BOX 599, WEST CHESTER, PA 19381 (610)-692-3026
EMERGENCY PHONE: 1-610-692-3026

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

The following compounds are contained in this mixture at the stated concentrations:

CONC	ANALYTE	CAS
100ug/ml	4,4'-DDD	72-54-8
100ug/ml	4,4'-DDT	50-29-3
100ug/ml	b-Endosulfan	33213-65-9
100ug/ml	Endosulfan sulfate	1031-07-8
100ug/ml	Endrin	72-20-8
20ug/ml	Heptachlor	76-44-8
20ug/ml	BHC (alpha isomer)	319-84-6
20ug/ml	BHC (beta isomer)	319-85-7
20ug/ml	a-Endosulfan	959-98-8
20ug/ml	Heptachlor epoxide (Isomer B)	1024-57-3
20ug/ml	Aldrin	309-00-2
20ug/ml	Dieldrin	60-57-1
20ug/ml	4,4'-DDE	72-55-9

SECTION 3 - HAZARDS IDENTIFICATION

Contact lenses should not be worn in the laboratory. All chemicals should be considered hazardous - Avoid direct physical contact!

For the solvent: Toluene

Can cause eye irritation. Prolonged exposure may cause nausea/headache/dizziness and/or eye damage. May be harmful if inhaled. Dust and/or vapors can cause irritation to respiratory tract. Can be irritating to mucous membranes.

May be harmful if swallowed. Can cause gastro-intestinal disturbances. Can cause blood disorders. Exposure can cause liver damage. Exposure can cause kidney damage.

Can cause skin irritation. May be harmful if absorbed through the skin. May be rapidly absorbed through the skin with potential adverse health effects.

Can cause delayed adverse health effects. Can cause nervous system injury.

Avoid consumption of alcohol before and after handling of this compound because it will increase the toxicity of the compound. Narcotic at high concentrations.

This chemical is considered to cause DEVELOPMENTAL TOXICITY by the state of California.

SECTION 4 - FIRST AID MEASURES

An antidote is a substance intended to counteract the effect of a poison. It should be administered only by a physician or trained emergency personnel. Medical advice can be obtained from a POISON CONTROL CENTER.

For the solvent: Toluene

In case of contact: Flush eyes continuously with water for 15-20 minutes. Flush skin with water for 15-20 minutes. If no burns have occurred-use soap and water to cleanse skin. If inhaled remove patient to fresh air. Administer oxygen if patient is having difficulty breathing. If patient has stopped breathing administer artificial respirations. If patient is in cardiac arrest administer CPR. Continue life supporting measures until medical assistance has arrived. Contact Poison Control Center immediately if necessary.

Remove and wash contaminated clothing. If patient is exhibiting signs of shock - Keep warm and quiet.

If swallowed DO NOT induce vomiting. If taken internally give milk, milk of magnesia or egg whites beaten with water. Do not administer liquids or induce vomiting to an unconscious or convulsing person. If patient is vomiting-watch closely to make sure airway does not become obstructed by vomit.

Get medical attention if necessary.

SECTION 5 - FIRE AND EXPLOSION DATA

For the solvent: Toluene

Flash Point:	4.4°C
Extinguishing Media:	Carbon dioxide or dry chemical powder. DO NOT USE WATER!
Lower Explosion Limit:	1.2%
Upper Explosion Limit:	7%
Autoignition Temperature:	535°C
NFPA Scale:	0 - Least, 1 - Slight, 2 - Moderate, 3 - High, 4 - Severe
NFPA Hazard Rating:	Health: 2, Reactivity: 0, Flammability: 3

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spills or Leaks: Evacuate area. Wear appropriate OSHA regulated equipment. Ventilate area. Absorb on vermiculite or similar material. Sweep up and place in an appropriate container. Hold for disposal.

Wash contaminated surfaces to remove any residue.

Remove contaminated clothing and wash before reuse.

SECTION 7 - HANDLING AND STORAGE

Handling: This chemical should be handled only in a hood. Eye shields should be worn. Use appropriate OSHA/MSHA approved safety equipment. Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation. Wash thoroughly after handling.

Storage: Store in a cool dry place. Store only with compatible chemicals.
Keep tightly closed.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

For the solvent: Toluene

OSHA PEL (TWA):	100 ppm (375mg/m3)
ACGIH TLV (TWA):	50ppm (147mg/m3)
ACGIH TLV (STEL):	Data Not Available

Personal Protective Equipment
Eyes: Wear Safety Glasses.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to minimize contact with skin.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant the use of a respirator.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

For the solvent: Toluene

Color:	Colorless
Phase:	Liquid
Melting Point:	-95°C
Boiling Point:	110.6°C
Specific Gravity:	0.866g/mL @ 20°C
Vapor Density:	2.9
Vapor Preasure:	29.1hPa @ 20°C
Solubility in Water:	Very slightly soluble
Odor:	Aromatic
Evaporation Rate (Butyl acetate=1):	1.9
Molecular Weight:	92.14
Molecular Formula:	C7H8

SECTION 10 - STABILITY AND REACTIVITY

For the solvent: Toluene

Flammable. Readily absorbed and retained on clothing and/or shoes.
Volatile. Incompatible with strong oxidizing agents. Decomposition liberates toxic fumes.
Hygroscopic.

SECTION 11 - TOXICOLOGY INFORMATION

Since this solution contains a very low concentration of active component, the primary hazard is from the solvent.

The LD50 for the minor component:

ANALYTE	CAS	LD50	
4,4'-DDD	72-54-8	113	mg/kg
4,4'-DDT	50-29-3	87	mg/kg
b-Endosulfan	33213-65-9	240	mg/kg
Endosulfan sulfate	1031-07-8	18	mg/kg
Endrin	72-20-8	8	mg/kg
Heptachlor	76-44-8	40	mg/kg
BHC (alpha isomer)	319-84-6	177	mg/kg
BHC (beta isomer)	319-85-7	6,000	mg/kg
a-Endosulfan	959-98-8	76	mg/kg
Heptachlor epoxide (Isomer B)	1024-57-3	15	mg/kg
Aldrin	309-00-2	38	mg/kg
Dieldrin	60-57-1	38	mg/kg
4,4'-DDE	72-55-9	880	mg/kg

For the solvent: Toluene

RTECS:	XS5250000
Oral Rat or Mouse LD50:	5000.0 mg/kg
Dermal Rat or Mouse LD50:	N/A mg/kg
Rat or Mouse LC50 :	49 g/m3(4h)

Carcinogenicity

OSHA:	NO
IARC:	NO Details: 3

NTP:	NO
ACGIH:	NO Details: A4
NIOSH:	NO
Other:	NO

Property 65: This chemical is considered to cause DEVELOPMENTAL TOXICITY by the state of California.

Carcinogenicity

For the minor component:

4,4'-DDD	OSHA	No	NTP	No	IARC	Yes	NIOSH	No	ACGIH	No
4,4'-DDT	OSHA	No	NTP	Yes	IARC	Yes	NIOSH	Yes	ACGIH	No
Heptachlor	OSHA	No	NTP	No	IARC	Yes	NIOSH	Yes	ACGIH	Yes
BHC (alpha isomer)	OSHA	No	NTP	No	IARC	Yes	NIOSH	No	ACGIH	No
BHC (beta isomer)	OSHA	No	NTP	Yes	IARC	Yes	NIOSH	No	ACGIH	No
Heptachlor epoxide (Isomer B)	OSHA	No	NTP	No	IARC	Yes	NIOSH	No	ACGIH	No
Aldrin	OSHA	No	NTP	No	IARC	No	NIOSH	Yes	ACGIH	No
Dieldrin	OSHA	No	NTP	No	IARC	No	NIOSH	Yes	ACGIH	No
4,4'-DDE	OSHA	No	NTP	No	IARC	Yes	NIOSH	No	ACGIH	No

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: Not Available
Environmental Fate: Not Available

SECTION 13 - DISPOSAL CONSIDERATIONS

Disposal: Dispose in accordance with Federal, State and Local regulations.

SECTION 14 - TRANSPORTATION INFORMATION

For the solvent: Toluene

UN Number:	UN1294
Class:	3
Packing Group:	II
Proper Shipping Name:	Toluene

SECTION 15 - REGULATORY INFORMATION

For the solvent: Toluene

European Labeling in Accordance with EC Directives

Hazard Symbols: F, Xn

Risk Phrases:
-R11: Highly Flammable.
-R20: Harmful by inhalation.

Safety Phrases:
-S16: Keep away from sources of ignition - No smoking.
-S25: Avoid contact with the eyes.
-S29: Do not empty into drains.
-S33: Take precautionary measures against static discharges.

SECTION 16 - OTHER INFORMATION

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded MSDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Material Safety Data Sheet (MSDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an MSDS for a solution or mixture the user should refer to the MSDS for every component of the solution or mixture. Chem Service warrants that this MSDS is based upon the most current information available to Chem Service at the time it was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. This MSDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

This product is furnished FOR LABORATORY USE ONLY!

Chem Service Inc. Material Safety Data Sheet

Last Revised On: **11/3/2011**

SECTION 1 - CHEMICAL PRODUCT and COMPANY IDENTIFICATION

Catalog Number: S-10875M1
Description: 4,4'-DDE
Product is: Solution
Other Name(s): 1,1-Dichloro-2,2-bis[p-chlorophenyl]ethylene/p,p'-DDE/1,1 -(Dichloroethenylidene)bis[4-chlorobenzene]
Supplied by CHEM SERVICE, Inc. PO BOX 599, WEST CHESTER, PA 19381 (610)-692-3026
EMERGENCY PHONE: 1-610-692-3026

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

CAS No.: 72-55-9
Description: 4,4'-DDE Solution
Concentration: 100ug/mL in Methanol
EINECS No.: 200-784-6
Hazard Symbols: XN

SECTION 3 - HAZARDS IDENTIFICATION

Contact lenses should not be worn in the laboratory. All chemicals should be considered hazardous - Avoid direct physical contact!

For the solvent: Methanol

Health Risks: May be fatal if absorbed through the skin! Repeated exposure to vapors and/or dust can cause eye injury. May be fatal if inhaled! Can cause cardiovascular system injury. Exposure can cause liver damage. Exposure can cause kidney damage. May be fatal or cause blindness if swallowed. Can cause gastro-intestinal disturbances. Can cause convulsions.

Property 65: Data Not Available

SECTION 4 - FIRST AID MEASURES

An antidote is a substance intended to counteract the effect of a poison. It should be administered only by a physician or trained emergency personnel. Medical advice can be obtained from a POISON CONTROL CENTER.

For the solvent: Methanol
First Aid: In case of contact: Flush eyes continuously with water for 15-20 minutes. Flush skin with water for 15-20 minutes. If patient has stopped breathing administer artificial respiration. If patient is in cardiac arrest administer CPR. Continue life supporting measures until medical assistance has arrived. Do not wear shoes or clothing until absolutely free of all chemical odors. Get medical attention if necessary. If no burns have occurred-use soap and water to cleanse skin. If inhaled remove patient to fresh air. Administer oxygen if patient is having difficulty breathing. If swallowed do not induce vomiting.

SECTION 5 - FIRE AND EXPLOSION DATA

For the solvent: Methanol

Flash Point: 11°C This is a flammable chemical.
Extinguishing Media: Carbon dioxide or dry chemical powder. DO NOT USE WATER!
Upper Explosion Limit: 36%
Lower Explosion Limit: 6.0%
Autoignition Temperature: 464°C

NFPA Scale: 0 - Least, 1 - Slight, 2 - Moderate, 3 - High, 4 - Severe
NFPA Hazard Rating: Health: 1. Reactivity: 0. Flammability: 3. Special: No Data.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spills or Leaks: Evacuate area. Wear appropriate OSHA regulated equipment. Ventilate area. Absorb on vermiculite or similar material. Sweep up and place in an appropriate container. Hold for disposal.

Wash contaminated surfaces to remove any residue.
Remove contaminated clothing and wash before reuse.

SECTION 7 - HANDLING AND STORAGE

Handling: This chemical should be handled only in a hood. Eye shields should be worn. Use appropriate OSHA/MSHA approved safety equipment. Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation. Wash thoroughly after handling.

Storage:
Store in a cool dry place. Store only with compatible chemicals.
Keep tightly closed.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

For the solvent: Methanol

OSHA PEL (TWA):	200 ppm (260 mg/m3)
ACGIH TLV (TWA):	200 ppm (262 mg/m3)
ACGIH TLV (STEL):	Data Not Available

<u>Personal Protective Equipment</u>
Eyes: Wear Safety Glasses.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to minimize contact with skin.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant a respirators use.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

For the solvent: Methanol

Color:	Colorless
Phase:	Liquid
Melting Point:	-98°C
Boiling Point:	64.6°C
Specific Gravity:	0.791g/mL
Vapor Density:	1.11
Vapor Pressure:	130.3 hPa @ 20°C
Solubility in Water:	Completely miscible.
Odor:	Data Not Available

Evaporation Rate (Butyl acetate=1): Data Not Available

Molecular Weight: 32.05
Molecular Formula: CH_4O

SECTION 10 - STABILITY AND REACTIVITY
For the solvent: Methanol

Reacts with Acid halides and anhydrides. Flammable. Incompatible with strong acids. Incompatible with strong reducing agents. Incompatible with strong oxidizing agents. Decomposition liberates toxic fumes. Hygroscopic. Incompatible with active metals (e.g. Sodium).

SECTION 11 - TOXICOLOGY INFORMATION
The primary hazards for this solution are predominantly from the solvent.

For the solvent: Methanol

RTECS: PC1400000
Oral Rat or Mouse LD50: 5628 mg/kg
Dermal Rat or Mouse LD50: N/A mg/kg
Rat or Mouse LC50 : 64000 ppm/8H
Carcinogenicity
OSHA: NO
IARC: NO
NTP: NO
ACGIH: NO
NIOSH: NO
Other: NO

Property 65: Data Not Available

SECTION 12 - ECOLOGICAL INFORMATION
Ecotoxicity: Not Available
Environmental Fate: Not Available

SECTION 13 - DISPOSAL CONSIDERATIONS
Disposal: Dispose in accordance with Federal, State and Local regulations.

SECTION 14 - TRANSPORTATION INFORMATION
For the solvent: Methanol

UN Number: UN1230
Class: 3
Packing Group: II
Proper Shipping Name: Methanol

SECTION 15 - REGULATORY INFORMATION
For the solvent: Methanol

European Labeling in Accordance with EC Directives
Hazard Symbols: T F
Risk Phrases
R11 Highly Flammable.
R23/25 Toxic by inhalation and if swallowed.

Safety Phrases
S16 Keep away from sources of ignition- No smoking.
S2 Keep out of reach of children.

S24	Avoid contact with the skin.
S45	In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).
S7	Keep container tightly closed

SECTION 16 - OTHER INFORMATION

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded MSDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with
CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.
This Material Safety Data Sheet (MSDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an MSDS for a solution or mixture the user should refer to the MSDS for every component of the solution or mixture. Chem Service warrants that this MSDS is based upon the most current information available to Chem Service at the time it was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. This MSDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

This product is furnished FOR LABORATORY USE ONLY!

Safety data for dibenz(a,h)anthracene

Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 1,2:5,6-benzanthracene, 1,2:5,6-dibenzanthracene, dibenzo(a,h) anthracene, DBA, 1,2,5,6-DBA
Use: a common pollutant in smoke and used oils
Molecular formula: $C_{22}H_{14}$
CAS No: 53-70-3
EINECS No: 200-181-8
Annex I Index. No: 601-041-00-2

Physical data

Appearance: white to light yellow crystalline solid
Melting point: 266 - 267 C
Boiling point: 524 C
Vapour density:
Vapour pressure:
Density (g cm^{-3}): 1.28
Flash point:
Explosion limits:
Autoignition temperature:
Water solubility:

Stability

Stable. Combustible. Incompatible with strong oxidizing agents.

Toxicology

Harmful if swallowed or inhaled. Experimental carcinogen, tumorigen and neoplastigen. IARC probable human carcinogen.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given here.)

IVN-MUS LDLO 10 mg kg^{-1}

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)
R45 R50 R53.

Environmental information

Harmful in the environment - may cause long-term damage.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)
Non-hazardous for air, sea and road freight.

Personal protection

Safety glasses, gloves, good ventilation. Handle as a possible carcinogen.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)
S45 S53 S60 S61.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.]

SAFETY DATA SHEET

Version 3.7
Revision Date 11/25/2014
Print Date 01/29/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Dibenzofuran
Product Number	:	236373
Brand	:	Aldrich
CAS-No.	:	132-64-9

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)
Acute toxicity, Oral (Category 4), H302
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning

Hazard statement(s)

H302	Harmful if swallowed.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth.
P391	Collect spillage.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Diphenylene oxide
Formula	:	$C_{12}H_8O$
Molecular weight	:	168.19 g/mol
CAS-No.	:	132-64-9
EC-No.	:	205-071-3

Hazardous components

Component	Classification	Concentration
Dibenzofuran		
	Acute Tox. 4; Aquatic Acute 2; Aquatic Chronic 2; H302, H411	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.
For personal protection see section 8.

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

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

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

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

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

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

Personal protective equipment

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an

industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Colour: white, beige
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 80 - 82 °C (176 - 180 °F) - lit.
f)	Initial boiling point and boiling range	154 - 155 °C (309 - 311 °F) at 27 hPa (20 mmHg) - lit.
g)	Flash point	130.0 °C (266.0 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 3.77
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
The preceding data, or interpretation of data, was determined using Quantitative Structure Activity Relationship (QSAR) modeling.

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: HP4430000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	NOEC - Cyprinodon variegatus (sheepshead minnow) - 1 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 1.05 mg/l - 96.0 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.
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.

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 substance, solid, n.o.s. (Dibenzofuran)
Reportable Quantity (RQ): 100 lbs
Marine pollutant:yes
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. (Dibenzofuran)
Marine pollutant:yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenzofuran)

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

Dibenzofuran	132-64-9	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	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
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H302	Harmful if swallowed.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	1
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 3.7 Revision Date: 11/25/2014 Print Date: 01/29/2016

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.

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.

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.

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

Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
Methane, dichlorodifluoro-	**ACGIH TLV (United States, 3/2012).** TWA: 4950 mg/m³ 8 hours. TWA: 1000 ppm 8 hours. **NIOSH REL (United States, 1/2013).** TWA: 4950 mg/m³ 10 hours. TWA: 1000 ppm 10 hours. **OSHA PEL (United States, 6/2010).** TWA: 4950 mg/m³ 8 hours. TWA: 1000 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 4950 mg/m³ 8 hours. 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.

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.

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

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.

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. **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 75 kg **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** T50	**Explosive Limit and Limited Quantity Index** 0.125 **Passenger Carrying Road or Rail Index** 75	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 75 kg **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

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.

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.)

Health	1
Flammability	0
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.)

Section 16. Other information

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

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.

MSDS SUMMARY SHEET

Manufacturer:
Name: PHILLIPS PETROLEUM COMPANY
Address 1:
Address 2:
Address 3:
CSZ: BARTLESVILLE **State:** OK **Zipcode:** 74004
Emergency phone: (800) 424-9300
Business phone: 800-762-0942

Product:

Ferndale MSDS#: 1354 **Version # :** 6
Manufacturer MSDS#: 0041
Current? : 2002
Name:

NO. 2 DIESEL FUEL

Synonyms:

CARB **Diesel** TF3
CARB **Diesel**
CARB **Diesel** 10%
Diesel Fuel Oil
EPA Low Sulfur **Diesel** Fuel
EPA Low Sulfur **Diesel** Fuel – Dyed
EPA Off Road High Sulfur **Diesel –** Dyed
Fuel Oil No. 2 – CAS # 68476-30-2
No. 2 **Diesel** Fuel Oil
No. 2 Fuel Oil – Non Hiway – Dyed
No. 2 High Sulfur **Diesel** – Dyed
No. 2 Low Sulfur **Diesel** - Dyed
No. 2 Low Sulfur **Diesel** - Undyed
Crude column 3rd IR
Crude column 3rd side cut
Atmospheric tower 3rd side cut
Ultra Low Sulfur **Diesel** No. 2
Finished **Diesel**
DHT Reactor Feed
Straight Run **Diesel**
Diesel
Middle Distillate

Product/Catalog Numbers:
MSDS Date: 01/01/2002 **(received:** 01/14/2002**)**

NFPA codes:
Health: 0 **Flammability:** 2 **Reactivity:** 0

MATERIAL SAFETY DATA SHEET
No. 2 Diesel Fuel

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: No. 2 Diesel Fuel
Product Code: Multiple
SAP Code:
Synonyms:
1354
CARB Diesel TF3
CARB Diesel
CARB Diesel 10%
Diesel Fuel Oil
EPA Low Sulfur Diesel Fuel
EPA Low Sulfur Diesel Fuel – Dyed
EPA Off Road High Sulfur Diesel – Dyed
Fuel Oil No. 2 – CAS # 68476-30-2
No. 2 Diesel Fuel Oil
No. 2 Fuel Oil – Non Hiway – Dyed
No. 2 High Sulfur Diesel – Dyed
No. 2 Low Sulfur Diesel - Dyed
No. 2 Low Sulfur Diesel – Undyed
No. 2 Ultra Low Sulfur Diesel – Dyed
No. 2 Ultra Low Sulfur Diesel - Undyed
Intended Use: Fuel
Chemical Family:
Responsible Party: Phillip's Petroleum Company
Bartlesville, Oklahoma 74004
For Additional MSDSs: 800-762-0942
Technical Information:

The intended use of this product is indicated above. If any additional use is known, please contact us at the Technical Information number listed.

EMERGENCY OVERVIEW

24 Hour Emergency Telephone Numbers:
Spill, Leak, Fire or Accident
Call CHEMTREC
North America: (800) 424-9300
Others: (703) 527-3887 (collect)

California Poison Control System: 800-356-3120

Health Hazards/Precautionary Measures: Causes severe skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Use with adequate ventilation. Avoid contact with eyes, skin and clothing. Do not taste or swallow. Wash thoroughly after handling.

Physical Hazards/Precautionary Measures: Flammable liquid and vapor. Keep away from heat, sparks, flames, static electricity or other sources of ignition.

Appearance: Straw-colored to dyed red
Physical Form: Liquid
Odor: Characteristic petroleum

HFPA Hazard Class:
Health: 0 (Least)
Flammability: 2 (Moderate)
Reactivity: 0 (Least)

HMIS Hazard Class
Not Evaluated

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	% VOLUME	EXPOSURE GUIDELINE		
		Limits	Agency	Type
Diesel Fuel No. 2 CAS# 68476-34-6	100	100* mg/m3	ACGIH	TWA-SKIN
Naphthalene CAS# 91-20-3	<1	10ppm	ACGIH	TWA
		15ppm	ACGIH	STEL
		10ppm	OSHA	TWA
		250ppm	NIOSH	IDLH

All components are listed on the TSCA inventory

Tosco Low Sulfur No. 2 Diesel meets the specifications of 40 CFR 60.41 for low sulfur diesel fuel.

Note: State, local or other agencies or advisory groups may have established more stringent limits.
Consult an industrial hygienist or similar professional, or your local agencies, for further information.

*Proposed ACGIH (1999)

3. HAZARDS IDENTIFICATION

Potential Health Effects:

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Severe skin irritant. Contact may cause redness, itching, burning, and severe skin damage. Prolonged or repeated contact can worsen irritation by causing drying and cracking of the skin, leading to dermatitis (inflammation). Not actually toxic by skin absorption, but prolonged or repeated skin contact may be harmful (see Section 11).

Inhalation (Breathing): No information available. Studies by other exposure routes suggest a low degree of toxicity by inhalation.

Ingestion (Swallowing): Low degree of toxicity by ingestion. ASPIRATION HAZARD – This material can enter lungs during swallowing or vomiting and cause lung inflammation and damage.

Signs and Symptoms: Effects of overexposure may include irritation of the nose and throat, irritation of the digestive tract, nausea, diarrhea and transient excitation followed by signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Cancer: Possible skin cancer hazard (see Sections 11 and 14).

Target Organs: There is limited evidence from animal studies that overexposure may cause injury to the kidney (see Section 11).

Developmental: Inadequate data available for this material.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders and kidney disorders.

4. FIRST AID MEASURES

Eye: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

Skin: Immediately remove contaminated shoes, clothing, and constrictive jewelry and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek immediate medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops, seek immediate medical attention.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard; Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

5. FIRE FIGHTING MEASURES

Flammable Properties:

Flash Point: >125°F/>52°
OSHA Flammability Class: Combustible liquid
LEL %: 0.3 / UEL %; 10.0
Autoignition Temperature: 500°F/260°C

Unusual Fire & Explosion Hazards: This material is flammable and can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, or mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk.

Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

6. ACCIDENTAL RELEASE MEASURES

Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof equipment is recommended.

Stay upwind and away from spill/release. Notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8).

Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors (see Section 5). Spilled material may be absorbed into an appropriate material.

Notify fire authorities and appropriate federal, state, and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, notify the National Response Center (phone number 800-424-8802).

7. HANDLING AND STORAGE

Handling: Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharged. The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-704 and/or API RP 2003 for specific bonding/grounding requirements.

Do not enter confined spaces such as tanks or pits without following proper entry procedures such ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Sections 2 and 8).

Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames. Use good personal hygiene practices.

High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection apparatus or from pinhole leaks in tubing or high pressure hydraulic oil equipment.

“Empty” containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. “Empty” drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSIZ49.1 and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Post area “No Smoking or Open Flame.” Store only in approved containers. Keep away from incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentration below the established exposure limits (see Section 2), additional ventilation or exhaust systems may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Personal Protective Equipment (PPE):

Respiratory: A NIOSH certified air purifying respirator with an organic vapor cartridge maybe used under conditions where airborne concentrations are expected to exceed exposure limits (see Section 2).

Protection provided by air purifying respirators is limited (see manufacturer's respirator selection guide). Use a positive pressure air supplied respirator if there is a potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrants a respirator's use.

Skin: The use of gloves impervious to the specific material handled is advised to prevent skin contact, possible irritation and skin damage (see glove manufacturer literature for information on permeability). Depending on conditions of use, apron and/or arm covers may be necessary.

Eyes/Face: Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse. It is recommended that impervious clothing be worn when skin contact is possible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1atm).

Appearance: Straw-colored to dyed red
Physical State: Liquid
Odor: Characteristic petroleum
pH: unavailable
Vapor Pressure (mm Hg): 0.40
Vapor Densisty (air=1):>3
Boiling Point/Range: 320-700°F /160-371°C
Freezing/Melting Point: No Data
Solubility in Water: Negligible
Specific Gravity: 0.81-0.88 @ 60°F
Percent Volatile: Negligible
Evaporation Rate (nBuAc=1): <1
Viscosity: 32.6-40.0 SUS @ 100°F
Bulk Density: 7.08 lbs/gal
Flash Point: >125°F / >52°C
Flammable/Expolsive Limits (%): LEL: 0.3 / UEL: 10.0

10. STABILITY AND REACTIVITY

Stability: Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Flammable liquid and vapor. Vapor can cause flash fire.

Conditions To Avoid: Avoid all possible sources of ignition (see Sections 5 and 7).

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc.

Hazardous Decomposition Products: The use of hydrocarbon fuels in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels. ACGIH has included a TLV of 0.05 mg/m3 TWA for diesel exhaust particulate on its 1999 Notice of Intended Changes. See Section 11 for additional information on hazards of engine exhaust.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Diesel Fuel No. 2 (CAS# 68476-34-6)

Carcinogenicity: Chronic dermal application of certain middle distillate streams contained in diesel fuel No. 2 resulted in an increased incidence of skin tumors in mice. This material has not been identified as carcinogen by NTP, IARC, or OSHA. Diesel exhaust is a probable cancer hazard based on tests with laboratory animals.

Target Organ(s): Limited evidence of renal impairment has been noted from a few case reports involving excessive exposure to diesel fuel No. 2.

Naphthalene (CAS# 91-20-3)

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has not been identified as a carcinogen by IARC or OSHA.

12. ECOLOGICAL INFORMATION

Not evaluated at this time

13. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, would be a RCRA “characteristic” hazardous waste due to the characteristic(s) of ignitability (D001) and benzene (D018). If the material is spilled to soil or water, characteristic testing of the contaminated materials is recommended. Further, this material, once it becomes a waste, is subject to the land disposal restrictions in 40 CFR 268.40 and may require treatment prior to disposal to meet specific standards. Consult state and local regulations to determine whether they are more stringent then the federal requirements.

Container contents should be completely used and containers should be emptied prior to discard. Container ?insate? could be considered a RCRA hazardous waste and must be disposed of with care and in compliance with federal, state and local regulations. Large empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure proper disposal of smaller containers, consult with state and local regulations and disposal authorities.

14. TRANSPORT INFORMATION

DOT Shipping Description: Diesel Fuel, NA1983
Non-Bulk Package Marking: Diesel Fuel, 3, NA 1993, III

15. REGULATORY INFORMATION

EPA SARA 311/312 (Title III Hazard Categories):

Acute Health:	Yes
Chronic Health:	Yes
Fire Hazard:	Yes
Pressure Hazard:	No
Reactive Hazard:	No

SARA 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

Component	CAS Number	Weight %
-- None known --		

California Proposition 65:
Warning: This material contains the following chemicals which are known to the state of California to cause cancer, birth defects or other reproductive harm, and are subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Effect
Benzene	Cancer, Developmental and Reproductive Toxicant
Toluene	Developmental Toxicant

Diesel engine exhaust, while not a component of this material, is on the Proposition 65 list of chemicals known to the State of California to cause cancer.

Carcinogen Identification:
This material has not been identified as a carcinogen by NTP, IARC, or OSHA. See Section 11 for carcinogenicity information of individual components, if any. Diesel exhaust is a probable cancer hazard based on tests in laboratory animals. It has been identified as carcinogen by IARC.

EPA (CERCLA Reportable Quantity: None

16. OTHER INFORMATION

Issue Date: 01/01/02
Previous Issue Date: 05/15/01
Product Code: Multiple
Revised Sections: None
Previous Product Code: Multiple
MSDS Number: 0041

Disclaimer of Expressed and Implied Warranties:

The information presented in this Material Data Safety Sheet is based on data believed to be accurate as of the date this Material Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THE PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Tosco Refining Company ***Ferndale Refinery***

UltraLow Sulfur Diesel Product Specification

Ferndale Product Code:34380xx (5) Product Code: ULSD2

(COMETS)

Specification	Unit	Limit	Test Procedure	Typical
Appearance				
Water & Sediment	Vol %	0.05 Max	D 2709	
Color	Number	3.0 Max	D 1500	
Haze Rating	Rating	2 Max	D 4176	
Composition				
Carbon Residue (Ramsbottom)	Wt %	0.35 Max	D 524, D 189	
Volatility				
90% Recovered	Deg; F	540 Min	D 86	
	Deg; F	640 Min	D 86	
Flash Point	Deg; F	125 Min (1)	D 93	130 F
Gravity	API	30 Min	D 287, D4052	
Fluidity				
Pour Point	Deg; F	See Season Table (6)	D 97	
Cloud Point	Deg; F	See Season Table (6)	D 2500	10 F
Viscosity @ 104F	cSt	1.9 Min	D 445	
	cSt	4.1 Max	D 445	
Lubricity, SLBOCLE	grams	3100 Min	D 6078	3300gm
Lubricity, HFRR	mm	.45	D 6079	
Combustion				
Cetane Index or Cetane Number (3,4)	Number	40.0 Min	D 976, D613	47.0
Corrosion				
Copper Strip, 3hr @ 50 deg C	Number	3 Max (2)	D 130	
Aromatics (4)	Vol %	35 Max	D 1319	25 %
Contaminants				
Total Sulfur	PPM	30 Max	D 2622, D4294	15-20ppm
Water & Sediment	Vol %	0.05 Max	D 1796	
Ash	Wt %	0.01 Max	D 482	
Additives				
Cetane Improver	Lb/MBbl	675 Max		
Dye		Undyed		

1. Minimum release specification is 125 deg. F. The refinery should target 135 deg. F.
2. Test result reported as a number and letter (e.g. 1a). Any letter is allowable as long as the number meets the spec shown.
3. Either specification must be met.
4. Either cetane index minimum or aromatics maximum must be met.
5. Winter cloud and pour specifications may be relaxed to the summer specifications by agreement with the customer.
6. Season Table

Month	Product Code	Pour Point	Cloud Point
Jan, Feb, Nov, Dec	WI	0 max (5)	14 max (5)
Mar - Oct	SU	15 max	24 max

Bis(2-ethylhexyl) phthalate

sc-254975

Material Safety Data Sheet

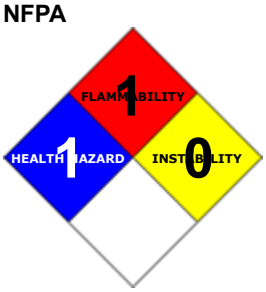
Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
Bis(2-ethylhexyl) phthalate

STATEMENT OF HAZARDOUS NATURE
CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER
Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800
EMERGENCY:
ChemWatch
Within the US & Canada: 877-715-9305
Outside the US & Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS
C24-H38-O4, "1, 2-benzenecarboxylic acid, bis(2-ethylhexyl) ester", "bis(2-ethylhexyl)-1, 2-benzenedicarboxylate", "bis(2-ethylhexyl) phthalate", "dioctyl phthalate", di(2-ethylhexyl)orthophthalate, DEHP, "di(2-ethylhexyl) phthalate", "2-ethylhexyl phthalate", "phthalic acid dioctyl ester", "Bisoflex 81", "Bisoflex DOP", "Compound 889", "Ergoplast FDO", "Eviplast 80, 81", Fleximel, "Flexol DOP", "Good-rite GP-264", "Hatcol DOP", "Hercoflex 260", "Jayflex DOP", "Kodaflex DOP", "Mollan O", NCI-C52733, "Nuoplaz DOP", Octoil, "Palatinol AM", "Platinol DOP", "RC Plasticizer DOP", "Reomol DOP", "Reomol D-79P", "Sicol 150", "Staflex DOP", "Truflex DOP", "Vestinol AH", "Vinicizer 80", "Witcizer 312", "plasticiser/ plasticizer", "Era Polymers DOP"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability:	1		
Toxicity:	2		
Body Contact:	1		
Reactivity:	1		
Chronic:	3		

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4

CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW

RISK

Limited evidence of a carcinogenic effect.
May impair fertility.
May cause harm to the unborn child.
May cause long-term adverse effects in the environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Accidental ingestion of the material may be damaging to the health of the individual.
■ The toxicity of phthalates is not excessive due to slow oral absorption and metabolism.
Absorption is affected by fat in the diet.

EYE

■ Although the liquid is not thought to be an irritant, direct contact with the eye may produce transient discomfort characterized by tearing or conjunctival redness (as with windburn).

SKIN

■ The liquid may be miscible with fats or oils and may degrease the skin, producing a skin reaction described as non-allergic contact dermatitis.
The material is unlikely to produce an irritant dermatitis as described in EC Directives .
■ Open cuts, abraded or irritated skin should not be exposed to this material.
■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.
Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

■ The material is not thought to produce either adverse health effects or irritation of the respiratory tract following inhalation (as classified using animal models).
Nevertheless, adverse effects have been produced following exposure of animals by at least one other route and good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
■ Inhalation hazard is increased at higher temperatures.
■ Not normally a hazard due to non-volatile nature of product.

CHRONIC HEALTH EFFECTS

■ There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment.
Ample evidence exists from experimentation that reduced human fertility is directly caused by exposure to the material.
Ample evidence exists, from results in experimentation, that developmental disorders are directly caused by human exposure to the material.
Results in experiments suggest that this material may cause disorders in the development of the embryo or fetus, even when no signs of poisoning show in the mother.
Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.
For di-sec-octyl phthalate:
Oral studies of 90-days to 2-years in rat, 1-year in guinea pig and up to 1-year in dog have shown a no-effect level of about 60 mg/kg/day. Higher doses produced growth retardation and increased weights of livers and kidneys.
Rats and mice fed on diets containing 6000-12000 (rats) and 3000-6000 (mice) mg/kg body weight for 103 weeks showed an increased incidence of hepatocellular carcinomas in female rats and male and female mice, and an increased incidence of either hepatocellular carcinomas or neoplastic nodules in male rats. About 35% of the hepatocellular carcinomas in mice had metastasised to the lungs.
The substance can cause testicular damage in rats (dietary and gavage studies) with a no-effect level in 0.3% to 0.5% in the diet. Inhalation or dermal exposures did not produce testicular effects. When the substance was fed to pregnant rats (5 ml/kg) it produced slight effects on embryonic and foetal development with skeletal abnormalities more common.
Exposure to phthalates over years leads to pain, numbness and spasms in the hands and feet. Many people have developed multiple disorders in the nervous system and the balancing system.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
di-sec-octyl phthalate	117-81-7	>99

Section 4 - FIRST AID MEASURES

SWALLOWED
· If swallowed do NOT induce vomiting. · If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

EYE
■ If this product comes in contact with the eyes: · Wash out immediately with fresh running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

SKIN
■ If skin or hair contact occurs: · Flush skin and hair with running water (and soap if available). · Seek medical attention in event of irritation.

INHALED
· If fumes or combustion products are inhaled remove from contaminated area. · Other measures are usually unnecessary.

NOTES TO PHYSICIAN
■ Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	1.275 @ 200 C
Upper Explosive Limit (%):	Not available.
Specific Gravity (water=1):	0.99 @ 20 C
Lower Explosive Limit (%):	0.3

EXTINGUISHING MEDIA
· Foam.
· Dry chemical powder.

FIRE FIGHTING
· Alert Emergency Responders and tell them location and nature of hazard.
· Wear full body protective clothing with breathing apparatus.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS
· Combustible.
· Slight fire hazard when exposed to heat or flame.
Combustion products include: carbon dioxide (CO_2), other pyrolysis products typical of burning organic material.
May emit poisonous fumes.

FIRE INCOMPATIBILITY
■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids,chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION
Glasses:
Safety Glasses.
Chemical goggles.
Gloves:
1.VITON 2.BUTYL 3.NITRILE
Respirator:
Type A-P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
■ Environmental hazard - contain spillage.
· Remove all ignition sources.
· Clean up all spills immediately.
MAJOR SPILLS
■ Environmental hazard - contain spillage.
Moderate hazard.
· Clear area of personnel and move upwind.
· Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING
· Avoid all personal contact, including inhalation.
· Wear protective clothing when risk of exposure occurs.

RECOMMENDED STORAGE METHODS
· Metal can or drum
· Packing as recommended by manufacturer.

STORAGE REQUIREMENTS
· Store in original containers.
· Keep containers securely sealed.
· No smoking, naked lights or ignition sources.
· Store in a cool, dry, well-ventilated area.
· Store away from incompatible materials and foodstuff containers.
· Protect containers against physical damage and check regularly for leaks.
· Observe manufacturer's storing and handling recommendations.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
US - Minnesota Permissible Exposure Limits (PELs)	di-sec-octyl phthalate (Di-sec octyl phthalate (Di-2-ethylhexyl-phthalate))		5		10				
US ACGIH Threshold Limit Values (TLV)	di-sec-octyl phthalate (Di(2-ethylhexyl)phthalate [DEHP])		5						TLV Basis: lower respiratory tract irritation
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	di-sec-octyl phthalate (Di-sec-octyl phthalate)		5		10				
US OSHA Permissible Exposure Levels (PELs) - Table Z1	di-sec-octyl phthalate (Di-sec octyl phthalate (Di-(2-ethylhexyl) phthalate))		5						
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	di-sec-octyl phthalate (Di-sec octyl phthalate (Di-2-ethylhexyl-phthalate))		5						
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	di-sec-octyl phthalate (Di-sec octyl phthalate (Di-2-ethylhexyl-phthalate))		5		10				
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	di-sec-octyl phthalate (Di-sec octyl phthalate (Di-2-ethylhexyl-phthalate))		5		10				

US - California Permissible Exposure Limits for Chemical Contaminants	di-sec-octyl phthalate (Di-sec-octyl phthalate; bis(2 ethylhexyl) phthalate)		5				
US - Idaho - Limits for Air Contaminants	di-sec-octyl phthalate (Di-sec, octyl phthalate (Di-(2-ethylhexyl)phthalate))		5				
US - Hawaii Air Contaminant Limits	di-sec-octyl phthalate (Di-sec-octyl phthalate (Di-2-ethylhexyl-phthalate))		5		10		
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	di-sec-octyl phthalate (Di-sec, octyl phthalate (Di-2-ethylhexyl phthalate or DEHP))		5		10		T20
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	di-sec-octyl phthalate (Di-sec,octyl phthalate (Di-2-ethylhexylphthalate)	-	5	-	10		
US - Washington Permissible exposure limits of air contaminants	di-sec-octyl phthalate (Di-sec, Octyl phthalate (Di-2-ethylhexylphthalate))		5		10		
US - Alaska Limits for Air Contaminants	di-sec-octyl phthalate (Di-sec-octyl phthalate (Di-2-ethylhexylphthalate))		5		10		
Canada - Prince Edward Island Occupational Exposure Limits	di-sec-octyl phthalate (Di(2-ethylhexyl)phthalate [DEHP])		5				TLV Basis: lower respiratory tract irritation
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	di-sec-octyl phthalate (Di-sec octyl phthalate (Di-(2-ethylhexyl) phthalate))		5				
Canada - Nova Scotia Occupational Exposure Limits	di-sec-octyl phthalate (Di(2-ethylhexyl)phthalate [DEHP])		5				TLV Basis: lower respiratory tract irritation
US - Michigan Exposure Limits for Air Contaminants	di-sec-octyl phthalate (Di-sec-octyl phthalate[Di(2-ethylhexyl)phthalate])		5		10		
Canada - Northwest Territories Occupational Exposure Limits (English)	di-sec-octyl phthalate (Di-sec-octyl phthalate (Di(2-ethylhexyl)phthalate))		5		10		

Canada - British Columbia Occupational Exposure Limits	di-sec-octyl phthalate (Diesel fuel, as total hydrocarbons, Inhalable)		100 (V)		Skin
Canada - British Columbia Occupational Exposure Limits	di-sec-octyl phthalate (Kerosene /Jet fuels, as total hydrocarbon vapour, Revised 2003)		200 (P)		Skin
Canada - Alberta Occupational Exposure Limits	di-sec-octyl phthalate (Diesel fuel, as total hydrocarbons)		100		
Canada - Alberta Occupational Exposure Limits	di-sec-octyl phthalate (Kerosene/Jet fuels, as total hydrocarbon vapour)		200		
Canada - British Columbia Occupational Exposure Limits	di-sec-octyl phthalate (Di(2-ethylhexyl)phthalate (DEHP))		5		
Canada - Ontario Occupational Exposure Limits	di-sec-octyl phthalate (Di(2-ethylhexyl)phthalate (DEHP) / Phtalate de dioctyle secondaire (DEHP))		3	5	
Canada - Alberta Occupational Exposure Limits	di-sec-octyl phthalate (Di(2-ethylhexyl)phthalate (DEHP, Di-sec-octyl phthalate))		5		
US - Oregon Permissible Exposure Limits (Z-1)	di-sec-octyl phthalate (Di-sec, octyl phthalate (Di-2-ethylhexylphthalate))	-	5		
US NIOSH Recommended Exposure Limits (RELs)	di-sec-octyl phthalate (Di-sec octyl phthalate)		5	10	See Appendix A; Ca

ENDOELTABLE

PERSONAL PROTECTION



RESPIRATOR

• type a-p filter of sufficient capacity.

EYE

· Safety glasses with side shields
· Chemical goggles.

HANDS/FEET

■ Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:
· frequency and duration of contact,
· chemical resistance of glove material,
· glove thickness and
· dexterity
Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).
· When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
· When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes

according to EN 374) is recommended.
· Contaminated gloves should be replaced.
Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.
· Neoprene rubber gloves.
Wear chemical protective gloves, eg. PVC.

OTHER

· Overalls.
· P.V.C. apron.
· Barrier cream.
· Skin cleansing cream.
· Eye wash unit.

ENGINEERING CONTROLS

■ General exhaust is adequate under normal operating conditions. If risk of overexposure exists, wear an approved respirator.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.
Does not mix with water.
Floats on water.

State	Liquid	Molecular Weight	390.54
Melting Range (°F)	-67	Viscosity	Not Available
Boiling Range (°F)	725	Solubility in water (g/L)	Insoluble
Flash Point (°F)	426	pH (1% solution)	Not applicable.
Decomposition Temp (°F)	Not available.	pH (as supplied)	Not applicable
Autoignition Temp (°F)	734	Vapor Pressure (mmHg)	1.275 @ 200 C
Upper Explosive Limit (%)	Not available.	Specific Gravity (water=1)	0.99 @ 20 C
Lower Explosive Limit (%)	0.3	Relative Vapor Density (air=1)	13.45
Volatile Component (%vol)	Not available	Evaporation Rate	Very Slow

APPEARANCE

Light-coloured, odourless and oily liquid; insoluble in water; Mixes with mineral oil and most organic solvents.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

· Presence of incompatible materials.
· Product is considered stable.

STORAGE INCOMPATIBILITY

■ Phthalates:
· react with strong acids, strong oxidisers, permanganates and nitrates
· attack some form of plastics.
Avoid reaction with oxidizing agents.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

di-sec-octyl phthalate

TOXICITY AND IRRITATION

DI-SEC-OCTYL PHTHALATE:
■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (rat) LD50: 30000 mg/kg	Skin (rabbit): 500 mg/24h Mild
Oral (human) TDLo: 143 mg/kg	Eye (rabbit): 500 mg/24h Mild
Oral (mouse) LD50: 1500 mg/kg	

Oral (rabbit) LD50: 34000 mg/kg
Dermal (rabbit) LD50: 25000 mg/kg
Oral (guinea pig) LD50: 26000 mg/kg
Dermal (g.pig) LD50: 10000 mg/kg
Intraperitoneal (Rat) LD50: 30700 mg/kg
Intravenous (Rat) LD50: 250 mg/kg
Intravenous (Mouse) LD50: 1060 mg/kg
Oral (Mouse) TDLo: 984.6 mg/kg

■ Di-sec-octyl phthalate (DEHP) is not acutely toxic in small laboratory animals via the oral route. The oral LD50 reported for mice is 26.3 g/kg; for rats, it is 33.8 g/kg . No skin irritation or sensitisation potential has been demonstrated in either animals or humans, and the lethal dermal dose in rabbits is about 25 ml/kg. Deaths in rats and chronic diffuse inflammation of the lung in mice exposed to DEHP at unspecified levels have been reported.

Long-term dietary toxicity studies in rats, guinea pigs, and dogs have established a no-effect dose level of about 60 mg/kg/day, and no carcinogenic or histologic abnormalities were observed at this level . Higher doses were associated with growth retardation and increased liver and kidney weights but not histologic abnormalities. Metabolic studies have demonstrated that laboratory animals do not appreciably metabolise DEHP . Teratogenicity studies in pregnant rats indicated that fertility is unaffected at doses of 0.1, 0.2, or 0.33 percent of the acute intraperitoneal LD50 dose for rats, although slight effects on embryonic and foetal development were observed in these animals; skeletal deformities were the most common teratogenic effects observed . Mutagenic effects were observed at intravenous doses of one-third, one-half, and two-thirds of the acute LD50; these effects are consistent with DEHP's ability to produce dominant lethal mutations .

A study of workers exposed to a mixture of the vapors of diethyl phthalate, dibutyl phthalate, and di-2-ethylhexyl phthalate reported that exposures to 1 to 6 ppm caused no peripheral polyneuritis However, Russian investigators examined male and female workers exposed to between 1.7 and 66 mg/m3 of various combinations of airborne phthalates (including butyl phthalate, higher aryl phthalates, dioctyl phthalate and others) and noted complaints of pain, numbness, and spasms in the upper and lower extremities after six to seven years of exposure. Polyneuritis was observed in 32 percent of the workers studied, and 78 percent of these workers showed depression of vestibular receptors.

The material may produce peroxisome proliferation. Peroxisomes are single, membrane limited, cytoplasmic organelles that are found in the cells of animals, plants, fungi and protozoa. Peroxisome proliferators include certain hypolipidaemic drugs, phthalate ester plasticisers, industrial solvents, herbicides, food flavours, leukotriene D4 antagonists and hormones. Numerous studies in rats and mice have demonstrated the hepatocarcinogenic effects of peroxisome proliferators, and these compounds have been unequivocally established as carcinogens. However it is generally conceded that compounds inducing proliferation in rats and mice have little, if any, effect on human liver except at very high doses or extreme conditions of exposure.

The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

Transitional Phthalate Esters: produced from alcohols with straight-chain carbon backbones of C4 to C6. This subcategory also includes a phthalate produced from benzyl alcohol as one ester group with the second ester composed of an alkyl group with a C5 carbon backbone and butyrate group. Phthalate esters containing >10% C4 to C6 molecules were conservatively included in this subcategory. Branched C7 and C8 isomers (di-iso-heptyl, di-iso-octyl and diethylhexyl phthalates) in contrast to linear dihexyl and dioctyl phthalate are members of this family.

Transitional phthalates have varied uses, but are largely used as plasticisers for PVC. Physicochemical properties also vary in that the lower molecular weight transitional phthalates are more water-soluble than higher molecular weight transitional phthalates, but none would be characterised as highly water soluble. Transitional phthalates have lower water solubility than the low molecular weight phthalates and except for butylbenzyl phthalate (BBP), existing data suggest they do not exhibit acute or chronic aquatic toxicity. What distinguishes some of the transitional phthalates from others is their greater mammalian toxicity potential, particularly with regard to reproductive and developmental effects, compared to either the low or high molecular weight phthalate subcategories

Acute Toxicity. The available data on phthalates spanning the carbon range from C4 to C6 indicate that phthalate esters in the transitional subcategory are minimally toxic by acute oral and dermal administration. The oral LD50 value for BBP exceeds 2 g/ kg, and for materials with higher molecular weights, the LD50 values exceed the maximum amounts which can be administered to the animals in a manner consistent with the principles of responsible animal use.

One member of this subcategory, diethylhexyl phthalate (DEHP), has been tested for acute inhalation toxicity. It did not cause an effect at the highest concentration tested. Further, considering the low volatility of these substances, inhalation exposure at toxicologically significant levels is not anticipated.

Repeated Dose Toxicity. Several substances in the C4 to C6 range, including BBP, have been tested for repeated dose toxicity in studies ranging from 3 weeks to 2 years . The principal effects found in these studies were those associated with peroxisome proliferation including liver enlargement and induction of peroxisomal enzymes. As shown in a comparative study of liver effects, the strongest inducers of peroxisome proliferation are diisononyl phthalate (DINP) and di-iso-decyl phthalate (DIDP) with substances of shorter chain length (e.g., BBP) showing much less pronounced effects. Thus it is reasonable to conclude that other members of this subcategory would show effects similar to BBP and less pronounced than DINP or DIDP. It should also be noted that the relevance of these findings to human health is, at best, questionable. It has been shown that these effects are mediated through the peroxisome proliferation-activated receptor alpha (PPARa) and that levels of PPARa are much higher in rodents than they are in humans. Thus one would expect humans to be substantially less responsive than rodents to peroxisome proliferating agents. Empirical evidence that this is true is provided by studies in primates in which repeated administration of DINP had no effects on liver, kidney or testicular parameters.

Several of the substances in the transitional phthalate esters subcategory, however, have been shown to produce testicular atrophy when given to juvenile rats at high levels. Testicular atrophy has been associated with BBP and other substances with C4 to C6 linear carbon chains. However, molecules with fewer than 4 or more than 6 carbons did not produce testicular atrophy in these studies.

Although the relevance of these data are uncertain, as the testes is not a target organ for diethylhexyl phthalate (DEHP) in primates, these data do provide one of the distinguishing toxicological characteristics of this subcategory and are one of the underlying reasons supporting the differentiation of phthalate esters on the basis of length of the linear region of the carbon chain.
Genetic Toxicity (Salmonella). A number of the substances in this subcategory including the reference substance BBP has been assessed in the Salmonella and mouse lymphoma assays. All of these substances were inactive in these assays.
Chromosomal Aberrations. BBP and dihexyl phthalate (DHP) were inactive in micronucleus assays in mice. DEHP was inactive in a cytogenetics assay in rat bone marrow. Diisoheptyl phthalate was inactive in CHO cells, in vitro..
Reproductive toxicity: A series of studies assessed the structure-activity relationship of the effects of phthalate esters on fertility using a continuous breeding protocol . The test substances included in these studies were diethyl-, dipropyl-, dibutyl-, dipentyl-, d-n-hexyl-, di-2(ethylhexyl)-, and di-n-octyl phthalates. The most profound effects were on fertility (i.e., number of females delivering/ number mated) and number of live births. The substance showing the greatest activity was DEHP which produced effects at dietary levels of 0.1 % with a no effect level of 0.01 %. The next most active compounds were di-n-hexyl- and di-n-pentyl phthalate which showed effects in the range of 0.3 to 0.5 %; no effect levels were not experimentally defined. Dipropyl phthalate had an effect on live birth index at 2.5 % but produced no effects at 1.25 %. Diethyl phthalate and di-n-octyl phthalate were inactive at the highest levels tested, 2.5 % and 5.0 %, respectively. These data demonstrated that molecules with linear alkyl chains of 4 to 6 carbons profoundly affect fertility in rodents, with DEHP being the most active. Molecules with longer or shorter side chains are essentially inactive in these assays. These data were also a basis for the separation of phthalates into three categories based on length of side chain.
In addition to these data there are reproductive toxicity studies on BBP and DEHP .
A 2-generation reproductive study was conducted in rats in which BBP was administered via the diet. Parental effects were limited to changes in body weight, weight gain, and increased absolute and relative liver weights. In the F1 parents, treatment with BBP affected mating and fertility indices and sperm number and motility. The F1 male offspring exhibited shortened anogenital distance, delayed acquisition of puberty and retention of nipples and areolae as well as reproductive effects. The NOAEL of the study was reported to be 3750 mg/ kg for reproductive effects. However, for male F1 and F2 offspring, the NOEL for reproductive effects was reported to be 50 mg/ kg based on reductions in anogenital distance. These studies along with previous data provide a good basis to assess the reproductive effects of C4 to C6 phthalate esters. Although several substances (diheptyl, heptyl nonyl, heptyl undecyl) have ester side chain constituents that predominately fall in the high molecular weight subcategory, these substances are conservatively assumed to exhibit reproductive effects similar to other transitional phthalates .
Developmental toxicity: There have been extensive studies of the developmental toxicity of BBP and DEHP. These substances produce structural malformations and also affect male reproductive development. No effect levels are in the range of 50 to 300 mg/ kg bw/ day. There is also an unpublished developmental toxicity study of di-isoheptyl phthalate (DIHP). The results of these studies are broadly consistent with the structure-activity relationships previously described, i.e., that phthalate esters with linear carbon chains of C4 to C6 carbons produce much more profound effects that either shorter or longer molecules.
Phthalate esters with >10% C4 to C6 isomers were conservatively placed in the transitional subcategory. This conclusion is supported by developmental test data on "711P*" (which showed structural malformations in rats at 1000 mg/ kg/ day with a NOAEL of 200 mg/ kg/ day ."711P" is an equal composition mixture of six phthalate esters consisting of linear and methyl-branched C7, C9, and C11 ester side chains. This test substance is considered by EPA under the following CAS Numbers.: 68515-44-6 (di C7), 68515-45-7 (di C9), 3648-20-2 (di C1 I), 111381-89-6 (C7, C9), 111381-90-9 (C7, C11), and 111381-91-0 (C9, C11). The overall content of C4 to C6 isomers in "71 1P" is approximately 10%, based on the contribution from methyl-branched C7 isomers e.g., di C7 (30% C4-C6); C7, C9 (15% C4-C6); and C7, C11 (15 % C4-C6). Test data on 711P were used selectively as read-across data to the C7-containing substances in the mixture, based on the C4 to C6 content of each substance in the mixture.
NOTE: Substance has been shown to be mutagenic in at least one assay, or belongs to a family of chemicals producing damage or change to cellular DNA.

The substance is classified by IARC as Group 3:

NOT classifiable as to its carcinogenicity to humans.
Evidence of carcinogenicity may be inadequate or limited in animal testing.
Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen
[National Toxicology Program: U.S. Dep. of Health & Human Services 2002].
Oral (rat) NOAEL: 28.9-36.1 mg/kg/day
Gastrointestinal changes, respiratory system changes, somnolence, haemorrhage, necrotic changes in GI tract, lowered blood pressure, liver, endocrine tumours, foetotoxicity, paternal effects, maternal effects, specific developmental abnormalities (hepatobiliary system, musculoskeletal system, cardiovascular system, urogenital system, central nervous system, eye/ear), foetolethality recorded.

CARCINOGEN

Di(2-ethylhexyl) phthalate (NB: Overall evaluation downgraded to Group 3 with supporting evidence from other relevant data)	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3
Bis(2-ethylhexyl) phthalate (see Di(2-ethylhexyl) phthalate)	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	
Di (2-ethylhexyl)phthalate (DEHP)	US EPA Carcinogens Listing	Carcinogenicity	B2
Di (2-ethylhexyl)phthalate (DEHP)	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	B2
Di(2-ethylhexyl)phthalate [DEHP]	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A3
di-sec-octyl phthalate	US - Rhode Island Hazardous Substance List	IARC	

BIS(2-ETHYLHEXYL)PHTHALATE	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65
BIS(2-ETHYLHEXYL)PHTHALATE	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65
BROMINE COMPOUNDS (ORGANIC OR INORGANIC)	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65-MC
Diethylhexylphthalate	US Air Toxics Hot Spots TSD for Describing Available Cancer Potency Factors	IARC Class	2B
Di(2-ethylhexyl)phthalate [DEHP]	US NIOSH Recommended Exposure Limits (RELs) - Carcinogens	Carcinogen	Ca
di-sec-octyl phthalate	US - Maine Chemicals of High Concern List	Carcinogen	B2
TWAPPM~	US - Maine Chemicals of High Concern List	Carcinogen	A3
PBIT_(PERS~	US - Maine Chemicals of High Concern List	Carcinogen	CA Prop 65; IRIS; NTP 11th ROC

SKIN

di-sec-octyl phthalate	Canada - British Columbia Occupational Exposure Limits - Skin	Notation	Skin
di-sec-octyl phthalate	Canada - Alberta Occupational Exposure Limits - Skin	Substance Interaction	1

Section 12 - ECOLOGICAL INFORMATION

May cause long-term adverse effects in the environment.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
di-sec-octyl phthalate	LOW	LOW	LOW	LOW

GESAMP/EHS COMPOSITE LIST - GESAMP Hazard Profiles

Name / EHS TRN A1a A1b A1 A2 B1 B2 C1 C2 C3 D1 D2 D3 E1 E2 E3 Cas No / RTECS No _____ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ Di- (2- 642 275 0 4 R 0 0 0 0 1 1 1 R Fp 3 ethylhexy 1 l) phthalate / CAS:117- 81- 7 /

Legend: EHS=EHS Number (EHS=GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships) NRT=Net Register Tonnage, A1a=Bioaccumulation log Pow, A1b=Bioaccumulation BCF, A1=Bioaccumulation, A2=Biodegradation, B1=Acuteaquatic toxicity LC/ECIC50 (mg/l), B2=Chronic aquatic toxicity NOEC (mg/l), C1=Acute mammalian oral toxicity LD50 (mg/kg), C2=Acutemammalian dermal toxicity LD50 (mg/kg), C3=Acute mammalian inhalation toxicity LC50 (mg/kg), D1=Skin irritation & corrosion, D2=Eye irritation& corrosion, D3=Long-term health effects, E1=Tainting, E2=Physical effects on wildlife & benthic habitats, E3=Interference with coastal amenities, For column A2: R=Readily biodegradable, NR=Not readily biodegradable. For column D3: C=Carcinogen, M=Mutagenic, R=Reprotoxic, S=Sensitising, A=Aspiration hazard, T=Target organ systemic toxicity, L=Lunginjury, N=Neurotoxic, I=Immunotoxic. For column E1: NT=Not tainting (tested), T=Tainting test positive. For column E2: Fp=Persistent floater, F=Floater, S=Sinking substances. The numerical scales start from 0 (no hazard), while higher numbers reflect increasing hazard. (GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships)

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

B. Component Waste Numbers

When di-sec-octyl phthalate is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U028 (waste code T).

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.
¦ Puncture containers to prevent re-use and bury at an authorized landfill.
Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
A Hierarchy of Controls seems to be common - the user should investigate:
· Reduction
· Reuse
· Recycling
· Disposal (if all else fails)
This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.
DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.
· Recycle wherever possible or consult manufacturer for recycling options.
· Consult Waste Management Authority for disposal.

Section 14 - TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IATA, IMDG

Section 15 - REGULATORY INFORMATION

di-sec-octyl phthalate (CAS: 117-81-7) is found on the following regulatory lists;

"Canada - Northwest Territories Occupational Exposure Limits (English)","Canada - Nova Scotia Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens","Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)","Canada - Saskatchewan Industrial Hazardous Substances","Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits","Canada - Saskatchewan Occupational Health and Safety Regulations - Designated Chemical Substances","Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances","Canada ARET (Accelerated Reduction / Elimination of Toxics) Substance List","Canada Environmental Protection Act (CEPA) 1999 - Schedule 1 Toxic Substances List","Canada Environmental Quality Guidelines (EQGs) Water: Aquatic life","Canada Ingredient Disclosure List (SOR/88-64)","Canada Priority Substances List (PSL1, PSL 2)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk","International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs","International Fragrance Association (IFRA) Survey: Transparency List","OECD Representative List of High Production Volume (HPV) Chemicals","OSPAR List of Chemicals for Priority Action","OSPAR List of Substances of Possible Concern","US - Alaska Limits for Air Contaminants","US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","US - California Permissible Exposure Limits for Chemical Contaminants","US - California Proposition 65 - No Significant Risk Levels (NSRLs) for Carcinogens","US - California Proposition 65 - Priority List for the Development of MADLs for Chemicals Causing Reproductive Toxicity","US - California Toxic Air Contaminant List Category II","US - California Toys and Childcare Articles - Phthalate Prohibitions","US - Connecticut Hazardous Air Pollutants","US - Hawaii Air Contaminant Limits","US - Idaho - Limits for Air Contaminants","US - Massachusetts Oil & Hazardous Material List","US - Michigan Exposure Limits for Air Contaminants","US - Minnesota Hazardous Substance List","US - Minnesota Permissible Exposure Limits (PELs)","US - New Jersey Right to Know Hazardous Substances","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Texas Drinking Water Standards - Maximum Contaminant Levels (MCLs) for synthetic organic contaminants","US - Vermont Hazardous Constituents","US - Vermont Hazardous wastes which are Discarded Commercial Chemical Products or Off-Specification Batches of Commercial Chemical Products or Spill Residues of Either","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US - Washington Class A toxic air pollutants: Known and Probable Carcinogens","US - Washington Dangerous waste constituents list","US - Washington Discarded Chemical Products List - ""U"" Chemical Products","US - Washington Permissible exposure limits of air contaminants","US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants","US ACGIH Threshold Limit Values (TLV)","US ACGIH Threshold Limit Values (TLV) - Carcinogens","US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)","US CERCLA Priority List of Hazardous Substances","US Clean Air Act - Hazardous Air Pollutants","US CWA (Clean Water Act) - Priority Pollutants","US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides","US DOE Temporary Emergency Exposure Limits (TEELs)","US DOT Coast Guard Bulk Hazardous Materials - List of Flammable and Combustible Bulk Liquid Cargoes","US EPA Carcinogens Listing","US EPA High Production Volume Program Chemical List","US EPA Master Testing List - Index I Chemicals Listed","US EPA National Priorities List - Superfund Chemical Data Matrix (SCDM) - Hazard Ranking System - Hazardous Substance Benchmarks","US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act","US National Toxicology Program (NTP) 11th Report Part B. Reasonably Anticipated to be a Human Carcinogen","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US RCRA (Resource Conservation & Recovery Act) - Appendix IX to Part 264 Ground-Water Monitoring List 1","US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261","US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Inorganic and Organic Constituents 1","US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory","US TSCA Section 4 - Chemicals Subject to Testing Consent Orders","US TSCA Section 4/12 (b) - Sunset Date/Status","WHO Guidelines for Drinking-water Quality - Guideline values for chemicals that are of health

significance in drinking-water"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

■ Ingestion may produce health damage*.
■ Cumulative effects may result following exposure*.
* (limited evidence).

Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Print Date:Jun-4-2011

SAFETY DATA SHEET

Version 4.10
Revision Date 07/09/2015
Print Date 02/23/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Ethyl Alcohol, pure
Product Number	:	459836
Brand	:	Sigma-Aldrich
Index-No.	:	603-002-00-5
CAS-No.	:	64-17-5

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Eye irritation (Category 2A), H319

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.
H319	Causes serious eye 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): 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.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
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	:	Absolute alcohol
Formula	:	C_2H_6O
Molecular weight	:	46.07 g/mol
CAS-No.	:	64-17-5
EC-No.	:	200-578-6
Index-No.	:	603-002-00-5

Hazardous components

Component	Classification	Concentration
Ethanol		
	Flam. Liq. 2; Eye Irrit. 2A; H225, H319	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
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
Carbon oxides

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.

Hygroscopic.
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
Ethanol	64-17-5	TWA	1,000.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Confirmed animal carcinogen with unknown relevance to humans		
		TWA	1,000 ppm 1,900 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	1,000 ppm 1,900 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	1,000.000000 ppm 1,900.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

		TWA	1,000.000000 ppm 1,900.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		STEL	1,000.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Confirmed animal carcinogen with unknown relevance to humans		

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: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 480 min
Material tested:Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.2 mm
Break through time: 38 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
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 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, clear Colour: colourless
b)	Odour	No data available

c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -114 °C (-173 °F)
f)	Initial boiling point and boiling range	78 °C (172 °F)
g)	Flash point	14.0 °C (57.2 °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: 19 %(V) Lower explosion limit: 3.3 %(V)
k)	Vapour pressure	59.5 hPa (44.6 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.789 g/mL at 25 °C (77 °F)
n)	Water solubility	completely soluble
o)	Partition coefficient: n-octanol/water	log Pow: -0.349 at 24 °C (75 °F)
p)	Auto-ignition temperature	363.0 °C (685.4 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Alkali metals, Oxidizing agents, Peroxides

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 - 10,470 mg/kg

LC50 Inhalation - Rat - 4 h - 30,000 mg/l

LD50 Dermal - Rabbit - 15,800 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 24 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Moderate eye irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

Carcinogenicity - Mouse - Oral
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Liver:Tumors. Blood:Lymphomas including Hodgkin's disease.

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

Reproductive toxicity - Human - female - Oral
Effects on Newborn: Apgar score (human only). Effects on Newborn: Other neonatal measures or effects. Effects on Newborn: Drug dependence.

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: KQ6300000

Central nervous system depression, narcosis, Damage to the heart., 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	LC50 - Pimephales promelas (fathead minnow) - 14,200 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	LC50 - Ceriodaphnia dubia (water flea) - 5,012 mg/l - 48 h

	NOEC - Daphnia magna (Water flea) - 9.6 mg/l - 9 d
Toxicity to algae	EC50 - Chlorella vulgaris (Fresh water algae) - 275 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability Result: 95 % - Readily biodegradable

12.3 Bioaccumulative potential

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

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: 1170 Class: 3 Packing group: II
Proper shipping name: Ethanol
Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG

UN number: 1170 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ETHANOL

IATA

UN number: 1170 Class: 3 Packing group: II
Proper shipping name: Ethanol

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

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Ethanol	64-17-5	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date

Ethanol	64-17-5	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Ethanol	64-17-5	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.

Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H319	Causes serious eye 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

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: 4.10 Revision Date: 07/09/2015 Print Date: 02/23/2016

SAFETY DATA SHEET

Version 3.12
Revision Date 02/26/2015
Print Date 04/30/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Ethyl acetate
Product Number	:	154857
Brand	:	Sigma-Aldrich
Index-No.	:	607-022-00-5
CAS-No.	:	141-78-6

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

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.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.

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.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
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.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

Repeated exposure may cause skin dryness or cracking.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_4H_8O_2$
Molecular weight	:	88.11 g/mol
CAS-No.	:	141-78-6
EC-No.	:	205-500-4
Index-No.	:	607-022-00-5
Registration number	:	01-2119475103-46-XXXX

Hazardous components

Component	Classification	Concentration
Ethyl acetate		
	Flam. Liq. 2; ; Eye Irrit. 2A; STOT SE 3; H225,, H319, H336	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
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
Carbon oxides

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
Ethyl acetate	141-78-6	TWA	400.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Eye irritation		

		TWA	400.000000 ppm 1,400.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	400.000000 ppm 1,400.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

Derived No Effect Level (DNEL)

Application Area	Exposure routes	Health effect	Value
Workers	Inhalation	Acute systemic effects	1468 mg/m3
Workers	Inhalation	Acute local effects	1468 mg/m3
Workers	Skin contact	Long-term systemic effects	63mg/kg BW/d
Workers	Inhalation	Long-term systemic effects	734 mg/m3
Workers	Inhalation	Long-term local effects	734 mg/m3
Consumers	Inhalation	Acute local effects, Acute systemic effects	734 mg/m3
Consumers	Skin contact	Long-term systemic effects	37mg/kg BW/d
Consumers	Inhalation	Long-term systemic effects	367 mg/m3
Consumers	Ingestion	Long-term systemic effects	4.5mg/kg BW/d
Consumers	Inhalation	Long-term local effects	367 mg/m3

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	0.24 mg/kg
Marine water	0.026 mg/l
Fresh water	0.26 mg/l
Marine sediment	0.125 mg/kg
Fresh water sediment	1.25 mg/kg

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: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 113 min
Material tested:Butoject® (KCL 897 / Aldrich Z677647, 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 ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: clear, liquid Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-84.0 °C (-119.2 °F)
f)	Initial boiling point and boiling range	76.5 - 77.5 °C (169.7 - 171.5 °F) - lit.
g)	Flash point	-2.99 °C (26.62 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	May form explosive dust-air mixture.
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 11.5 %(V) Lower explosion limit: 2.2 %(V)
k)	Vapour pressure	97.3 hPa (73.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.90 g/cm3 at 20 °C (68 °F)
n)	Water solubility	soluble
o)	Partition coefficient: n-octanol/water	log Pow: 0.73
p)	Auto-ignition temperature	427.0 °C (800.6 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	24.0 mN/m at 20.0 °C (68.0 °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
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 5,620 mg/kg

LC50 Inhalation - Mouse - 2 h - 45,000 mg/m3

LD50 Dermal - Rabbit - > 18,000 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

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.

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: AH5425000

Inhalation of high concentrations may cause:, Headache, Drowsiness, Dizziness, Vomiting, narcosis, anemia, Central nervous system depression

Kidney - Irregularities - Based on Human Evidence
Kidney - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 350.00 - 600.00 mg/l - 96 h
	LC50 - Pimephales promelas (fathead minnow) - 220.00 - 250.00 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 2,300.00 - 3,090.00 mg/l - 24 h
	LC50 - Daphnia magna (Water flea) - 560 mg/l - 48 h
Toxicity to algae	EC50 - Algae - 4,300.00 mg/l - 24 h
	EC50 - SELENASTRUM - 1,800.00 - 3,200.00 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability	Result: 79 % - Readily biodegradable (OECD Test Guideline 301D)

12.3 Bioaccumulative potential

Bioaccumulation	- 3 d
	Bioconcentration factor (BCF): 30

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: 1173 Class: 3 Packing group: II
Proper shipping name: Ethyl acetate
Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1173 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ETHYL ACETATE

IATA
UN number: 1173 Class: 3 Packing group: II
Proper shipping name: Ethyl acetate

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
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Ethyl acetate	141-78-6	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Ethyl acetate	141-78-6	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Ethyl acetate	141-78-6	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

	Combustible dust
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
STOT SE	Specific target organ toxicity - single exposure

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

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: 3.12 Revision Date: 02/26/2015 Print Date: 04/30/2016

Safety Data Sheet

Material Name: ETHYL BENZENE **SDS ID: MAT08780**

Section 1 - PRODUCT AND COMPANY IDENTIFICATION

Material Name
ETHYL BENZENE
Synonyms
MTG MSDS 185; EB; PHENYLETHANE; ETHYLBENZENE; ETHYLBENZOL; ALPHA-METHYLTOLUENE; UN 1175; C8H10
Chemical Family
Hydrocarbons, aromatic
Product Use
industrial.
Restrictions on Use
None known.
Details of the supplier of the safety data sheet
MATHESON TRI-GAS, INC.
150 Allen Road, Suite 302
Basking Ridge, NJ 07920
General Information: 1-800-416-2505
Emergency #: 1-800-424-9300 (CHEMTREC)
Outside the US: 703-527-3887 (Call collect)

Section 2 - HAZARDS IDENTIFICATION

Classification in accordance with paragraph (d) of 29 CFR 1910.1200.
Flammable Liquids - Category 2
Aspiration Hazard - Category 1
Acute Toxicity - Inhalation - Dust/Mist - Category 4
Acute Toxicity - Inhalation - Vapor - Category 4
Skin Corrosion/Irritation - Category 2
Serious Eye Damage/Eye Irritation - Category 2A
Carcinogenicity - Category 2
Reproductive Toxicity - Category 1B
Specific target organ toxicity - Single exposure - Category 2
Specific target organ toxicity - Single exposure - Category 3
Specific Target Organ Toxicity - Repeated Exposure - Category 2 (ears , Ears)
Hazardous to the Aquatic Environment - Acute - Category 2
Hazardous to the Aquatic Environment - Chronic - Category 2
GHS Label Elements
Symbol(s)

Signal Word
Danger
Hazard Statement(s)

Highly flammable liquid and vapor.
Harmful if inhaled.
Causes skin irritation.
Causes serious eye irritation.
Suspected of causing cancer.
May damage fertility or the unborn child.
May cause damage to organs. (central nervous system)
May cause respiratory irritation.
May be fatal if swallowed and enters airways.
Toxic to aquatic life.

Precautionary Statement(s)

Prevention

Keep away from heat, sparks, open flame, and 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.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Use Personal Protective equipment as required.
Do not breathe vapor or mist.
Use only outdoors or in a well-ventilated area.
Wear protective gloves and eye/face protection.
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 media appropriate 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.
Wash contaminated clothing 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 in a well-ventilated place.
Keep cool.
Keep container tightly closed.
Store locked up.

Disposal

Dispose in accordance with all applicable regulations.

Statement(s) of Unknown Acute Toxicity

Inhalation 0% of the mixture consists of ingredient(s) of unknown acute toxicity.

Statement(s) of Unknown Aquatic Toxicity
0% of the mixture consists of ingredient(s) of unknown acute aquatic toxicity.
0% of the mixture consists of ingredient(s) of unknown chronic aquatic toxicity.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Component Name	Percent
100-41-4	ETHYL BENZENE	100

Section 4 - FIRST AID MEASURES

Inhalation
If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.
Skin
Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.
Eyes
Flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Then get immediate medical attention.
Ingestion
aspiration hazard. Do NOT induce vomiting. When vomiting occurs, keep head lower than hips to help prevent aspiration. Get medical attention immediately. Give artificial respiration if not breathing.
Most Important Symptoms/Effects
Acute
respiratory tract irritation, skin irritation, eye irritation, central nervous system damage, lung damage (from aspiration)
Delayed
cancer, Reproductive Effects
Note to Physicians
For inhalation, consider oxygen.

Section 5 - FIRE FIGHTING MEASURES

Extinguishing Media
Suitable Extinguishing Media
regular dry chemical, carbon dioxide, water spray, regular foam, Large fires: Use water spray, fog or regular foam.
Unsuitable Extinguishing Media
Do not use high-pressure water streams.
Special Hazards Arising from the Chemical
Severe fire hazard. Vapor/air mixtures are explosive above flash point. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.
Hazardous Combustion Products
Oxides of carbon
Fire Fighting Measures
Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank,

rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Water may be ineffective.

Special Protective Equipment and Precautions for Firefighters

Wear full protective fire fighting gear including self contained breathing apparatus (SCBA) for protection against possible exposure.

Section 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

Wear personal protective clothing and equipment, see Section 8.

Methods and Materials for Containment and Cleaning Up

Avoid heat, flames, sparks and other sources of ignition. Eliminate all ignition sources if safe to do so. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if possible without personal risk. Prevent entry into waterways, sewers, basements, or confined areas. Reduce vapors with water spray. Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Dike for later disposal. Remove sources of ignition. Use water spray to reduce vapors or divert vapor cloud drift. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

Environmental Precautions

Avoid release to the environment.

Section 7 - HANDLING AND STORAGE

Precautions for Safe Handling

Keep away from heat, sparks, open flame, and 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 discharges. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use Personal Protective equipment as required. Do not breathe vapor or mist. Use only outdoors or in a well-ventilated area. Wear protective gloves/eye protection/face protection. Wash hands thoroughly after handling. Do not eat, drink, or smoke when using this product. Avoid release to the environment.

Conditions for Safe Storage, Including any Incompatibilities

Store in a well-ventilated place.
Keep cool.
Keep container tightly closed.
Store locked up.
Store and handle in accordance with all current regulations and standards. Store in a well-ventilated area. Keep cool. Keep container tightly closed. Keep locked up. Grounding and bonding required. Keep separated from incompatible substances. Protect from physical damage. Store outside or in a detached building. Store with flammable liquids. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106.

Incompatible Materials

Acids, bases, oxidizing materials, combustible materials

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Component Exposure Limits

ETHYL BENZENE	**100-41-4**

ACGIH:	20 ppm TWA
NIOSH:	100 ppm TWA ; 435 mg/m3 TWA
	125 ppm STEL ; 545 mg/m3 STEL
	800 ppm IDLH (10% LEL)
Europe:	100 ppm TWA ; 442 mg/m3 TWA
	Possibility of significant uptake through the skin
	200 ppm STEL ; 884 mg/m3 STEL
OSHA (US):	100 ppm TWA ; 435 mg/m3 TWA
Mexico:	100 ppm TWA VLE-PPT ; 435 mg/m3 TWA VLE-PPT
	125 ppm STEL [PPT-CT]; 545 mg/m3 STEL [PPT-CT]

ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)
ETHYL BENZENE (100-41-4)
0.15 g/g creatinine Medium: urine Time: end of shift Parameter: Sum of mandelic acid and phenylglyoxylic acid (nonspecific)

Engineering Controls
Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Individual Protection Measures, such as Personal Protective Equipment

Eye/face protection
Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin Protection
Wear appropriate chemical resistant clothing.

Respiratory Protection
The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA. 800 ppm. Any air-purifying half-mask respirator equipped with organic vapor cartridge(s). Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister. Any powered, air-purifying respirator with organic vapor cartridge(s). Any supplied-air respirator. Any self-contained breathing apparatus with a full facepiece. Emergency or planned entry into unknown concentrations or IDLH conditions -. Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode. Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode. Escape -. Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister. Any appropriate escape-type, self-contained breathing apparatus. Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode. Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Glove Recommendations
Wear appropriate chemical resistant gloves.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Clear, colorless liquid	**Physical State**	liquid
Odor	aromatic odor	**Color**	colorless
Odor Threshold	140 ppm	**pH**	Not available
Melting Point	-95 °C (-139 °F)	**Boiling Point**	136 °C (277 °F)
Boiling Point Range	Not available	**Freezing point**	Not available
Evaporation Rate	<1 (Butyl acetate = 1)	**Flammability (solid, gas)**	Not available
Autoignition Temperature	432 °C (810 °F)	**Flash Point**	15 °C Closed Cup (59 °F)
Lower Explosive Limit	0.8 %	**Decomposition temperature**	Not available
Upper Explosive Limit	6.7 %	**Vapor Pressure**	7.1 mmHg @ 20 °C
Vapor Density (air=1)	3.66	**Specific Gravity (water=1)**	0.867
Water Solubility	0.015 %	**Partition coefficient: n-octanol/water**	154170.05
Viscosity	0.64 cp	**Kinematic viscosity**	Not available
Solubility (Other)	Not available	**Bioconcentration Factor (BCF)**	36.39
Density	Not available	**Henry's Law Constant**	0.00788 atm-m3/mole
KOC	520 (Estimated)	**Physical Form**	liquid
Volatility	100 %	**Molecular Formula**	C-H3-C-H2-C6-H5
Molecular Weight	106.17	**OSHA Flammability Class**	IB

Solvent Solubility
Soluble
alcohol, ether, Benzene, sulfur dioxide, carbon tetrachloride
Insoluble
ammonia

Section 10 - STABILITY AND REACTIVITY

Reactivity
No reactivity hazard is expected.
Chemical Stability
Stable at normal temperatures and pressure.

Possibility of Hazardous Reactions
Will not polymerize.
Conditions to Avoid
Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.
Incompatible Materials
Acids, bases, oxidizing materials, combustible materials
Hazardous decomposition products
Oxides of carbon

Section 11 - TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure
Inhalation
irritation (possibly severe), chest pain, difficulty breathing, emotional disturbances, headache, drowsiness, dizziness, loss of coordination, coma, cancer
Skin Contact
irritation
Eye Contact
irritation
Ingestion
nausea, vomiting, stomach pain, aspiration hazard
Acute and Chronic Toxicity
Component Analysis - LD50/LC50
The components of this material have been reviewed in various sources and the following selected endpoints are published:
ETHYL BENZENE (100-41-4)
Oral LD50 Rat 3500 mg/kg
Dermal LD50 Rabbit 15400 mg/kg
Inhalation LC50 Rat 17.4 mg/L 4 h
Product Toxicity Data
Acute Toxicity Estimate

Dermal	> 2000 mg/kg
Inhalation - Vapor	17.4 mg/L
Oral	> 2000 mg/kg

Immediate Effects
respiratory tract irritation, skin irritation, eye irritation, central nervous system damage, lung damage (from aspiration)
Delayed Effects
Reproductive Effects, cancer
Irritation/Corrosivity Data
respiratory tract irritation, skin irritation, eye irritation
Respiratory Sensitization
No data available.
Dermal Sensitization
No data available.
Component Carcinogenicity

ETHYL BENZENE	**100-41-4**
ACGIH:	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC:	Monograph 77 [2000] (Group 2B (possibly carcinogenic to humans))
DFG:	Category 4 (no significant contribution to human cancer)
OSHA:	Present

Germ Cell Mutagenicity
No data available.
Tumorigenic Data
No data available
Reproductive Toxicity
Available data characterizes components of this product as reproductive hazards.
Specific Target Organ Toxicity - Single Exposure
central nervous system, Respiratory system
Specific Target Organ Toxicity - Repeated Exposure
No target organs identified.
Aspiration hazard
This material is an aspiration hazard.
Medical Conditions Aggravated by Exposure
kidney disorders, liver disorders, respiratory disorders, skin disorders and allergies
Additional Data
May cross the placenta.

Section 12 - ECOLOGICAL INFORMATION

Ecotoxicity
Toxic to aquatic life.
Component Analysis - Aquatic Toxicity

ETHYL BENZENE	**100-41-4**
Fish:	LC50 96 h Oncorhynchus mykiss 11 - 18 mg/L [static]; LC50 96 h Oncorhynchus mykiss 4.2 mg/L [semi-static]; LC50 96 h Pimephales promelas 7.55 - 11 mg/L [flow-through]; LC50 96 h Lepomis macrochirus 32 mg/L [static]; LC50 96 h Pimephales promelas 9.1 - 15.6 mg/L [static]; LC50 96 h Poecilia reticulata 9.6 mg/L [static]
Algae:	EC50 72 h Pseudokirchneriella subcapitata 4.6 mg/L IUCLID ; EC50 96 h Pseudokirchneriella subcapitata >438 mg/L IUCLID ; EC50 72 h Pseudokirchneriella subcapitata 2.6 - 11.3 mg/L [static] EPA ; EC50 96 h Pseudokirchneriella subcapitata 1.7 - 7.6 mg/L [static] EPA
Invertebrate:	EC50 48 h Daphnia magna 1.8 - 2.4 mg/L IUCLID

Persistence and Degradability
Not expected to undergo hydrolysis in the environment.
Bioaccumulative Potential
Bioconcentration potential in aquatic organisms is low based on a BCF value of 15.
Mobility

Expected to have moderate mobility in soil.

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Methods
Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262.
Hazardous Waste Number(s): D001.
Component Waste Numbers
The U.S. EPA has not published waste numbers for this product's components.

Section 14 - TRANSPORT INFORMATION

US DOT Information:
Shipping Name: ETHYLBENZENE
Hazard Class: 3
UN/NA #: UN1175
Packing Group: II
Required Label(s): 3
Marine pollutant

IMDG Information:
Shipping Name: ETHYLBENZENE
Hazard Class: 3
UN#: UN1175
Packing Group: II
Required Label(s): 3
Marine pollutant
International Bulk Chemical Code
This material contains one or more of the following chemicals required by the IBC Code to be identified as dangerous chemicals in bulk.

ETHYL BENZENE	**100-41-4**
IBC Code:	Category Y

Section 15 - REGULATORY INFORMATION

U.S. Federal Regulations
This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

ETHYL BENZENE	**100-41-4**
SARA 313:	0.1 % de minimis concentration
CERCLA:	1000 lb final RQ ; 454 kg final RQ

SARA Section 311/312 (40 CFR 370 Subparts B and C) reporting categories
Flammable; Carcinogenicity; Acute toxicity; Reproductive Toxicity; Skin Corrosion/Irritation; Serious Eye Damage/Eye Irritation; Specific Target Organ Toxicity; Aspiration Hazard
U.S. State Regulations
The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
ETHYL BENZENE	**100-41-4**	Yes	Yes	Yes	Yes	Yes

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):
WARNING! This product contains a chemical known to the state of California to cause cancer

ETHYL BENZENE	**100-41-4**
Carc:	carcinogen , 6/11/2004

Canada Regulations
Canadian WHMIS Ingredient Disclosure List (IDL)
Components of this material have been checked against the Canadian WHMIS Ingredients Disclosure List. The List is composed of chemicals which must be identified on MSDSs if they are included in products which meet WHMIS criteria specified in the Controlled Products Regulations and are present above the threshold limits listed on the IDL

ETHYL BENZENE	**100-41-4**
	0.1 %

WHMIS Classification
B2
Component Analysis - Inventory
ETHYL BENZENE (100-41-4)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN - NCI (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Section 16 - OTHER INFORMATION

NFPA Ratings
Health: 2 Fire: 3 Reactivity: 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe
Summary of Changes
Updated: 05/01/2015
Key / Legend
ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CA/MA/MN/NJ/PA - California/Massachusetts/Minnesota/New Jersey/Pennsylvania*; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CFR - Code of Federal Regulations (US); CLP - Classification, Labelling, and Packaging; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSD - Dangerous Substance Directive; DSL - Domestic Substances List; EC – European Commission; EEC - European Economic Community; EIN - European Inventory of (Existing Commercial Chemical Substances); EINECS - European Inventory of Existing Commercial Chemical Substances; ENCS - Japan Existing and New Chemical Substance Inventory; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research

on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; ISHL - Japan Industrial Safety and Health Law; IUCLID - International Uniform Chemical Information Database; JP - Japan; Kow - Octanol/water partition coefficient; KR KECI Annex 1 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR KECI Annex 2 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL) , KR - Korea; LD50/LC50 - Lethal Dose/ Lethal Concentration; LEL - Lower Explosive Limit; LLV - Level Limit Value; LOLI - List Of LIsts™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; MX – Mexico; NDSL – Non-Domestic Substance List (Canada); NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PEL- Permissible Exposure Limit; PH - Philippines; RCRA - Resource Conservation and Recovery Act; REACH- Registration, Evaluation, Authorisation, and restriction of Chemicals; RID - European Rail Transport; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TCCA – Korea Toxic Chemicals Control Act; TDG - Transportation of Dangerous Goods; TLV - Threshold Limit Value; TSCA - Toxic Substances Control Act; TW – Taiwan; TWA - Time Weighted Average; UEL - Upper Explosive Limit; UN/NA - United Nations /North American; US - United States; VLE - Exposure Limit Value (Mexico); VN NCI (Draft) - Vietnam National Chemicals Inventory (NCI) (Draft); WHMIS - Workplace Hazardous Materials Information System (Canada) .

Other Information

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SAFETY DATA SHEET

Ethyl Chloride

Section 1. Identification

GHS product identifier : Ethyl Chloride

Chemical name : chloroethane

Other means of identification : Ethane, chloro-; Ethyl chloride; Ethane, chloro- (chloroethane)

Product use : Synthetic/Analytical chemistry.

Synonym : Ethane, chloro-; Ethyl chloride; Ethane, chloro- (chloroethane)

SDS # : 001023

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
CARCINOGENICITY - Category 2
AQUATIC HAZARD (LONG-TERM) - Category 3

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.
Suspected of causing cancer.
Harmful to aquatic life with long lasting effects.

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.

Section 2. Hazards identification

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. Avoid release to the environment.

Response : IF exposed or concerned: Get medical attention. 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 : chloroethane

Other means of identification : Ethane, chloro-; Ethyl chloride; Ethane, chloro- (chloroethane)

CAS number/other identifiers

CAS number : 75-00-3

Product code : 001023

Ingredient name	%	CAS number
Ethyl chloride	100	75-00-3

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.

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 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.

Section 4. First aid measures

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 : 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. 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. 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. This material is harmful to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Section 5. Fire-fighting measures

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). Water polluting material. 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. 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 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. Avoid breathing gas. Avoid release to the environment. 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-

Section 7. Handling and storage

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
Ethyl chloride	**ACGIH TLV (United States, 3/2012).** **Absorbed through skin.** TWA: 264 mg/m³ 8 hours. TWA: 100 ppm 8 hours. **OSHA PEL (United States, 6/2010).** TWA: 2600 mg/m³ 8 hours. TWA: 1000 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 2600 mg/m³ 8 hours. TWA: 1000 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.

Section 8. Exposure controls/personal protection

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 gas]

Color : Colorless.

Molecular weight : 64.52 g/mole

Molecular formula : C2-H5-Cl

Boiling/condensation point : 12.3°C (54.1°F)

Melting/freezing point : -138.7°C (-217.7°F)

Critical temperature : 187.25°C (369.1°F)

Odor : Characteristic. Ether-like.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: -50°C (-58°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, heat and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 3.16%
Upper: 15%

Vapor pressure : 5.6 psi

Vapor density : 2.22 (Air = 1)

Specific Volume (ft ^{3}/lb) : 6.0241

Section 9. Physical and chemical properties

Gas Density (lb/ft ^{3})	:	0.166
Relative density	:	Not applicable.
Solubility	:	Not available.
Solubility in water	:	5.74 g/l
Partition coefficient: n-octanol/water	:	1.43
Auto-ignition temperature	:	519°C (966.2°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.

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.

Classification

Section 11. Toxicological information

Product/ingredient name	OSHA	IARC	NTP
Ethyl chloride	-	3	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : 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

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.

Section 11. Toxicological information

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

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Ethyl chloride	1.43	-	low

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	UN1037	UN1037	UN1037	UN1037	UN1037
UN proper shipping name	ETHYL CHLORIDE	ETHYL CHLORIDE	ETHYL CHLORIDE	ETHYL CHLORIDE	ETHYL CHLORIDE (CYLINDERS)
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. **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** B77, T50	**Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Road or Rail Index** Forbidden	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **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."

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: chloroethane

Clean Air Act (CAA) 112 regulated flammable substances: chloroethane

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Section 15. Regulatory information

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
Delayed (chronic) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Ethyl chloride	100	Yes.	Yes.	No.	No.	Yes.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	chloroethane	75-00-3	100
Supplier notification	chloroethane	75-00-3	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 cancer.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
chloroethane	Yes.	No.	Yes.	No.

Canada inventory : This material is listed or exempted.

International regulations

Section 15. Regulatory information

International lists : **Australia inventory (AICS)**: This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
Malaysia Inventory (EHS Register): 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.

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.)

Health	2
Flammability	4
Physical hazards	1

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Section 16. Other information

History

Date of printing : 5/18/2015.

Date of issue/Date of revision : 5/18/2015.

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 (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

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.

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE

Containing One or More of the Following Components in a Nitrogen Balance Gas:Oxygen, 0.0015-23.5%;Methane, 0.0005-2.5%;Carbon Monoxide, 0.0005-1.0%; Hydrogen Sulfide, 0.001-0.025%

SYNONYMS: Not Applicable
CHEMICAL FAMILY NAME: Not Applicable
FORMULA: Not Applicable
Document Number: 50018

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
SUPPLIER/MANUFACTURER'S NAME:	CALGAZ
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	1-410-228-6400
General MSDS Information	1-713/868-0440
Fax on Demand:	1-800/231-1366

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA		NIOSH	OTHER
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	ppm
Oxygen	7782-44-7	0.0015 - 23.5%	There are no specific exposure limits for Oxygen. Oxygen levels should be maintained above 19.5%.					
Methane	74-82-8	0.0005 - 2.5%	There are no specific exposure limits for Methane. Methane is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					
Hydrogen Sulfide	7783-06-4	0.001- 0.025 %	10 (NIC = 5)	15	10 (Vacated 1989 PEL)	20 (ceiling); 50 (ceiling, 10 min. peak once per 8-hour shift 15 (vacated 1989 PEL)	100	NIOSH REL: STEL = 10 (ceiling) 10 minutes DFG-MAKs: TWA = 10 PEAK = 2•MAK, 10 min., momentary value
Carbon Monoxide	630-08-0	0.0005 - 1.0%	25	NE	50 35 (Vacated 1989 PEL)	200 [ceiling] (Vacated 1989 PEL)	1200	NIOSH RELS: TWA = 35 STEL = 200 (ceiling) DFG MAKs: TWA = 30 PEAK = 2•MAK, 15 min., average value DFG MAK Pregnancy Risk Classification: B
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established. NIC = Notice of Intended Change See Section 16 for Definitions of Terms Used.
NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This gas mixture has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This gas mixture is a colorless gas which has a rotten-egg odor (due to the presence of Hydrogen Sulfide). The odor cannot be relied on as an adequate warning of the presence of this gas mixture, because olfactory fatigue occurs after over-exposure to Hydrogen Sulfide. Hydrogen Sulfide and Carbon Monoxide (another component of this gas mixture) are toxic to humans in relatively low concentrations. Over-exposure to this gas mixture can cause skin or eye irritation, nausea, dizziness, headaches, collapse, unconsciousness, coma, and death. Additionally, releases of this gas mixture may produce oxygen-deficient atmospheres (especially in small confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this gas mixture is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this gas mixture, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. A potential health hazard associated with this gas mixture is the potential of inhalation of Hydrogen Sulfide, a component of this gas mixture. Such over-exposures may occur if this gas mixture is used in a confined space or other poorly-ventilated area. Over-exposures to Hydrogen Sulfide can cause dizziness, headache, and nausea. Over-exposure to this gas could result in respiratory arrest, coma, or unconsciousness, due to the presence of Hydrogen Sulfide. Continuous inhalation of low concentrations of Hydrogen Sulfide may cause olfactory fatigue, so that the odor is no longer an effective warning of the presence of this gas. A summary of exposure concentrations and observed effects are as follows:

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM		
HEALTH HAZARD	(BLUE)	3
FLAMMABILITY HAZARD	(RED)	0
PHYSICAL HAZARD	(YELLOW)	0
PROTECTIVE EQUIPMENT		
EYES RESPIRATORY HANDS BODY		
See Section 8		

For Routine Industrial Use and Handling Applications

CONCENTRATION OF HYDROGEN SULFIDE	OBSERVED EFFECT
0.3-30 ppm	Odor is unpleasant.
50 ppm	Eye irritation. Dryness and irritation of nose, throat.
Slightly higher than 50 ppm	Irritation of the respiratory system.
100-150 ppm	Temporary loss of smell.
200-250 ppm	Headache, vomiting nausea. Prolonged exposure may lead to lung damage. Exposures of 4-8 hours can be fatal.
300-500	Swifter onset of symptoms. Death occurs in 1-4 hours.
500 ppm	Headache, excitement, staggering, and stomach ache after brief exposure. Death occurs within 0.5 - 1 hour of exposure.
> 600 ppm	Rapid onset of unconsciousness, coma, death.
> 1000 ppm	Immediate respiratory arrest.

NOTE: This gas mixture contains a maximum of 250 ppm Hydrogen Sulfide. The higher concentration values here are presented to delineate the complete health effects which have been observed for humans after exposure to Hydrogen Sulfide.

3. HAZARD IDENTIFICATION (continued)

Inhalation over-exposures to atmospheres containing more than the Threshold Limit Value of Carbon Monoxide (25 ppm), another component of this gas mixture, can result in serious health consequences. Carbon Monoxide is classified as a chemical asphyxiant, producing a toxic action by combining with the hemoglobin of the blood and replacing the available oxygen. Through this replacement, the body is deprived of the required oxygen, and asphyxiation occurs. Since the affinity of Carbon Monoxide for hemoglobin is about 200-300 times that of oxygen, only a small amount of Carbon Monoxide will cause a toxic reaction to occur. Carbon Monoxide exposures in excess of 50 ppm will produce symptoms of poisoning if breathed for a sufficiently long time. If this gas mixture is released in a small, poorly ventilated area (i.e. an enclosed or confined space), symptoms which may develop include the following:

CONCENTRATION OF CARBON MONOXIDE	OBSERVED EFFECT
All exposure levels:	Over-exposure to Carbon Monoxide can be indicated by the lips and fingernails turning bright red.
200 ppm:	Slight symptoms (i.e. headache) after several hours of exposure.
400 ppm:	Headache and discomfort experienced within 2-3 hours of exposure.
1,000 -2000 ppm:	Within 30 minutes, slight palpitations of the heart occurs. Within 1.5 hours, there is a tendency to stagger.
200-2500 ppm:	Within 2 hours, there is mental confusion, headaches, and nausea. Unconsciousness within 30 minutes.
>2500 ppm:	Potential for collapse and death before warning symptoms.

Additionally, if mixtures of this gas mixture contain less than 19.5% Oxygen and are released in a small, poorly ventilated area (i.e. an enclosed or confined space), an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The following effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN	OBSERVED EFFECT
12-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

SKIN and EYE CONTACT: Hydrogen Sulfide, a component of this gas mixture, may be irritating to the skin. Inflammation and irritation of the eyes can occur at very low airborne concentration of Hydrogen Sulfide (less than 10 ppm). Exposure over several hours may result in “gas eyes” or “sore eyes” with symptoms of scratchiness, irritation, tearing and burning. Above 50 ppm of Hydrogen Sulfide, there is an intense tearing, blurring of vision, and pain when looking at light. Over-exposed individuals may see rings around bright lights. Most symptoms disappear when exposure ceases. However, in serious cases, the eye can be permanently damaged.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this gas mixture, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. However the Hydrogen Sulfide and Carbon Monoxide components of this gas mixture are toxic to humans. Over-exposure to this gas mixture can cause nausea, dizziness, headaches, collapse, unconsciousness, coma, and death. Due to the presence of Hydrogen Sulfide, over-exposures to this gas mixture can also irritate the skin and eyes; severe eye contamination can result in blindness.

CHRONIC: Severe over-exposures to the Hydrogen Sulfide component of this gas mixture, which do not result in death, may cause long-term symptoms such as memory loss, paralysis of facial muscles, or nerve tissue damage. In serious cases of over-exposure, the eyes can be permanently damaged. Skin disorders and respiratory conditions may be aggravated by repeated over-exposures to this gas product. Refer to Section 11 (Toxicology Information) for additional information on the components of this gas mixture. Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system.

TARGET ORGANS: ACUTE: Respiratory system, blood system, central nervous system effects, cardiovascular system, skin, eyes. CHRONIC: Neurological system, reproductive system, eyes.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS GAS MIXTURE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn. Victim(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary.

SKIN EXPOSURE: If irritation of the skin develops after exposure to this gas mixture, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

EYE EXPOSURE: If irritation of the eye develops after exposure to this gas mixture, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Seek medical assistance immediately, preferably an ophthalmologist.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions may be aggravated by over-exposure to this gas mixture. Carbon Monoxide, a component of this gas mixture, can aggravate some diseases of the cardiovascular system, such as coronary artery disease and angina pectoris. Because of the presence of Hydrogen Sulfide, eye disorders or skin problems may be aggravated by over-exposure to this gas mixture.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure. Hyperbaric oxygen is the most efficient antidote to Carbon Monoxide poisoning, the optimum range being 2-2.5 atm. A special mask, or, preferably, a compression chamber to utilize oxygen at these pressures is required. Avoid administering stimulant drugs. Be observant for initial signs of pulmonary edema in the event of severe inhalation over-exposures.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

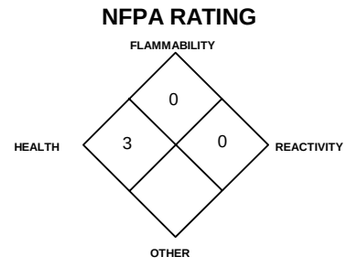
AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

NFPA RATING



FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture contains toxic gases, Hydrogen Sulfide and Carbon Monoxide, and presents an health hazard to firefighters. This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Not Sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this gas mixture presents significantly less risk of over-exposure to Hydrogen Sulfide and Carbon Monoxide, the toxic components of this gas mixture, and other safety hazards related to the remaining components of this gas mixture, than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel. For emergency disposal,

6. ACCIDENTAL RELEASE MEASURES (continued)

secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for Hydrogen Sulfide, Carbon Monoxide, and Oxygen. Hydrogen Sulfide and Carbon Monoxide level must be below exposure level listed in Section 2 (Composition and Information on Ingredients) and Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area. If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue, especially if work is done in a poorly ventilated area; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to olfactory fatigue or oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify cylinders containing a gas mixture with Hydrogen Sulfide or Carbon Monoxide. If there is a malfunction or another type of operational problem, contact nearest distributor immediately. Eye wash stations/safety showers should be near areas where this gas mixture is used or stored. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. All work practices should minimize releases of Hydrogen Sulfide and Carbon Monoxide-containing gas mixtures.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C (70°F). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If this gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Oxygen, Hydrogen Sulfide, and Carbon Monoxide.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if the levels of components exceeds exposure limits presented in Section 2 (Composition and Information of Ingredients) and Oxygen levels are below 19.5%, or unknown, during emergency response to a release of this gas mixture. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Oxygen levels below 19.16.33% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). The following NIOSH respiratory protection recommendations for Hydrogen Sulfide and Carbon Monoxide are provided for further information.

NIOSH/OSHA RECOMMENDATIONS FOR HYDROGEN SULFIDE CONCENTRATIONS IN AIR:

Up to 100 ppm:	Powered air-purifying respirator with cartridge(s) to protect against hydrogen sulfide; gas mask with canister to protect against hydrogen sulfide; or SAR; or full-facepiece SCBA.
Emergency or Planned Entry into Unknown Concentration or IDLH Conditions:	Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.
Escape:	Gas mask with canister to protect against hydrogen sulfide; or escape-type SCBA
NOTE:	The IDLH concentration for Hydrogen Sulfide is 100 ppm.

NIOSH/OSHA RECOMMENDATIONS FOR CARBON MONOXIDE CONCENTRATIONS IN AIR:

Up to 350 ppm	Supplied Air Respirator (SAR)
Up to 875 ppm	Supplied Air Respirator (SAR) operated in a continuous flow mode.
Up to 1200 ppm	Gas mask with canister to protect against carbon monoxide; or full-facepiece SCBA; or full-facepiece Supplied Air Respirator (SAR).
Emergency or Planned Entry into Unknown Concentration or IDLH Conditions:	Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece Supplied Air Respirator (SAR) with an auxiliary positive pressure SCBA.
Escape:	Gas mask with canister to protect against carbon monoxide; or escape-type SCBA. **NOTE**: End of Service Life Indicator (ESLI) required for gas masks.
NOTE:	The IDLH concentration for Carbon Monoxide is 1200 ppm.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Wear leather gloves when handling cylinders. Chemically resistant gloves should be worn when using this gas mixture. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: No special protection is needed under normal circumstances of use. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Nitrogen, the main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: .072 lbs/ ft^3 (1.153 kg/m^3)

FREEZING/MELTING POINT @ 10 psig: -345.8°F (-210°C)

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906

SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023

EVAPORATION RATE (nBuAc = 1): Not applicable.

VAPOR PRESSURE @ 70°F (21.1°C) (psig): Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

BOILING POINT: -320.4°F (-195.8°C)

pH: Not applicable.

MOLECULAR WEIGHT: 28.01

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME (ft^3/lb): 13.8

The following information is for this gas mixture.

ODOR THRESHOLD: 0.13 ppm (Hydrogen Sulfide)

APPEARANCE AND COLOR: This gas mixture is a colorless gas which has an rotten egg-like odor, due to the presence of Hydrogen Sulfide.

HOW TO DETECT THIS SUBSTANCE (warning properties): Continuous inhalation of low concentrations of this gas mixture may cause olfactory fatigue, due to the presence of Hydrogen Sulfide, so the odor is not a good warning property of a release of this gas mixture. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation. Wet lead acetate paper can be used for leak detection. The paper turns black in the presence of Hydrogen Sulfide. Cadmium chloride solutions can also be used. Cadmium solutions will turn yellow upon contact with Hydrogen Sulfide.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of Methane include carbon oxides. The decomposition products of Hydrogen Sulfide include water and sulfur oxides. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this gas mixture). Lithium reacts slowly with Nitrogen at ambient temperatures. Components of this gas mixture (Hydrogen Sulfide, Methane) are also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride). Carbon Monoxide is mildly corrosive to nickel and iron (especially at high temperatures and pressures). Hydrogen Sulfide is corrosive to most metals, because it reacts with these substances to form metal sulfides.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this gas mixture:

NITROGEN:

There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

METHANE:

There are no specific toxicology data for Methane. Methane is a simple asphyxiant, which acts to displace oxygen in the environment.

CARBON MONOXIDE:

LC_{50} (Inhalation-Rat) 1807 ppm/4 hours
LC_{50} (Inhalation-Mouse) 2444 ppm/4 hours
LC_{50} (Inhalation-Guinea Pig) 5718 ppm/4 hours
LC_{50} (Inhalation-wild bird species) 1334 ppm
LCLo (Inhalation-Human) 4 mg/m^3/12 hours: Behavioral: coma; Vascular: BP lowering not characterized in autonomic section; Blood: methemoglobinemia-carboxyhemoglobin
LCLo (Inhalation-Man) 4000 ppm/30 minutes
LCLo (Inhalation-Human) 5000 ppm/5 minutes
LCLo (Inhalation-Dog) 4000 ppm/46 minutes
LCLo (Inhalation-Rabbit) 4000 ppm
LCLo (Inhalation-Mammal-species unspecified) 5000 ppm/5 minutes
TCLo (Inhalation-Human) 600 mg/m^3/10 minutes: Behavioral: headache
TCLo (Inhalation-Man) 650 ppm/45 minutes: Blood: methemoglobinemia-carboxyhemoglobin; Behavioral: changes in psychophysiological tests
TCLo (Inhalation-Rat) 1800 ppm/1 hour/14 days-intermittent: Cardiac: other changes
TCLo (Inhalation-Rat) 30 mg/m^3/8 hours/10 weeks-intermittent: Brain and Coverings: other degenerative changes; Behavioral: muscle contraction or spasticity
TCLo (Inhalation-Rat) 96 ppm/24 hours/90 days-continuous: Blood: pigmented or nucleated red blood cells, other changes
TCLo (Inhalation-Rat) 250 ppm/5 hours/20 days-intermittent: Blood :pigmented or nucleated red blood cells, changes in other cell count (unspecified), changes in erythrocyte (RBC) count
TDLo (Subcutaneous-Rat) 5983 mg/kg/18 weeks-intermittent: Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol)
TCLo (Inhalation-Monkey) 200 ppm/24 hours/90 days-continuous: Blood: pigmented or nucleated red blood cells, other changes
TCLo (Inhalation-Rabbit) 200 mg/m^3/3 hours/13 weeks-intermittent: Brain and Coverings: other degenerative changes; Cardiac: other changes; Blood: hemorrhage
TCLo (Inhalation-Guinea Pig) 200 mg/m^3/5 hours/30 weeks-continuous: Cardiac: arrhythmias (including changes in conduction), EKG changes not diagnostic of specified effects, pulse rate increase, without fall in BP

CARBON MONOXIDE (continued):

TCLo (Inhalation-Mouse) 50 ppm/30 days-intermittent: Lungs, Thorax, or Respiration: structural or functional change in trachea or bronchi
TCLo (Inhalation-Guinea Pig) 200 mg/m^3/5 hours/4 weeks-intermittent: Endocrine: hyperglycemia
TCLo (Inhalation-Guinea Pig) 200 ppm/24 hours/90 days-continuous: Blood: pigmented or nucleated red blood cells, other changes
TCLo (Inhalation-Rat) 75 ppm/24 hours: female 0-20 day(s) after conception: Reproductive: Maternal Effects: other effects; Effects on Newborn: behavioral
TCLo (Inhalation-Rat) 150 ppm/24 hours: female 1-22 day(s) after conception: Reproductive: Specific Developmental Abnormalities: cardiovascular (circulatory) system
TCLo (Inhalation-Rat) 150 ppm/24 hours: female 1-22 day(s) after conception: Reproductive: Effects on Newborn: growth statistics (e.g.%, reduced weight gain), behavioral
TCLo (Inhalation-Rat) 1 mg/m^3/24 hours: female 72 day(s) pre-mating: Reproductive: Maternal Effects: menstrual cycle changes or disorders, parturition; Fertility: female fertility index (e.g. # females pregnant per # sperm positive females; # females pregnant per # females mated)
TCLo (Inhalation-Rat) 150 ppm/24 hours: female 0-20 day(s) after conception: Reproductive: Effects on Newborn: behavioral
TCLo (Inhalation-Rat) 75 ppm/24 hours: female 0-20 day(s) after conception: Reproductive: Specific Developmental Abnormalities: immune and reticuloendothelial system
TCLo (Inhalation-Mouse) 65 ppm/24 hours: female 7-18 day(s) after conception: Reproductive: Effects on Newborn: behavioral
TCLo (Inhalation-Mouse) 250 ppm/7 hours: female 6-15 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Specific Developmental Abnormalities: musculoskeletal system
TCLo (Inhalation-Mouse) 125 ppm/24 hours: female 7-18 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)
TCLo (Inhalation-Mouse) 8 pph/1 hour: female 8 day(s) after conception: Reproductive: Fertility: litter size (e.g. # fetuses per litter; measured before birth); Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), fetal death

CARBON MONOXIDE (continued):

TCLo (Inhalation-Rabbit) 50 ppm/24 hours/8 weeks-continuous: Blood: changes in platelet count
TCLo (Inhalation-Mouse) 8 pph/1 hour: female 8 day(s) after conception: Reproductive: Specific Developmental Abnormalities: Central Nervous System
TCLo (Inhalation-Rabbit) 180 ppm/24 hours: female 1-30 day(s) after conception: Reproductive: Effects on Newborn: stillbirth, viability index (e.g., # alive at day 4 per # born alive)
Micronucleus Test (Inhalation-Mouse)1500 ppm/10 minutes
Sister Chromatid Exchange (Inhalation-Mouse) 2500 ppm/10 minutes

HYDROGEN SULFIDE:

LC_{50} (Inhalation-Rat) 444 ppm: Lungs, Thorax, or Respiration: other changes; Gastrointestinal: hypermotility, diarrhea; Kidney, Ureter, Bladder: urine volume increased
LC_{50} (Inhalation-Mouse) 634 ppm/1 hour
LCLo (Inhalation-Human) 600 ppm/30 minutes
LCLo (Inhalation-Man) 5700 μg/kg: Behavioral: coma; Lungs, Thorax, or Respiration: chronic pulmonary edema
LCLo (Inhalation-Human) 800 ppm/5 minutes
LCLo (Inhalation-Mammal-species unspecified) 800 ppm/5 minutes
TCLo (Inhalation-Rat) 30 ppm/6 hours/10 weeks-intermittent: Sense Organs and Special Senses (Olfaction): olfactory nerve change, effect, not otherwise specified
TCLo (Inhalation-Rat) 1200 mg/m^3/2 hours/5 days-intermittent: Brain and Coverings: other degenerative changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: true cholinesterase
TCLo (Inhalation-Rat) 100 ppm/8 hours/5 weeks-intermittent: Brain and Coverings: other degenerative changes; Lungs, Thorax, or Respiration: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: cytochrome oxidases (including oxidative phosphorylation)
TCLo (Inhalation-Rat) 80 ppm/6 hours/90 days-intermittent: Brain and Coverings: changes in brain weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain
TCLo (Inhalation-Rat) 20 ppm: female 6-22 day(s) after conception lactating female 21 day(s) post-birth: Reproductive: Effects on Newborn: physical
TCLo (Inhalation-Mouse) 80 ppm/6 hours/90 days-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain; Related to Chronic Data: death
TCLo (Inhalation-Rabbit) 40 mg/m^3/5 hours/30 weeks-intermittent: Sense Organs and Special Senses (Eye): conjunctive irritation

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: This gas mixture is irritating to the eyes, and may be irritating to the skin.

SENSITIZATION OF PRODUCT: The components of this gas mixture are not known to be skin or respiratory sensitizers.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture on the human reproductive system.

Mutagenicity: The components of this gas mixture are not reported to cause mutagenic effects in humans.

REPRODUCTIVE TOXICITY INFORMATION (continued):

Embryotoxicity: This gas mixture contains components that may cause embryotoxic effects in humans; however, due to the small total amount of the components, embryotoxic effects are not expected to occur.

Teratogenicity: This gas mixture is not expected to cause teratogenic effects in humans due to the small cylinder size and small total amount of all components. The Carbon Monoxide component of this gas mixture which exists up to 1%, can cause teratogenic effects in humans. Severe exposure to Carbon Monoxide during pregnancy has caused adverse effects and the death of the fetus. In general, maternal symptoms are an indicator of the potential risk to the fetus since Carbon Monoxide is toxic to the mother before it is toxic to the fetus.

Reproductive Toxicity: The components of this gas mixture are not reported to cause adverse reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES (BEIs): Biological Exposure Indices (BEIs) have been determined for components of this gas mixture, as follows:

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
CARBON MONOXIDE • Carboxyhemoglobin in blood • Carbon monoxide in end-exhaled air	 • End of shift • End of shift	 • 3.5% of hemoglobin • 20 ppm

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

CARBON MONOXIDE:

Atmospheric Fate: A photochemical model was used to quantify the sensitivity of the tropospheric oxidants ozone (O_3) and OH to changes in methane (CH_4), Carbon Monoxide (CO), and NO emissions and to perturbations in climate and stratospheric chemistry. In most cases, increased CH_4 and CO emissions will suppress OH (negative coefficients) in increased O_3 (positive coefficients) except in areas where NO and O_3 influenced by pollution are sufficient to increased OH. In most regions, NO, CO, and CH_4 emission increased will suppress OH and increased O_3, but these trends may be opposed by stratospheric O3 depletion and climate change.

HYDROGEN SULFIDE:

Water Solubility = 1 g/242 mL at 20°C.

Plant toxicity: Continuous fumigation of plants with 300 or 3000 ppb Hydrogen Sulfide caused leaf lesions, defoliation, and reduced growth with severity of injury correlated to dose. At higher (3.25 and 5.03 ppm) Hydrogen Sulfide, significant reductions in leaf CO2 and water vapor exchanges occurred, and stomatal openings were depressed. When Hydrogen Sulfide gas was applied to 29 species of green plants for 5 hours, young, rapidly elongating tissues were more sensitive to injury than older tissues. Symptoms included scorching of young shoots and

12. ECOLOGICAL INFORMATION(continued)

leaves, basal and marginal scorching of older leaves. Mature leaves were unaffected. Seeds exposed to Hydrogen Sulfide gas showed delay in germination.

Persistence: Converts to elemental sulfur upon standing in water.

Major Species Threatened: Aquatic and animal life plants may be injured if exposed to 5 ppm in air over 24 hours.

Biodegradation: Microorganisms in soil and water are involved in oxidation-reduction reactions that oxidize hydrogen sulfide to elemental sulfur. Members of the genera Beggiatoa, Thioploca, and Thiotrix function in transition zones between aerobic and anaerobic conditions where both molecular oxygen and hydrogen sulfide are found. Also, some photosynthetic bacteria oxidize hydrogen sulfide to elemental sulfur. Members of the families Chlorobiaceae and Chromatiaceae (purple sulfur bacteria) are obligate aerobes and are phototropic, and are found in waters with high H_2S concentrations. The interactions of these organisms form part of the global sulfur cycle.

Bioconcentration: Does not have bioaccumulation or food chain contamination potential.

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C; 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this gas mixture's effects on plant and animal life. Hydrogen Sulfide and Carbon Monoxide, components of this gas mixture, can be deadly to exposed animal life, producing symptoms similar to those experienced by humans. This gas mixture may also be harmful to plant life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this gas mixture's effects on aquatic life. The presence of more than a trace of the Carbon Monoxide component of this gas mixture is a hazard to fish. The following aquatic toxicity data are available for the Hydrogen Sulfide component of this gas mixture:

HYDROGEN SULFIDE:

LC_{50} (*Asellus* arthropods) 96 hours = 0.111 mg/L
LC_{50} (*Crangon* arthropods) 96 hours = 1.07 mg/L
LC_{50} (*Gammarus* arthropods) 96 hours = 0.84 mg/L
LC_{50} (Ephemera) 96 hours = 0.316 mg/L
LC_{50} (Inhalation-Flies) > 960 minutes = 380 mg/m^3
LC_{50} (Inhalation-Flies) 7 minutes = 1,500 mg/m^3
LC_{50},F (bluegill, eggs) 72 hours = 0.0190 mg/L

HYDROGEN SULFIDE (continued):

LC_{50},F (bluegill, 35-day-old fry) 96 hours = 0.0131 mg/L
LC_{50},F (bluegill, juveniles) 96 hours = 0.0478 mg/L
LC_{50},F (bluegill, adults) 96 hours = 0.0448 mg/L
LC_{50},F (fathead minnows) 96 hours = 0.0071-0.55 mg/L
LC_{50},F (bluegill) 96 hours = 0.0090-0.0140 mg/L
LC_{50},F (brook trout) 96 hours = 0.0216-0.0308 mg/L
Toxic (goldfish) = 100 mg/L

HYDROGEN SULFIDE (continued):

Lethal (goldfish) 96 hours = 10 mg/L
Toxic (carp) 24 hours = 3.3 mg/L
Toxic (goldfish) 24 hours = 4.3 mg/L
Toxic (sunfish) 1 hour = 4.9 to 5.3 mg/L
Toxic (goldfish) 200 hours = 5 mg/L
Toxic (minnows) 24 hours = 5-6 mg/L
Toxic (carp) 24 hours = 6-25 mg/L
Toxic (trout) 15 minutes = 10 mg/L
Toxic (goldfish) 24 hours = 25 mg/L
Toxic (tench) 3 hours = 100 mg/L
MATC,F (fathead minnows) 0.0037 mg/L
MATC,F (bluegill) 0.0004 mg/L
MATC,F (brook trout) 0.055 mg/L

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS GAS MIXTURE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (*Oxygen, Nitrogen)*or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not Applicable
DOT LABEL(S) REQUIRED: Non-Flammable Gas
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126

U.S. DEPARTMENT OF TRANSPORTATION INFORMATION (continued):

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas mixture is considered as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (*Oxygen, Nitrogen)*or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not Applicable
HAZARD LABEL: Class 2.2 (Non-Flammable Gas)
SPECIAL PROVISIONS: None
EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12
ERAP INDEX: 3000
PASSENGER CARRYING SHIP INDEX: Forbidden
PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: Forbidden
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126

NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: This gas mixture is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Hydrogen Sulfide	YES	YES	YES

U.S. SARA THRESHOLD PLANNING QUANTITY: Hydrogen Sulfide = 500 lb (227 kg)
U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.
U.S. CERCLA REPORTABLE QUANTITY (RQ): Hydrogen Sulfide = 100 lb (45 kg)
OTHER U.S. FEDERAL REGULATIONS:

- Hydrogen Sulfide and Carbon Monoxide are subject to the reporting requirements of CFR 29 1910.1000.
- Hydrogen Sulfide and Methane are subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for each of these gases is 10,000 pounds and so this mixture will not be affected by the regulation.
- Depending on specific operations involving the use of this gas mixture, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Hydrogen Sulfide is listed in Appendix A of this regulation. The Threshold Quantity for Hydrogen Sulfide under this regulation is 1500 lbs (and so one cylinder of this gas mixture will not be affected by this regulation).
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Nitrogen and Oxygen are not listed Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Hydrogen Sulfide is listed under this regulation in Table 1 as a Regulated Substance (Toxic Substance), in quantities of 10,000 lbs (4,553 kg) or greater.

15. REGULATORY INFORMATION(continued)

Carbon Monoxide and Methane are listed under this regulation in Table 3, as Regulated Substances (Flammable), in quantities of 10,000 lbs (4,553 kg) or greater, and so this mixture will not be affected by the regulation.

U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Carbon Monoxide, Hydrogen Sulfide, Methane.

California - Permissible Exposure Limits for Chemical Contaminants: Carbon Monoxide, Nitrogen, Hydrogen Sulfide, Methane.

Florida - Substance List: Oxygen, Carbon Monoxide, Hydrogen Sulfide

Illinois - Toxic Substance List: Carbon Monoxide, Methane, Hydrogen Sulfide.

Kansas - Section 302/313 List: No.

Massachusetts - Substance List: Oxygen, Carbon Monoxide, Hydrogen Sulfide, Methane.

Michigan - Critical Materials Register: No.

Minnesota - List of Hazardous Substances: Carbon Monoxide, Hydrogen Sulfide, Methane.

Missouri - Employer Information/Toxic Substance List t: Hydrogen Sulfide, Methane.

New Jersey - Right to Know Hazardous Substance List: Oxygen, Carbon Monoxide, Nitrogen, Methane.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: Hydrogen Sulfide.

Pennsylvania - Hazardous Substance List: Oxygen, Carbon Monoxide, Nitrogen, Hydrogen Sulfide, Methane.

Rhode Island - Hazardous Substance List: Oxygen, Carbon Monoxide, Nitrogen, Hydrogen Sulfide, Methane.

Texas - Hazardous Substance List: Hydrogen Sulfide.

West Virginia - Hazardous Substance List: Hydrogen Sulfide.

Wisconsin - Toxic and Hazardous Substances: Hydrogen Sulfide

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): The Carbon Monoxide component of this gas mixture is on the California Proposition 65 lists. WARNING! This gas mixture contains a compound known to the State of California to cause birth defects or other reproductive harm.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this gas mixture are not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS CLASSIFICATION: This gas mixture is categorized as a Controlled Product, Hazard Classes A and D2A, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. CALGAZ will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1 *"Safe Handling of Compressed Gases in Containers"*

AV-1 *"Safe Handling and Storage of Compressed Gases"*

"Handbook of Compressed Gases"

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 3519, La Mesa, CA 91944-3519
619/670-0609

Fax on Demand: 1-800/231-1366

AIR LIQUIDE

SAFETY DATA SHEET

Helium

Section 1. Identification

GHS product identifier : Helium

Chemical name : Helium

Other means of identification : helium (dot); Helium-4; He; o-Helium; UN 1046

Product use : Synthetic/Analytical chemistry.

Synonym : helium (dot); Helium-4; He; o-Helium; UN 1046

SDS # : 001025

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 - Compressed gas

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Contains gas under pressure; may explode if heated.
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.

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 : 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 : Helium

Other means of identification : helium (dot); Helium-4; He; o-Helium; UN 1046

CAS number/other identifiers

CAS number : 7440-59-7

Product code : 001025

Ingredient name	%	CAS number
Helium	100	7440-59-7

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

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. 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 : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

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.

Section 4. First aid measures

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 : No specific data.

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.

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. 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.

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. Avoid contact with eyes, skin and clothing. Avoid breathing gas. 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

Ingredient name	Exposure limits
Helium	Oxygen Depletion [Asphyxiant]

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

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.

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. [Compressed gas.]

Color : Colorless.

Molecular weight : 4 g/mole

Molecular formula : He

Boiling/condensation point : -268.9°C (-452°F)

Melting/freezing point : -272.2°C (-458°F)

Critical temperature : -267.9°C (-450.2°F)

Odor : Odorless.

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 : Not available.

Vapor density : 0.14 (Air = 1) Liquid Density@BP: 7.8 lb/ft3 (125 kg/m3)

Specific Volume (ft ^{3}/lb) : 96.1538

Gas Density (lb/ft ^{3}) : 0.0104

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : 0.28

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Section 9. Physical and chemical properties

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.

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.

Section 11. Toxicological information

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

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.

Section 12. Ecological information

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Helium	0.28	-	low

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	UN1046	UN1046	UN1046	UN1046	UN1046
UN proper shipping name	HELIUM, COMPRESSED	HELIUM, COMPRESSED	HELIUM, COMPRESSED	HELIUM, COMPRESSED	HELIUM, COMPRESSED
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 75 kg **Cargo aircraft** Quantity limitation: 150 kg	**Explosive Limit and Limited Quantity Index** 0.125 **Passenger Carrying Road or Rail Index** 75	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 75 kg **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 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 : Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Helium	100	No.	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.

Canada inventory : This material is listed or exempted.

International regulations

Section 15. Regulatory information

International lists : **Australia inventory (AICS)**: This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: Not determined.
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 not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not 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.)

Health	0
Flammability	0
Physical hazards	0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

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Section 16. Other information

History

Date of printing : 10/15/2014.

Date of issue/Date of revision : 10/15/2014.

Date of previous issue : 10/2/2014.

Version : 0.02

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United 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.

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.

MATERIAL SAFETY DATA SHEET
HORIBA INSTRUMENTS, INC.
17671 Armstrong Avenue, Irvine, CA 92614
(949) 250-4811

REVISION DATE MAY 2003

SECTION I: MATERIAL IDENTIFICATION

IDENTITY: Potassium hydrogen phthalate
P/N 350623, 527033, 696138-1, 9003001600, 100-4

CHEMICAL FORMULA: $C_6H_4(COOK)(COOH)$ ~1% in water

GENERIC NAME: pH 4 Buffer Solution

CHEMICAL FAMILY: Salt solution

OTHER DESIGNATION: pH 4 Standard Solution, Autocal solution, 100-4

IN CASE OF EMERGENCY CONTACT YOUR REGIONAL PLANT MANAGER

SECTION II: HAZARDOUS INGREDIENTS

Irritant: Eyes, nose and throat, skin.

This product contains the following toxic chemical(s) subject to Section 313 Title III reporting requirements (40 CFR Part 372): NONE

SECTION III: PHYSICAL DATA

MELTING POINT (*): 295-300°C

SPECIFIC GRAVITY (H_2O = 1): 1.636

VAPOR PRESSURE: N/A

PERCENT, VOLATILE BY VOLUME (%): None

SOLUBILITY IN WATER v/v @°C: 1.2% (cool water) CAS #: 877-24-7

APPEARANCE AND ODOR: Colorless liquid

SECTION IV:PHYSICAL DATA

FLASH POINT AND METHOD: N/A

FLAMMABLE LIMITS: None

EXTINGUISHING MEDIA: Determine based on surrounding combustibles.

SPECIAL FIRE FIGHTING PROCEDURES: None

UNUSUAL FIRE AND EXPLOSION HAZARDS: N/A

SECTION V: REACTIVITY DATA

STABILITY: Stable at normal temperature

INCOMPATIBILITY (MATERIALS TO AVOID): None

HAZARDOUS DECOMPOSITION PRODUCTS: None

HAZARDOUS POLYMERIZATION: None

SECTION VI: HEALTH HAZARD DATA

EMERGENCY AND FIRST AID PROCEDURES:

Eyes: Wash eyes with clean water flowing for 10-15 minutes. Call doctor immediately.
Skin: Take off contaminated clothing and wash skin with water.
Inhaled: Move the patient into clear air. Keep patient warm and stable. Loosen clothing and use artificial respiration if necessary. Call doctor immediately.
Swallowed: Give patient plenty of warm water/milk. Induce vomiting. Call doctor immediately. If patient is unconscious, do not give water/milk, but call doctor immediately.

SECTION VII: SPILL OR LEAK PROCEDURES

Highway or railway spills call Chemtrec (800) 424-9300

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
Collect as much material as possible. The place of leakage should be washed with plenty of water.

WASTE DISPOSAL METHOD:
Dispose as chemical waste.

SECTION VIII: SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE): Not normally required.

VENTILATION: Not normally required.

OTHER PROTECTIVE EQUIPMENT: Optional - eye mask, gloves and long-sleeve working clothes.

SECTION IX:SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:
After working, wash hands thoroughly.

OTHER PRECAUTIONS: None.

For the following RAE Part Numbers:

600-0001-000, 600-0002-000

600-0002-001, 600-0026-000

600-0027-000, 600-0069-000

AIR LIQUIDE

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NONFLAMMABLE GAS MIXTURE

Containing One or More of the Following Components in a Nitrogen Balance Gas: Oxygen 0-23.5%; Isobutylene, 0.0005-0.9%

SYNONYMS: Not Applicable
CHEMICAL FAMILY NAME: Not Applicable
FORMULA: Not Applicable
Document Number: 50054

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
SUPPLIER/MANUFACTURER'S NAME:	CALGAZ
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	1-410-228-6400
General MSDS Information:	1-713/868-0440
Fax on Demand:	1-800/231-1366

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH	OTHER
			TWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	ppm
Isobutylene	115-11-7	0.0005-0.9%	There are no specific exposure limits for Isobutylene.					
Oxygen	7782-44-7	0-23.5%	There are no specific exposure limits for Oxygen.					
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established. See Section 16 for Definitions of Terms Used.

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This gas mixture has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This is a colorless, odorless gas mixture. Releases of this gas mixture may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. Isobutylene, a component of this gas mixture, may cause drowsiness and other central nervous system effects in high concentrations; however, due to its low concentration in this gas mixture, this is unlikely to occur.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this gas mixture is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this gas mixture, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. The chief health hazard associated with this gas mixture is when this gas mixture contains less than 19.5% Oxygen and is released in a small, poorly-ventilated area (i.e. an enclosed or confined space). Under this circumstance, an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN	OBSERVED EFFECT
12-16% Oxygen:	Breathing and pulse rate increase, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	1
FLAMMABILITY HAZARD	(RED)	0
PHYSICAL HAZARD	(YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
See Section 8			

For Routine Industrial Use and Handling Applications

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this gas mixture, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. The most significant hazard associated with this gas mixture when it contains less than 19.5% oxygen is the potential for exposure to oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, unconsciousness, and death. The skin of a victim of over-exposure may have a blue color. Additionally, Isobutylene, a component of this gas mixture, may cause drowsiness or central nervous system effects in high concentrations; however, due to its low concentration in this gas mixture, this is unlikely to occur.

CHRONIC: Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system.

TARGET ORGANS: ACUTE: Respiratory system, eyes. CHRONIC: Heart, cardiovascular system, central nervous system.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS GAS MIXTURE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary. Victim(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by over-exposure to this gas mixture.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary; treat symptoms and eliminate exposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

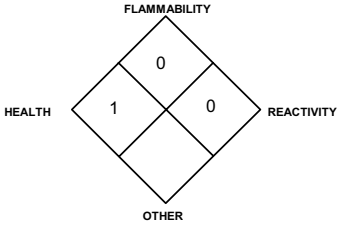
FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

NFPA RATING



6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this gas mixture presents significantly less risk of an oxygen deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen. Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area.

If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C [70°F]). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If this gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Nitrous Oxide and Oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection when oxygen levels are below 19.5%, or during emergency response to a release of this gas mixture. During an emergency situation, before entering the area, check the concentration of Methane and Oxygen. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Wear leather gloves when handling cylinders. Chemically resistant gloves should be worn when using this gas mixture. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: No special protection is needed under normal circumstances of use. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Nitrogen, a main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.072 lbs/ ft^3 (1.153 kg/m^3)
BOILING POINT: -195.8°C (-320.4°F)
FREEZING/MELTING POINT @ 10 psig: -210°C (-345.8°F)
SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906
pH: Not applicable.
SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023
MOLECULAR WEIGHT: 28.01
EVAPORATION RATE (nBuAc = 1): Not applicable.
EXPANSION RATIO: Not applicable.
ODOR THRESHOLD: Not applicable.
SPECIFIC VOLUME (ft^3/lb): 13.8
VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for Oxygen, a main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.083 lb/cu ft (1.326 kg/m^3)
FREEZING/MELTING POINT @ 10 psig: -218.8°C (-361.8°F)
BOILING POINT: -183.0°C (-297.4°F)
SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 1.105
pH: Not applicable.
SOLUBILITY IN WATER vol/vol at 32°F (0°C) and 1 atm: 0.04.91
MOLECULAR WEIGHT: 32.00
EVAPORATION RATE (nBuAc = 1): Not applicable.
EXPANSION RATIO: Not applicable.
ODOR THRESHOLD: Not applicable.
VOLUME (ft^3/lb): 12.1
VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for the gas mixture.

APPEARANCE AND COLOR: This is a colorless, odorless gas mixture.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no unusual warning properties associated with a release of this gas mixture. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.
DECOMPOSITION PRODUCTS: The thermal decomposition products of Isobutylene include carbon oxides. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in the Nitrogen component of this gas mixture. Lithium reacts slowly with Nitrogen at ambient temperatures. The Isobutylene component of this gas mixture is also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen difluoride, and nitrogen trifluoride).
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this gas mixture:

ISOBUTYLENE:
LC_{50} (inhalation, rat) = 620,000 mg/kg/4 hours
LC_{50} (inhalation, mouse) = 415,000 mg/kg
NITROGEN:
There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.
IRRITANCY OF PRODUCT: Contact with rapidly expanding gases can be irritating to exposed skin and eyes.
SENSITIZATION TO THE PRODUCT: The components of this gas mixture are not known to cause human skin or respiratory sensitization.
REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture and its components on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for the components in this gas mixture.
Embryotoxcity: No embryotoxic effects have been described for the components in this gas mixture.
Teratogenicity: No teratogenicity effects have been described for the components in this gas mixture.
Reproductive Toxicity: No reproductive toxicity effects have been described for the components in gas mixture.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.
BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for the components of this gas mixture.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this gas mixture occur naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log K_{ow} = -0.65
NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C. 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on the effects of this gas mixture on plant and animal life.
EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of this gas mixture on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS GAS MIXTURE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (*Oxygen, Nitrogen)*or the gas component with the next highest concentration next to Nitrogen.
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas)
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126
MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).
SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.
Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is considered as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (*Oxygen, Nitrogen)*or the gas component with the next highest concentration next to Nitrogen.
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not Applicable
HAZARD LABEL: Class 2.2 (Non-Flammable Gas)
SPECIAL PROVISIONS: None
EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12
ERAP INDEX: None
PASSENGER CARRYING SHIP INDEX: None
PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: 75
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126
NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:
U.S. SARA REPORTING REQUIREMENTS: The components of this gas mixture are not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.
U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this gas mixture. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.
U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.
U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.
OTHER U.S. FEDERAL REGULATIONS:

- No component of this gas mixture is subject to the requirements of CFR 29 1910.1000 (under the 1989 PELs).
- Isobutylene is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 pounds.
- The regulations of the Process Safety Management of Highly Hazardous Chemicals are not applicable (29 CFR 1910.119).
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR Part 82).

15. REGULATORY INFORMATION (continued)

- Nitrogen and Oxygen are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Isobutylene is listed under this regulation in Table 3 as Regulated Substances (Flammable Substances), in quantities of 10,000 lbs (4,554 kg) or greater.

U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: No.
California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen.
Florida - Substance List: Oxygen, Isobutylene.
Illinois - Toxic Substance List: No.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Oxygen, Isobutylene.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: No.
Missouri - Employer Information/Toxic Substance List: No.
New Jersey - Right to Know Hazardous Substance List: Oxygen, Nitrogen, Isobutylene.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Oxygen, Nitrogen, Isobutylene.
Rhode Island - Hazardous Substance List: Oxygen, Nitrogen.
Texas - Hazardous Substance List: No.
West Virginia - Hazardous Substance List: No.
Wisconsin - Toxic and Hazardous Substances: : No.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this gas mixture is on the California Proposition 65 lists.

ADDITIONAL CANADIAN REGULATIONS:
CANADIAN DSL/NDSL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this gas mixture are not on the CEPA Priorities Substances Lists.
CANADIAN WHMIS REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Class A, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. CALGAZ will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1 *"Safe Handling of Compressed Gases in Containers"*
AV-1 *"Safe Handling and Storage of Compressed Gases"*
"Handbook of Compressed Gases"

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 3519, La Mesa, CA 91944-3519
619/670-0609
Fax on Demand: 1-800/231-1366

AIR LIQUIDE

SAFETY DATA SHEET

Creation Date 08-Nov-2010 **Revision Date** 18-Jun-2015 **Revision Number** 2

1. Identification

Product Name **Fluoranthene**

Cat No. : **AC119170000; AC119170250; AC119171000; AC119175000**

Synonyms Benzo[j,k]fluorene

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)

Acute oral toxicity	Category 4

Label Elements

Signal Word
Warning

Hazard Statements
Harmful if swallowed

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

Rinse mouth
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 %
Fluoranthene	206-44-0	>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 Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

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 Water spray. Carbon dioxide (CO_2). Dry chemical. alcohol-resistant foam.

Unsuitable Extinguishing Media No information available

Flash Point 100 °C / 212 °F
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
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	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 Sweep up or vacuum up spillage and collect in suitable container for disposal.

7. Handling and storage

Handling Ensure adequate ventilation. Wear personal protective equipment. Avoid contact with skin and eyes. Do not breathe dust. Do not breathe vapors or spray mist. Avoid dust formation.

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	Powder Solid
Appearance	Light green
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	109 - 111 °C / 228.2 - 231.8 °F
Boiling Point/Range	384 - 34 °C / 723.2 - 93.2 °F
Flash Point	100 °C / 212 °F
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
Relative Density	No information available
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	C16 H10
Molecular Weight	202.25

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 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

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Fluoranthene	2 g/kg (Rat)	3180 mg/kg (Rabbit)	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.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Fluoranthene	206-44-0	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 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.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Fluoranthene	Not listed	Oncorhynchus mykiss: LC50=0.0077 mg/L 96h	Not listed	EC50: 0.78 mg/L 20h

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

Mobility .

Component	log Pow
Fluoranthene	5.33

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
Fluoranthene - 206-44-0	U120	-

14. Transport information

DOT
- **UN-No** UN3077
- **Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.
- **Proper technical name** (Fluoranthene)
- **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
Fluoranthene	X	-	X	205-912-4	-		-	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 %
Fluoranthene	206-44-0	>95	1.0 0.1

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
Fluoranthene	-	-	X	X

Clean Air Act Not applicable

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
Fluoranthene	100 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
Fluoranthene	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 D1B Toxic materials

16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Creation Date	08-Nov-2010
Revision Date	18-Jun-2015
Print Date	18-Jun-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 10-Feb-2015 **Revision Number** 1

1. Identification

Product Name **Fluorene**

Cat No. : **AC156130000; AC156130250; AC156131000; AC156135000**

Synonyms Diphenylenemethane

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
Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements
None required

Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
May form combustible dust concentrations in air

3. Composition / information on ingredients

Component	CAS-No	Weight %
Fluorene	86-73-7	98

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 151 °C / 303.8 °F
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
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
0	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.

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.

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.

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	No protective equipment is needed under normal use conditions.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Beige
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	112 - 116 °C / 233.6 - 240.8 °F
Boiling Point/Range	298 °C / 568.4 °F @ 760 mmHg
Flash Point	151 °C / 303.8 °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	13 hPa @ 146 °C
Vapor Density	Not applicable
Relative Density	1.200
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	Not applicable
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	C13 H10
Molecular Weight	166.22

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	No information available.
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 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
Fluorene	86-73-7	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 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.

Persistence and Degradability Insoluble in water May persist
Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Fluorene	4.18

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
- **UN-No** 3077
- **Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.*
- **Hazard Class** 9
- **Packing Group** III

IMDG/IMO

UN-No	3077
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
Fluorene	X	X	-	201-695-5	-		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 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	No

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Fluorene	-	-	X	X

Clean Air Act Not applicable

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
Fluorene	5000 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
Fluorene	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

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

Material Name: Fuel Oil No. 2

SDS No. 0088
EU/CLP GHS

Synonyms: #2 Heating Oil; 2 Oil; Off-road Diesel Fuel

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquids - Category 3
Acute Toxicity, Inhalation - Category 4
Skin Corrosion/Irritation – Category 2
Eye Damage/Irritation – Category 2
Carcinogenicity - Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3 (respiratory irritation, narcosis)
Aspiration Hazard – Category 1
Hazardous to the Aquatic Environment, Acute Hazard – Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Flammable liquid and vapor.
Harmful if inhaled.
Causes skin irritation.
Causes eye irritation.
Suspected of causing cancer.
Suspected of causing genetic defects.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.
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.
Avoid breathing fume/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid release to the environment.

Response

In case of fire: Use water spray, fog or foam.
If on skin (or hair): Wash with plenty of soap and water. Take off immediately all contaminated clothing and wash it before reuse. If skin irritation occurs, get medical advice/attention.
If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor if you feel unwell.
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 exposed or concerned: Get medical advice/attention.
If swallowed: Immediately all a poison center or doctor/physician if you feel unwell. Do NOT induce vomiting.

Storage

Store in a well ventilated place.
Keep cool. Keep container tightly closed.
Store locked up.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
68476-30-2	Fuel oil No. 2	100
91-20-3	Naphthalene	<0.1

A complex combination of hydrocarbons with carbon numbers in the range C9 and higher produced from the distillation of petroleum crude oil.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO_2, 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.

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, excessive temperatures and open flame! No smoking or open flame in storage, use or handling areas. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when this product is loaded into tanks previously containing low flash point products (such as gasoline) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep containers closed and clearly labeled. Use approved vented storage containers. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Incompatibilities

Keep away from strong oxidizers; Fluorel ®

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Fuel oil No. 2 (270-671-4)

ACGIH: 100 mg/m3 TWA (inhalable fraction and vapor, as total hydrocarbons, listed under Diesel fuel)
Skin - potential significant contribution to overall exposure by the cutaneous route (listed under Diesel fuel)

Belgium: 100 mg/m3 TWA (as total hydrocarbon, aerosol and vapor)
Skin (listed under Gas oil)

Portugal: 100 mg/m3 TWA [VLE-MP] (aerosol and vapor, as total Hydrocarbons, listed under Fuel diesel)

Naphthalene (202-049-5)

ACGIH: 15 ppm STEL
10 ppm TWA
Skin - potential significant contribution to overall exposure by the cutaneous route

Austria: 10 ppm TWA [TMW]; 50 mg/m3 TWA [TMW]
skin notation

Belgium: 15 ppm STEL; 80 mg/m3 STEL
10 ppm TWA; 53 mg/m3 TWA
Skin

Denmark: 10 ppm TWA; 50 mg/m3 TWA

Finland: 2 ppm STEL; 10 mg/m3 STEL
1 ppm TWA; 5 mg/m3 TWA

France: 10 ppm TWA [VME]; 50 mg/m3 TWA [VME]

Germany: 0.1 ppm TWA AGW (The risk of damage to the embryo or fetus can be excluded when MAK and BAT values are observed, inhalable fraction, exposure factor 1); 0.5 mg/m3 TWA AGW (The risk of damage to the embryo or fetus can be excluded when MAK and BAT values are observed, inhalable fraction, exposure factor 1)

Greece: 10 ppm TWA; 50 mg/m3 TWA

Ireland: 15 ppm STEL; 75 mg/m3 STEL
10 ppm TWA; 50 mg/m3 TWA

Netherlands: 80 mg/m3 STEL
50 mg/m3 TWA

Portugal: 10 ppm TWA [VLE-MP]

Spain: 15 ppm STEL [VLA-EC]; 80 mg/m3 STEL [VLA-EC]
10 ppm TWA [VLA-ED]; 53 mg/m3 TWA [VLA-ED]
skin - potential for cutaneous exposure

Sweden: 10 ppm LLV; 50 mg/m3 LLV
15 ppm STV; 80 mg/m3 STV

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Red or reddish/orange colored (dyed)	**Odor:**	Mild, petroleum distillate odor
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	0.009 psia @ 70 °F (21 °C)	**Vapor Density:**	>1.0
Boiling Point:	340 to 700 °F (171 to 371 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible	**Specific Gravity:**	AP 0.823-0871
Evaporation Rate:	Slow; varies with conditions	**VOC:**	ND
Octanol/H2O Coeff.:	ND	**Flash Point:**	100 °F (38 °C) minimum
Flash Point Method:	PMCC	**Upper Flammability Limit (UFL):**	7.5
Lower Flammability Limit (LFL):	0.6	**Burning Rate:**	ND
Auto Ignition:	494°F (257°C)		

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers; Fluorel ®

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Fuel oil No. 2 (68476-30-2)

Oral LD50 Rat 12 g/kg; Dermal LD50 Rabbit 4720 µL/kg; Dermal LD50 Rabbit >2000 mg/kg; Inhalation LC50 Rat 4.6 mg/L 4 h

Naphthalene (91-20-3)

Inhalation LC50 Rat >340 mg/m3 1 h; Oral LD50 Rat 490 mg/kg; Dermal LD50 Rat >2500 mg/kg; Dermal LD50 Rabbit >20 g/kg

Product Mixture

Oral LD50 Rat 14.5 ml/kg; Dermal LD50 Rabbit >5 mL/kg; Guinea Pig Sensitization: negative; Primary dermal irritation: moderately irritating (Draize mean irritation score - 3.98 rabbits); Draize eye irritation: mildly irritating (Draize score, 48 hours, unwashed - 2.0 rabbits)

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Contact with eyes may cause mild irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This product is not reported to have any mutagenic effects. Material of similar composition has been positive in a mutagenicity study.

Carcinogenicity

A: General Product Information

Suspected of causing cancer.

Dermal carcinogenicity: positive - mice

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

This product is similar to Diesel Fuel. IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A) and NIOSH regards it as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

B: Component Carcinogenicity

Fuel oil No. 2 (68476-30-2)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans (listed under Diesel fuel)

Naphthalene (91-20-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
NTP: Reasonably Anticipated To Be A Human Carcinogen (Possible Select Carcinogen)
IARC: Monograph 82 [2002] (Group 2B (possibly carcinogenic to humans))

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity repeat exposure effects.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Very toxic to aquatic life with long lasting effects. 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

Fuel oil No. 2 (68476-30-2)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	35 mg/L [flow-through]	

Naphthalene (91-20-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	5.74-6.44 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	1.6 mg/L [flow-through]	

96 Hr LC50 Oncorhynchus mykiss	0.91-2.82 mg/L [static]
96 Hr LC50 Pimephales promelas	1.99 mg/L [static]
96 Hr LC50 Lepomis macrochirus	31.0265 mg/L [static]
72 Hr EC50 Skeletonema costatum	0.4 mg/L
48 Hr LC50 Daphnia magna	2.16 mg/L
48 Hr EC50 Daphnia magna	1.96 mg/L [Flow through]
48 Hr EC50 Daphnia magna	1.09 - 3.4 mg/L [Static]

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

IATA Information

Shipping Name: Heating oil, light
UN #: 1202 **Hazard Class:** 3 **Packing Group:** III

ICAO Information

Shipping Name: Heating oil, light
UN #: 1202 **Hazard Class:** 3 **Packing Group:** III

IMDG Information

Shipping Name: Heating oil, light
UN #: 1202 **Hazard Class:** 3 **Packing Group:** III

* * * Section 15 - Regulatory Information * * *

Regulatory Information

Component Analysis – Inventory

Component/CAS	EC #	EEC	CAN	TSCA
Fuel oil No. 2 68476-30-2	270-671-4	EINECS	DSL	Yes
Naphthalene 91-20-3	202-049-5	EINECS	DSL	Yes

* * * Section 16 - Other Information * * *

Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; ADG = Australian Code for the Transport of Dangerous Goods by Road and Rail; ADR/RID = European Agreement of Dangerous Goods by Road/Rail; AS = Standards Australia; DFG = Deutsche Forschungsgemeinschaft; DOT = Department of Transportation; DSL = Domestic Substances List; EEC = European Economic Community; EINECS = European Inventory of Existing Commercial Chemical Substances; ELINCS = European List of Notified Chemical Substances; EU = European Union; HMIS = Hazardous Materials Identification System; IARC = International Agency for Research on Cancer; IMO = International Maritime Organization; IATA = International Air Transport Association; MAK = Maximum Concentration Value in the Workplace; NDSL = Non-Domestic Substances List; NFPA = National Fire Protection Association; NOHSC = National Occupational Health & Safety Commission; NTP = National Toxicology Program; STEL = Short-term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; TSCA = Toxic Substances Control Act; TWA = Time Weighted Average

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 6.2
Revision Date 23.06.2020
Print Date 19.06.2021
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name	:	trans-Chlordane
Product Number	:	ERC-004
Brand	:	Cerilliant
REACH No.	:	A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.
CAS-No.	:	5103-74-2

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich Inc. 3050 SPRUCE ST ST. LOUIS MO 63103 UNITED STATES
Telephone	:	+1 314 771-5765
Fax	:	+1 800 325-5052

1.4 Emergency telephone

Emergency Phone #	:	800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 4), H332
Carcinogenicity (Category 2), H351
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

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

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008

Pictogram	
Signal word	Danger
Hazard statement(s)	
H301	Toxic if swallowed.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P273	Avoid release to the environment.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
Supplemental Hazard Statements	none

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Substances

Molecular weight	:	409,78 g/mol
CAS-No.	:	5103-74-2
EC-No.	:	225-826-0

Component	Classification	Concentration
trans-Chlordane		
	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H332, H351, H400, H410 M-Factor - Aquatic Acute: 10	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Consult a physician. Show this material safety data sheet to the doctor in attendance.

If inhaled

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

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

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

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

SECTION 5: Firefighting measures

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapors, 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.

SECTION 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. Store in cool place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

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.

The selected protective gloves have to satisfy the specifications of Regulation (EU) 2016/425 and the standard EN 374 derived from it.

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.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Color: white
b)	Odor	odorless

c)	Odor 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)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Relative density	1,590 g/cm3
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition 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

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 200 mg/kg
LD50 Oral - Mouse - 145 mg/kg
Inhalation: (Regulation (EC) No 1272/2008, Annex VI)

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity

Carcinogenicity
Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (trans-Chlordane)

Reproductive toxicity

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

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

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

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0,044 mg/l - 96,0 h Remarks: (in analogy to similar products)
	LOEC - Pimephales promelas (fathead minnow) - 0,025 mg/l - 48,0 h Remarks: (in analogy to similar products)

Toxicity to daphnia and other aquatic invertebrates	LOEC - Daphnia magna (Water flea) - 0,07 mg/l - 48 h Remarks: (in analogy to similar products)
	LC50 - Daphnia magna (Water flea) - 0,0984 mg/l - 48 h Remarks: (in analogy to similar products)

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
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects
Very toxic to aquatic life with long lasting effects.
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Waste material must be disposed of in accordance with the Directive on waste 2008/98/EC as well as other national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number
ADR/RID: 3077 IMDG: 3077 IATA: 3077

14.2 UN proper shipping name
ADR/RID: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (trans-Chlordane)
IMDG: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (trans-Chlordane)
IATA: Environmentally hazardous substance, solid, n.o.s. (trans-Chlordane)

14.3 Transport hazard class(es)
ADR/RID: 9 IMDG: 9 IATA: 9

14.4 Packaging group
ADR/RID: III IMDG: III IATA: III

14.5 Environmental hazards
ADR/RID: yes IMDG Marine pollutant: yes IATA: yes

14.6 Special precautions for user

No data available

SECTION 15: Regulatory information

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

This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.2 Chemical Safety Assessment

For this product a chemical safety assessment was not carried out

SECTION 16: Other information

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

H301	Toxic if swallowed.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

SAFETY DATA SHEET

SDS ID NO.: 0127MAR019
Revision Date: 06/01/2016

1. IDENTIFICATION

Product Name: Marathon Petroleum Gasoline - All Grades

Synonym: Gasoline; Regular Unleaded Gasoline; Conventional Regular Unleaded Gasoline; Mid Grade Unleaded Gasoline; Conventional Mid Grade Unleaded Gasoline; Premium Unleaded Gasoline; Conventional Premium Unleaded Gasoline; Sub-Octane Gasoline; Regular RBOB; Super RBOB; Premium RBOB; RBOB; Reformulated Blend Stock For Oxygenated Blending; 84 Octane Gasoline; CBOB; Premium CBOB; Conventional Blend Stock for Oxygenate Blending; Recreational Gasoline; Recreational Gasoline; Recreational Unleaded Gasoline; 89 Recreational Gasoline; Brand 89 Recreational Gasoline; 7.0 Max RVP 89 Recreational Gasoline; BR 7.0 Max RVP 89 Recreational Gasoline; 90 Recreational Gasoline; 90 Marina Gasoline; Brand 91 Recreational Gasoline; 91 Recreational Gasoline; 91 Marina Gasoline; 90 Octane Midgrade Gasoline with No Ethanol; 0125MAR019; 0126MAR019; 0134MAR019; 0313MAR019; 0314MAR019

Chemical Family: Complex Hydrocarbon Substance

Recommended Use: Fuel.
Restrictions on Use: All others.

Manufacturer, Importer, or Responsible Party Name and Address:

MARATHON PETROLEUM COMPANY LP
539 South Main Street
Findlay, OH 45840

SDS information: 1-419-421-3070

Emergency Telephone: 1-877-627-5463

2. HAZARD IDENTIFICATION

Classification

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

Flammable liquids	Category 1
Skin corrosion/irritation	Category 2
Germ cell mutagenicity	Category 1B
Carcinogenicity	Category 1B
Reproductive toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Aspiration toxicity	Category 1
Acute aquatic toxicity	Category 2
Chronic aquatic toxicity	Category 2

Hazards Not Otherwise Classified (HNOC)

Static accumulating flammable liquid

Label elements

EMERGENCY OVERVIEW

Danger

EXTREMELY FLAMMABLE LIQUID AND VAPOR
May accumulate electrostatic charge and ignite or explode
May be fatal if swallowed and enters airways
Causes skin irritation
May cause respiratory irritation
May cause drowsiness or dizziness
May cause genetic defects
May cause cancer
Suspected of damaging fertility or the unborn child
Toxic to aquatic life with long lasting effects

Appearance Clear yellow liquid **Physical State** Liquid **Odor** Hydrocarbon

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/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
Avoid breathing mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Wash hands and any possibly exposed skin thoroughly after handling
Avoid release to the environment

Precautionary Statements - Response
IF exposed or concerned: Get medical attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
If skin irritation occurs: Get medical attention
Wash contaminated clothing before reuse
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor if you feel unwell
IF SWALLOWED: Immediately call a POISON CENTER or doctor
Do NOT induce vomiting
In case of fire: Use water spray, fog or regular foam for extinction
Collect spillage

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

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

Gasoline is a complex combination of hydrocarbons consisting of paraffins, cycloparaffins, aromatic and olefinic hydrocarbons having molecular chains ranging in length from four to ten carbons. May contain small amounts of dye and other additives (>0.02%) which are not considered hazardous at the concentrations used.

Composition Information:

Name	CAS Number	% Concentration
Gasoline	86290-81-5	100
Heptane (mixed isomers)	142-82-5	2.5-26
Pentane (mixed isomers)	78-78-4	6.5-19
Butane (mixed isomers)	106-97-8	0.5-14
Hexane Isomers (other than n-Hexane)	107-83-5	2-12
Toluene	108-88-3	3-9.5
Xylene (mixed isomers)	1330-20-7	3.5-9.5
n-Hexane	110-54-3	0.1-4.5
Cumene	98-82-8	0-4
1,2,4 Trimethylbenzene	95-63-6	1-4
Ethylbenzene	100-41-4	0.5-2.5
Benzene	71-43-2	0.1-1.5
Cyclohexane	110-82-7	0-1.5
Octane	111-65-9	0-1.5
1,2,3-trimethylbenzene	526-73-8	0-1
Naphthalene	91-20-3	0.1-0.5

All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

4. FIRST AID MEASURES

First Aid Measures

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation: Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Keep affected person warm and at rest. If symptoms occur get medical attention.

Skin Contact: Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes. May be absorbed through the skin in harmful amounts. Get medical attention if irritation persists. Any injection injury from high pressure equipment should be evaluated immediately by a physician as potentially serious (See NOTES TO PHYSICIAN).

Place contaminated clothing in closed container until cleaned or discarded. If clothing is to be laundered, inform the person performing the operation of contaminant's hazardous properties. Destroy contaminated, non-chemical resistant footwear.

Eye Contact: Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Gently remove contacts while flushing. Get medical attention if irritation persists.

Ingestion: Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips, or if patient is lying down, turn body and head to side to prevent aspiration and monitor for breathing difficulty. Never give anything by mouth to an unconscious person. Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse Effects: Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking.

Indication of any immediate medical attention and special treatment needed

Notes To Physician: INHALATION: This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

SKIN: Leaks or accidents involving high-pressure equipment may inject a stream of material through the skin and initially produce an injury that may not appear serious. Only a small puncture wound may appear on the skin surface but, without proper treatment and depending on the nature, original pressure, volume, and location of the injected material, can compromise blood supply to an affected body part. Prompt surgical debridement of the wound may be necessary to prevent irreversible loss of function and/or the affected body part. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES.

INGESTION: This material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFF/ATC) can be used. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media
Do not use straight water streams to avoid spreading fire.

Specific hazards arising from the chemical
This product has been determined to be an extremely flammable liquid per the OSHA Hazard Communication Standard and should be handled accordingly. May accumulate electrostatic charge and ignite or explode. Vapors may travel along the ground or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information, see NFPA 30 or the Emergency Response Guidebook 128.

Hazardous combustion products
Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data
Sensitivity to Mechanical Impact No.
Sensitivity to Static Discharge Yes.

Special protective equipment and precautions for firefighters
Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Avoid using straight water streams. Water may be ineffective in extinguishing low flash point fires, but can be used to cool exposed surfaces. Avoid excessive water spray application. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Keep run-off water out of sewers and water sources.

Additional firefighting tactics
FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles: if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA	Health 1	Flammability 3	Instability 0	Special Hazard -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources.
Protective equipment:	Use personal protection measures as recommended in Section 8.
Emergency procedures:	Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.
Environmental precautions:	Avoid release to the environment. Avoid subsoil penetration. Ethanol in gasoline phase seperates in contact with water. Monitor downstream for dissolved ethanol or other appropriate indicators.
Methods and materials for containment:	Contain liquid with sand or soil. Prevent spilled material from entering storm drains, sewers, and open waterways.
Methods and materials for cleaning up:	Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids. Recover and return free product to proper containers. When recovering free liquids ensure all equipment is grounded and bonded. Use only non-sparking tools.

7. HANDLING AND STORAGE

Safe Handling Precautions:

NEVER SIPHON THIS PRODUCT BY MOUTH. Use appropriate grounding and bonding practices. Static accumulating flammable liquid. Bonding and grounding may be insufficient to eliminate the hazard from static electricity. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Vapors may travel along the ground or be moved by ventilation. Flashback may occur along vapor trails. No smoking. Use only non-sparking tools. Avoid contact with skin, eyes and clothing. Avoid breathing fumes, gas, or vapors. Use only with adequate ventilation. Avoid repeated and prolonged skin contact. Use personal protection measures as recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Refer to applicable EPA, OSHA, NFPA and consistent state and local requirements.

Hydrocarbons are basically non-conductors of electricity and can become electrostatically charged during mixing, filtering, pumping at high flow rates or loading and transfer operations. If this charge reaches a sufficiently high level, sparks can form that may ignite the vapors of flammable liquids. Sudden release of hot organic chemical vapors or mists from process equipment operating under elevated temperature and pressure, or sudden ingress of air into vacuum equipment may result in ignition of vapors or mists without the presence of obvious ignition sources. Nozzle spouts must be kept in contact with the containers or tank during the entire filling operation.

Portable containers should never be filled while in or on a motor vehicle or marine craft. Containers should be placed on the ground. Static electric discharge can ignite fuel vapors when filling non-grounded containers or vehicles on trailers. The nozzle spout must be kept in contact with the container before and during the entire filling operation. Use only approved containers.

A buildup of static electricity can occur upon re-entry into a vehicle during fueling especially in cold or dry climate conditions. The charge is generated by the action of dissimilar fabrics (i.e., clothing and upholstery) rubbing across each other as a person enters/exits the vehicle. A flash fire can result from this discharge if sufficient flammable vapors are present. Therefore, do not get back in your vehicle while refueling.

Cellular phones and other electronic devices may have the potential to emit electrical charges (sparks). Sparks in potentially explosive atmospheres (including fueling areas such as gas stations) could cause an explosion if sufficient flammable vapors are present. Therefore, turn off cellular phones and other electronic devices when working in potentially explosive atmospheres or keep devices inside your vehicle during refueling.

High-pressure injection of any material through the skin is a serious medical emergency even though the small entrance wound at the injection site may not initially appear serious. These injection injuries can occur from high-pressure equipment such as paint spray or grease or guns, fuel injectors, or pinhole leaks in hoses or hydraulic lines and should all be considered serious. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES (See First Aid Section 4).

Storage Conditions:

Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Do not store near an open flame, heat or other sources of ignition.

Incompatible Materials

Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	ACGIH TLV	OSHA PELS:	OSHA - Vacated PELs	NIOSH IDLH
Gasoline 86290-81-5	300 ppm TWA 500 ppm STEL	-	300 ppm TWA 900 mg/m^3 TWA 500 ppm STEL 1500 mg/m^3 STEL	-

Heptane (mixed isomers) 142-82-5	400 ppm TWA 500 ppm STEL	TWA: 500 ppm TWA: 2000 mg/m³	400 ppm TWA 1600 mg/m³ TWA 500 ppm STEL 2000 mg/m³ STEL	750 ppm
Pentane (mixed isomers) 78-78-4	1000 ppm TWA	-	-	-
Butane (mixed isomers) 106-97-8	1000 ppm STEL	-	800 ppm TWA 1900 mg/m³ TWA	-
Hexane Isomers (other than n-Hexane) 107-83-5	500 ppm TWA 1000 ppm STEL	-	500 ppm TWA 1800 mg/m³ TWA 1000 ppm STEL 3600 mg/m³ STEL	-
Toluene 108-88-3	20 ppm TWA	TWA: 200 ppm Ceiling: 300 ppm	100 ppm TWA 375 mg/m³ TWA 150 ppm STEL 560 mg/m³ STEL	500 ppm
Xylene (mixed isomers) 1330-20-7	100 ppm TWA 150 ppm STEL	TWA: 100 ppm TWA: 435 mg/m³	100 ppm TWA 435 mg/m³ TWA 150 ppm STEL 655 mg/m³ STEL	900 ppm
n-Hexane 110-54-3	50 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 500 ppm TWA: 1800 mg/m³	50 ppm TWA 180 mg/m³ TWA	1100 ppm
Cumene 98-82-8	50 ppm TWA	TWA: 50 ppm TWA: 245 mg/m³ Skin	50 ppm TWA 245 mg/m³ TWA Limit applies to skin	900 ppm
1,2,4 Trimethylbenzene 95-63-6	25 ppm TWA	-	25 ppm TWA 125 mg/m³ TWA	-
Ethylbenzene 100-41-4	20 ppm TWA	TWA: 100 ppm TWA: 435 mg/m³	100 ppm TWA 435 mg/m³ TWA 125 ppm STEL 545 mg/m³ STEL	800 ppm
Benzene 71-43-2	0.5 ppm TWA 2.5 ppm STEL Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm (applies to industry segments exempt from the benzene standard) TWA: 1 ppm STEL: 5 ppm (see 29 CFR 1910.1028)	25 ppm Ceiling 1 ppm TWA 5 ppm STEL	500 ppm
Cyclohexane 110-82-7	100 ppm TWA	TWA: 300 ppm TWA: 1050 mg/m³	300 ppm TWA 1050 mg/m³ TWA	1300 ppm
Octane 111-65-9	300 ppm TWA	TWA: 500 ppm TWA: 2350 mg/m³	300 ppm TWA 1450 mg/m³ TWA 375 ppm STEL 1800 mg/m³ STEL	1000 ppm
1,2,3-trimethylbenzene 526-73-8	25 ppm TWA	-	25 ppm TWA 125 mg/m³ TWA	-
Naphthalene 91-20-3	10 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm TWA: 50 mg/m³	10 ppm TWA 50 mg/m³ TWA 15 ppm STEL 75 mg/m³ STEL	250 ppm

Notes: The manufacturer has voluntarily elected to provide exposure limits contained in OSHA's 1989 air contaminants standard in its SDSs, even though certain of those exposure limits were vacated in 1992.

Engineering measures: Local or general exhaust required in an enclosed area or when there is inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof.

Personal protective equipment

Eye protection:	Use goggles or face-shield if the potential for splashing exists.
Skin and body protection:	Use nitrile rubber, Viton® or PVA gloves for repeated or prolonged skin exposure. Glove suitability is based on workplace conditions and usage. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.
Respiratory protection:	Use a NIOSH approved organic vapor chemical cartridge or supplied air respirators when there is the potential for airborne exposures to exceed permissible exposure limits or if excessive vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.
Hygiene measures:	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State	Liquid
Appearance	Clear yellow liquid
Color	Yellow
Odor	Hydrocarbon
Odor Threshold	No data available.

Property	**Values (Method)**
Melting Point / Freezing Point	No data available.
Initial Boiling Point / Boiling Range	24-210 °C / 75-410 °F (ASTM D86)
Flash Point	-43 °C / -45 °F
Evaporation Rate	No data available.
Flammability (solid, gas)	Not applicable.
Flammability Limit in Air (%):	
Upper Flammability Limit:	7.6
Lower Flammability Limit:	1.4
Explosion limits:	No data available.
Vapor Pressure	5.5-15 psi (ASTM D4814)
Vapor Density	3-4
Specific Gravity / Relative Density	0.70-0.76
Water Solubility	No data available.
Solubility in other solvents	No data available.
Partition Coefficient	2.13-4.5
Decomposition temperature	No data available.
pH:	Not applicable
Autoignition Temperature	280 °C / 536 °F
Kinematic Viscosity	No data available.
Dynamic Viscosity	No data available.
Explosive Properties	No data available.
VOC Content (%)	100%
Density	No data available.
Bulk Density	Not applicable.

10. STABILITY AND REACTIVITY

Reactivity	The product is non-reactive under normal conditions.
Chemical stability	The material is stable at 70°F, 760 mmHg pressure.
Possibility of hazardous reactions	None under normal processing.
Hazardous polymerization	Will not occur.

Conditions to avoid Excessive heat, sources of ignition, open flame.

Incompatible Materials Strong oxidizing agents.

Hazardous decomposition products None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation May cause irritation of respiratory tract. May cause drowsiness or dizziness. Breathing high concentrations of this material in a confined space or by intentional abuse can cause irregular heartbeats which can cause death.

Eye contact Exposure to vapor or contact with liquid may cause mild eye irritation, including tearing, stinging, and redness.

Skin contact Causes skin irritation. Effects may become more serious with repeated or prolonged contact. May be absorbed through the skin in harmful amounts.

Ingestion May be fatal if swallowed or vomited and enters airways. May cause irritation of the mouth, throat and gastrointestinal tract.

Acute toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
Gasoline 86290-81-5	14000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.2 mg/L (Rat) 4 h
Heptane (mixed isomers) 142-82-5	-	3000 mg/kg (Rabbit)	103 g/m^3 (Rat) 4 h
Pentane (mixed isomers) 78-78-4	-	-	450 mg/L (Mouse) 2 h
Butane (mixed isomers) 106-97-8	-	-	658 mg/L (Rat) 4 h
Hexane Isomers (other than n-Hexane) 107-83-5	> 5000 mg/kg (Rat)	-	-
Toluene 108-88-3	> 2000 mg/kg (Rat)	8390 mg/kg (Rabbit)	12.5 mg/L (Rat) 4 h
Xylene (mixed isomers) 1330-20-7	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.04 mg/L (Rat) 4 h
n-Hexane 110-54-3	15000 mg/kg (Rat)	3000 mg/kg (Rabbit)	48000 ppm (Rat) 4 h
Cumene 98-82-8	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 20 mg/L (Rat) 6 h
1,2,4 Trimethylbenzene 95-63-6	3280 mg/kg (Rat)	> 3160 mg/kg (Rabbit)	18,000 mg/m^3 (Rat) 4 h
Ethylbenzene 100-41-4	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	17.2 mg/L (Rat) 4 h
Benzene 71-43-2	> 2000 mg/kg (Rat)	> 5000 mg/kg (Rabbit)	> 20 mg/l (Rat) 4 h
Cyclohexane 110-82-7	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	13.9 mg/L (Rat) 4 h
Octane 111-65-9	-	-	118 g/m^3 (Rat) 4 h
1,2,3-trimethylbenzene 526-73-8	-	-	-
Naphthalene 91-20-3	490 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 340 mg/m^3 (Rat) 1 h

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

NAPHTHAS: In a large epidemiological study on over 15,000 employees at several petroleum refineries and amongst residents located near these refineries, no increased risk of kidney cancer was observed in association with gasoline exposures (a similar material). In a similar study, no increased risk of kidney cancer was observed among petroleum refinery workers, but there was a slight trend in the incidence of kidney cancers among service station employees, especially after a 30-year latency period. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffer's Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline.

ISOPARAFFINS: Studies in laboratory animals have shown that long-term exposure to similar materials (isoparaffins) can cause kidney damage and kidney cancer in male laboratory rats. However, in-depth research indicates that these findings are unique to the male rat, and that these effects are not relevant to humans.

C9 AROMATIC HYDROCARBONS: A developmental inhalation study was conducted in laboratory mice. Increased implantation losses, reduced fetal weights, delayed ossification and an increased incidence of cleft palate were observed at the highest exposure level (1,500 ppm). This exposure level was extremely toxic to pregnant female mice (44% mortality). Reduced fetal body weights were also observed at 500 ppm. A multi-generation reproduction inhalation study was conducted in laboratory rats. Reductions in pup weights, pup weight gain, litter size, and pup survival were observed at 1,500 ppm, an exposure level at which significant maternal toxicity was observed. Reduced pup weight gain was also observed at 500 ppm.

PENTANES: Studies of pentane isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol.%) may induce cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

BUTANES: Studies in laboratory animals indicate exposure to extremely high levels of butanes (1-10 or higher vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

TOLUENE: Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Abuse of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system, and can cause CNS depression, cardiac arrhythmias, and death. Studies of workers indicate longterm exposure may be related to impaired color vision and hearing. Some studies of workers suggest longterm exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest longterm exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals have been largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Adverse effects on the liver, kidney, thymus and nervous system were observed in animal studies following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

XYLENES, ALL ISOMERS: Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, nervous system damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross overexposure. Effects from Prolonged or Repeated Exposure: Impaired neurological function was reported

in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure with evidence of maternal toxicity. The relevance of these observations to humans is not clear at this time. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

1,2,4-TRIMETHYLBENZENE: The following information pertains to a mixture of C9 aromatic hydrocarbons, over 40% of which was composed of 1,2,4-trimethylbenzene. A developmental inhalation study was conducted in laboratory mice. Increased implantation losses, reduced fetal weights, delayed ossification and an increased incidence of cleft palate were observed at the highest exposure level (1,500 ppm). This exposure level was extremely toxic to pregnant female mice (44% mortality). Reduced fetal body weights were also observed at 500 ppm. A multi-generation reproduction inhalation study was conducted in laboratory rats. Reductions in pup weights, pup weight gain, litter size, and pup survival were observed at 1,500 ppm, an exposure level at which significant maternal toxicity was observed. Reduced pup weight gain was also observed at 500 ppm. Embryotoxicity has been reported in studies of laboratory animals. Adverse effects included increased implantation losses, reduced fetal weights, delayed ossification and an increased incidence of cleft palate.<n><n>

N-HEXANE: Long-term or repeated exposure to n-hexane can cause peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. Testicular atrophy and partial to full loss of the germ cell line were observed in sub-chronic high-dose inhalation studies of laboratory rodents. These effects appeared irreversible. Rodent reproduction studies have shown evidence of reduced fetal weight but no frank malformations.

CUMENE: Overexposure to cumene may cause upper respiratory tract irritation and CNS depression. Studies in laboratory animals indicate evidence of respiratory tract hyperplasia, and adverse effects on the liver, kidney and adrenal glands following high level exposure. The relevance of these findings to humans is not clear at this time. Findings from lifetime laboratory rodent inhalation studies were as follows: In F344/N rats: an increased incidence of renal carcinomas and adenomas, respiratory epithelial adenomas, and interstitial cell adenomas of the testes. In B6C3F1 mice: an increased incidence of carcinomas and adenomas of the bronchi and lung, liver neoplasms, hemangiosarcomas of the spleen, and adenomas of the thyroid.

ETHYLBENZENE: Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). The incidence of tumors was also elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure with evidence of maternal toxicity. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals have demonstrated evidence of ototoxicity (hearing loss) following exposure levels as low as 300 ppm for 5 days. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

BENZENE: Studies of workers exposed to benzene show clear evidence that overexposure can cause cancer and other diseases of the blood forming organs including Acute

Myelogenous Leukemia (AML), and Aplastic Anemia (AA), an often fatal disease. Some studies suggest overexposure to benzene may also be associated with Myelodysplastic Syndrome (MDS). Findings from a case control study of workers exposed to benzene was reported during the 2009 Benzene Symposium in Munich included an increase in Acute Myeloid Leukemias and Non-Hodgkins Lymphoid Neoplasms (NHLN) of the subtype follicular lymphoma (FL) in some occupational categories. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of AA have been reported in the offspring of persons severely overexposed to benzene. Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and minor skeletal variations. Benzene has been classified as a proven human carcinogen by OSHA and a Group 1 (Carcinogenic to Humans) material by IARC. The current proposed IARC classification for benzene is summarized as follows: Sufficient evidence for Acute Myeloid Leukemia; limited evidence for Acute Lymphatic Leukemia, Chronic Lymphatic Leukemia, Non-Hodgkin Lymphoma, and Multiple Myeloma.

NAPHTHALENE: Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from overexposure to naphthalene. Persons with glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have been reported in persons overexposed to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect. Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) in vitro. Naphthalene has been classified as Possibly Carcinogenic to Humans (2B) by IARC, based on findings from studies in laboratory animals.

CARBON MONOXIDE: is a chemical asphyxiant with no warning properties (such as odor). At 400-500 ppm for 1 hour headache and dyspnea may occur. If activity is increased, symptoms of overexposure may include nausea, irritability, increased respiration, tinnitus, sweating, chest pain, confusion, impaired judgement, dizziness, weakness, drowsiness, ataxia, irregular heart beat, cyanosis and pallor. Levels in excess of 1000 ppm can result in collapse, loss of conciousness, respiratory failure and death. Extremely high concentrations (12,800 ppm) can cause immediate unconsciousness and death in 1-3 minutes. Repeated anoxia can lead to central nervous system damage and peripheral neuropathy, with loss of sensation in the fingers, amnesia, and mental deterioration and possible congestive heart failure. Damage may also occur to the fetus, lung, liver, kidney, spleen, cardiovascular system and other organs.

WHOLLY-VAPORIZED UNLEADED GASOLINE: Lifetime exposure to wholly vaporized unleaded gasoline produced an increased incidence of liver tumors in female mice exposed to the highest exposure concentration (2056 ppm) and α-2 urinary globulin-mediated kidney tumors in male rats. No exposure-related tumors were observed in male mice or female rats. The male-specific rat kidney tumors are not considered relevant to human health. Mice receiving lifetime repeated skin application of various petroleum naphthas exhibited an irritation-dependent increased incidence of skin tumors. Additional studies suggest that these tumors occur through a mechanism that may not be relevant to human health. Epidemiological data from over 18,000 petroleum marketing and distribution workers

showed no increased risk of leukemia, multiple myeloma, or kidney cancer resulting from gasoline exposure. Unleaded gasoline has been identified as possibly carcinogenic to humans (2B) by the International Agency for Research on Cancer (IARC).

COMBUSTION ENGINE EXHAUST: Chronic inhalation studies of gasoline engine exhaust in mice, rats and hamsters did not produce any carcinogenic effects. Condensates/extracts of gasoline engine exhaust produced an increase in tumors compared to controls when testing by skin painting, subcutaneous injection, intratracheal instillation or implantation into the lungs. Gasoline exhaust has been classified as possibly carcinogenic to humans (2B) by the International Agency for Research on Cancer (IARC).

Adverse effects related to the physical, chemical and toxicological characteristics

Signs and Symptoms Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking.

Sensitization Not expected to be a skin or respiratory sensitizer.

Mutagenic effects May cause genetic defects.

Carcinogenicity May cause cancer.

Cancer designations are listed in the table below

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
Gasoline 86290-81-5	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Not Listed	Not Listed
Heptane (mixed isomers) 142-82-5	Not Listed	Not Listed	Not Listed	Not Listed
Pentane (mixed isomers) 78-78-4	Not Listed	Not Listed	Not Listed	Not Listed
Butane (mixed isomers) 106-97-8	Not Listed	Not Listed	Not Listed	Not Listed
Hexane Isomers (other than n-Hexane) 107-83-5	Not Listed	Not Listed	Not Listed	Not Listed
Toluene 108-88-3	Not Classifiable (A4)	Not Classifiable (3)	Not Listed	Not Listed
Xylene (mixed isomers) 1330-20-7	Not classifiable (A4)	Not classifiable (3)	Not Listed	Not Listed
n-Hexane 110-54-3	Not Listed	Not Listed	Not Listed	Not Listed
Cumene 98-82-8	Not listed	Possible human carcinogen (2B)	Reasonably anticipated to be a human carcinogen	Not listed
1,2,4 Trimethylbenzene 95-63-6	Not Listed	Not Listed	Not Listed	Not Listed
Ethylbenzene 100-41-4	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Not Listed	Not Listed
Benzene 71-43-2	Confirmed human carcinogen (A1)	Carcinogenic to humans (1)	Known to be human carcinogen	Known carcinogen
Cyclohexane 110-82-7	Not Listed	Not Listed	Not Listed	Not Listed
Octane 111-65-9	Not Listed	Not Listed	Not Listed	Not Listed
1,2,3-trimethylbenzene 526-73-8	Not Listed	Not Listed	Not Listed	Not Listed
Naphthalene 91-20-3	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Reasonably anticipated to be a human carcinogen	Not Listed

Reproductive toxicity Suspected of damaging fertility or the unborn child.

Specific Target Organ Toxicity (STOT) - single exposure Respiratory system. Central nervous system.

Specific Target Organ Toxicity (STOT) - repeated exposure Not classified.

Aspiration hazard May be fatal if swallowed or vomited and enters airways.

12. ECOLOGICAL INFORMATION

Ecotoxicity This product should be considered toxic to aquatic organisms, with the potential to cause long lasting adverse effects in the aquatic environment.

Name	Algae/aquatic plants	Fish	Toxicity to Microorganisms	Crustacea
Gasoline 86290-81-5	72-hr EC50 = 56 mg/l Algae	96-hr LC50 = 11 mg/l Rainbow trout (static)	-	48-hr LC50 = 7.6 mg/l Daphnia magna
Heptane (mixed isomers) 142-82-5	-	96-hr LC50 = 375 mg/L Tilapia	-	-
Pentane (mixed isomers) 78-78-4	-	96-hr LC50 = 3.1 mg/L Rainbow trout	-	48-hr EC50 = >1 - <10 mg/L Daphnia magna
Butane (mixed isomers) 106-97-8	-	-	-	-
Hexane Isomers (other than n-Hexane) 107-83-5	-	-	-	-
Toluene 108-88-3	72-hr EC50 = 12.5 mg/l Algae	96-hr LC50 <= 10 mg/l Rainbow trout	-	48-hr EC50 = 5.46-9.83 mg/l Daphnia magna 48-hr EC50 = 11.5 mg/l Daphnia magna (Static)
Xylene (mixed isomers) 1330-20-7	72-hr EC50 = 11 mg/l Algae	96-hr LC50 = 8 mg/l Rainbow trout	-	48-hr LC50 = 3.82 mg/l Daphnia magna
n-Hexane 110-54-3	-	96-hr LC50 = 2.5 mg/l Fathead minnow	-	-
Cumene 98-82-8	72-hr EC50 = 2.6 mg/l Algae	96-hr LC50 = 6.04-6.61 mg/l Fathead minnow (Flow-through) 96-hr LC50 = 2.7 mg/l Rainbow trout (semi-static)	-	48-hr EC50 = 7.9-14.1 mg/l Daphnia magna (static)
1,2,4 Trimethylbenzene 95-63-6	-	96-hr LC50 = 7.19-8.28 mg/l Fathead minnow (flow-through)	-	48-hr EC50 = 6.14 mg/L Daphnia magna
Ethylbenzene 100-41-4	72-hr EC50 = 1.7-7.6 mg/l Algae	96-hr LC50 = 4 mg/L Rainbow trout	-	48-hr EC50 = 1-4 mg/L Daphnia magna
Benzene 71-43-2	72-hr EC50 = 29 mg/l Algae	96-hr LC50 = 5.3 mg/l Rainbow trout (flow-through)	-	48-hr EC50 = 8.76-15.6 mg/l Daphnia magna (Static)
Cyclohexane 110-82-7	72-hr EC50 = 500 mg/l Algae	96-hr LC50 = 3.96-5.18 mg/l Fathead minnow	-	48-hr EC50 = 1.7-3.5 mg/L Bay shrimp
Octane 111-65-9	-	-	-	48-hr LC50 = 0.38 mg/l Daphnia magna
1,2,3-trimethylbenzene 526-73-8	-	96-hr LC50 = 7.72 mg/l Fathead Minnow (flow-through)	-	-
Naphthalene 91-20-3	-	96-hr LC50 = 0.91-2.82 mg/l Rainbow trout (static) 96-hr LC50 = 1.99 mg/l Fathead minnow (static)	-	48-hr LC50 = 1.6 mg/l Daphnia magna

Persistence and degradability Expected to be inherently biodegradable. The presence of ethanol in this product may impede the biodegradation of benzene, toluene, ethylbenzene and xylene in groundwater, resulting in elongated plumes of these constituents.

Bioaccumulation Has the potential to bioaccumulate.

Mobility in soil May partition into air, soil and water.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of Waste Residues
This material may be a flammable liquid waste.

Safe Handling of Wastes
Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of Wastes / Methods of Disposal
The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Methods of Contaminated Packaging Disposal
Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT (49 CFR 172.101):

UN Proper Shipping Name:	Gasoline
UN/Identification No:	UN 1203
Transport Hazard Class(es):	3
Packing Group:	II

TDG (Canada):

UN Proper Shipping Name:	Gasoline
UN/Identification No:	UN 1203
Transport Hazard Class(es):	3
Packing Group:	II

15. REGULATORY INFORMATION

US Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b): This product and/or its components are listed on the TSCA Chemical Inventory.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List.

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
Gasoline	NA
Heptane (mixed isomers)	NA
Pentane (mixed isomers)	NA
Butane (mixed isomers)	NA
Hexane Isomers (other than n-Hexane)	NA
Toluene	NA
Xylene (mixed isomers)	NA

n-Hexane	NA
Cumene	NA
1,2,4 Trimethylbenzene	NA
Ethylbenzene	NA
Benzene	NA
Cyclohexane	NA
Octane	NA
1,2,3-trimethylbenzene	NA
Naphthalene	NA

SARA Section 304: This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	Hazardous Substances RQs
Gasoline	NA
Heptane (mixed isomers)	NA
Pentane (mixed isomers)	NA
Butane (mixed isomers)	NA
Hexane Isomers (other than n-Hexane)	NA
Toluene	1000 lb final RQ 454 kg final RQ
Xylene (mixed isomers)	100 lb final RQ 45.4 kg final RQ
n-Hexane	5000 lb final RQ 2270 kg final RQ
Cumene	5000 lb final RQ 2270 kg final RQ
1,2,4 Trimethylbenzene	NA
Ethylbenzene	1000 lb final RQ 454 kg final RQ
Benzene	10 lb final RQ 4.54 kg final RQ
Cyclohexane	1000 lb final RQ 454 kg final RQ
Octane	NA
1,2,3-trimethylbenzene	NA
Naphthalene	100 lb final RQ 45.4 kg final RQ

SARA: The following EPA hazard categories apply to this product:

Acute Health Hazard
Chronic Health Hazard
Fire Hazard

SARA Section 313: This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting:
Gasoline	None
Heptane (mixed isomers)	None
Pentane (mixed isomers)	None
Butane (mixed isomers)	None
Hexane Isomers (other than n-Hexane)	None
Toluene	1.0 % de minimis concentration
Xylene (mixed isomers)	1.0 % de minimis concentration
n-Hexane	1.0 % de minimis concentration
Cumene	1.0 % de minimis concentration

1,2,4 Trimethylbenzene	1.0 % de minimis concentration
Ethylbenzene	0.1 % de minimis concentration
Benzene	0.1 % de minimis concentration
Cyclohexane	1.0 % de minimis concentration
Octane	None
1,2,3-trimethylbenzene	None
Naphthalene	0.1 % de minimis concentration

State and Community Right-To-Know Regulations:
The following component(s) of this material are identified on the regulatory lists below:

Gasoline

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 0957
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Not Listed
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Carcinogen; Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 0957 TPQ: 10000 lb (Under N.J.A.C. 7:1G, environmental hazardous substances in mixtures such as gasoline or new and used petroleum oil may be reported under these categories)
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Heptane (mixed isomers)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1339
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Pentane (mixed isomers)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1064
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Not Listed
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed

California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - fourth degree
New Jersey - Environmental Hazardous Substances List:	SN 1064 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Butane (mixed isomers)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 0273
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - fourth degree
New Jersey - Environmental Hazardous Substances List:	SN 0273 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Hexane Isomers (other than n-Hexane)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1285
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Not Listed
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Toluene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Developmental toxicity, initial date 1/1/91 Female reproductive toxicity, initial date 8/7/09
New Jersey Right-To-Know:	SN 1866
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan Critical Materials Register List:	100 lb Annual usage threshold
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed

New Jersey - Special Hazardous Substances:	Flammable - third degree; Teratogen
New Jersey - Environmental Hazardous Substances List:	SN 1866 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)

Xylene (mixed isomers)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 2014
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan Critical Materials Register List:	100 lb Annual usage threshold all isomers
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 2014 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)

n-Hexane

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1340
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 1340 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1 lb RQ (air); 1 lb RQ (land/water)

Cumene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Carcinogen, initial date 4/6/10
New Jersey Right-To-Know:	SN 0542
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 0542 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present

New York - Reporting of Releases Part 597 - List of Hazardous Substances:	5000 lb RQ (air); 1 lb RQ (land/water)
1,2,4 Trimethylbenzene	
Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1929
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed
Ethylbenzene	
Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Carcinogen, initial date 6/11/04
New Jersey Right-To-Know:	SN 0851
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Carcinogen; flammable - Third degree
New Jersey - Environmental Hazardous Substances List:	SN 0851 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)
Benzene	
Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Carcinogen, initial date 2/27/87 Developmental toxicity, initial date 12/26/97 Male reproductive toxicity, initial date 12/26/97
New Jersey Right-To-Know:	SN 0197
Pennsylvania Right-To-Know:	Environmental hazard; Special hazardous substance
Massachusetts Right-To Know:	Carcinogen; Extraordinarily hazardous
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin); Carcinogen (skin)
Michigan Critical Materials Register List:	100 lb Annual usage threshold
Massachusetts Extraordinarily Hazardous Substances:	Carcinogen; Extraordinarily hazardous
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Present
New Jersey - Special Hazardous Substances:	Carcinogen; Flammable - third degree; Mutagen
New Jersey - Environmental Hazardous Substances List:	SN 0197 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	10 lb RQ (air); 1 lb RQ (land/water)

Cyclohexane

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 0565
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 0565 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)

Octane

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1434
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

1,2,3-trimethylbenzene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1929
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Naphthalene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Carcinogen, initial date 4/19/02
New Jersey Right-To-Know:	SN 1322 SN 3758

Pennsylvania Right-To-Know:	Environmental hazard Present (particulate)
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Carcinogen
New Jersey - Environmental Hazardous Substances List:	SN 1322 TPQ: 500 lb (Reportable at the de minimis quantity of >0.1%)
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	100 lb RQ (air); 1 lb RQ (land/water)

Canada DSL/NDSL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Canadian Regulatory Information: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

Name	Canada - WHMIS: Classifications of Substances:	Canada - WHMIS: Ingredient Disclosure:
Gasoline	B2,D2A,D2B	0.1%
Heptane (mixed isomers)	B2,D2B	1%
Pentane (mixed isomers)	B2	1%
Butane (mixed isomers)	A,B1	1%
Hexane Isomers (other than n-Hexane)	B2	1%
Toluene	B2,D2A,D2B	0.1%
Xylene (mixed isomers)	B2,D2A,D2B	m-, o-isomers 1.0%; p-isomer 0.1%
n-Hexane	B2,D2A,D2B	1%
Cumene	B2,D2A	0.1%
1,2,4 Trimethylbenzene	B3,D2B	1%
Ethylbenzene	B2,D2A,D2B	0.1%
Benzene	B2,D2A,D2B	0.1%
Cyclohexane	B2,D2B	1%
Octane	B2,D2B	1%
1,2,3-trimethylbenzene	B3	1%
Naphthalene	B4,D2A	0.1%

Note: Not applicable.

16. OTHER INFORMATION

Prepared By Toxicology and Product Safety

Revision Date: 06/01/2016

Revision Note:

Revised Sections

The following sections (§) have been updated:
1. IDENTIFICATION
2. HAZARD IDENTIFICATION
3. COMPOSITION/INFORMATION ON INGREDIENTS
4. FIRST AID MEASURES
6. ACCIDENTAL RELEASE MEASURES
7. HANDLING AND STORAGE
8. EXPOSURE CONTROLS/PERSONAL PROTECTION
9. PHYSICAL AND CHEMICAL PROPERTIES
11. TOXICOLOGICAL INFORMATION
12. ECOLOGICAL INFORMATION
15. REGULATORY INFORMATION

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 is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not 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.

SAFETY DATA SHEET

Helium

Section 1. Identification

GHS product identifier : Helium

Chemical name : Helium

Other means of identification : helium (dot); Helium-4; He; o-Helium; UN 1046

Product use : Synthetic/Analytical chemistry.

Synonym : helium (dot); Helium-4; He; o-Helium; UN 1046

SDS # : 001025

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 - Compressed gas

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Contains gas under pressure; may explode if heated.
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.

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 : 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 : Helium

Other means of identification : helium (dot); Helium-4; He; o-Helium; UN 1046

CAS number/other identifiers

CAS number : 7440-59-7

Product code : 001025

Ingredient name	%	CAS number
Helium	100	7440-59-7

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

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. 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 : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

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.

Section 4. First aid measures

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 : No specific data.

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.

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. 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.

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. Avoid contact with eyes, skin and clothing. Avoid breathing gas. 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

Ingredient name	Exposure limits
Helium	Oxygen Depletion [Asphyxiant]

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

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.

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. [Compressed gas.]

Color : Colorless.

Molecular weight : 4 g/mole

Molecular formula : He

Boiling/condensation point : -268.9°C (-452°F)

Melting/freezing point : -272.2°C (-458°F)

Critical temperature : -267.9°C (-450.2°F)

Odor : Odorless.

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 : Not available.

Vapor density : 0.14 (Air = 1) Liquid Density@BP: 7.8 lb/ft3 (125 kg/m3)

Specific Volume (ft ^{3}/lb) : 96.1538

Gas Density (lb/ft ^{3}) : 0.0104

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : 0.28

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Section 9. Physical and chemical properties

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.

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.

Section 11. Toxicological information

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

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.

Section 12. Ecological information

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Helium	0.28	-	low

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	UN1046	UN1046	UN1046	UN1046	UN1046
UN proper shipping name	HELIUM, COMPRESSED	HELIUM, COMPRESSED	HELIUM, COMPRESSED	HELIUM, COMPRESSED	HELIUM, COMPRESSED
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 75 kg **Cargo aircraft** Quantity limitation: 150 kg	**Explosive Limit and Limited Quantity Index** 0.125 **Passenger Carrying Road or Rail Index** 75	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 75 kg **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 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 : Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Helium	100	No.	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.

Canada inventory : This material is listed or exempted.

International regulations

Section 15. Regulatory information

International lists : **Australia inventory (AICS)**: This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: Not determined.
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 not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not 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.)

Health	0
Flammability	0
Physical hazards	0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

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Section 16. Other information

History

Date of printing : 10/15/2014.

Date of issue/Date of revision : 10/15/2014.

Date of previous issue : 10/2/2014.

Version : 0.02

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United 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.

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

Version 5.6
Revision Date 04/24/2015
Print Date 02/09/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Heptachlor
Product Number	:	PS78
Brand	:	Supelco
Index-No.	:	602-046-00-2
CAS-No.	:	76-44-8

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 2), H300
Acute toxicity, Dermal (Category 2), H310
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure (Category 2), H373
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.
H373	May cause damage to organs through prolonged or repeated exposure.
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.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P302 + P350	IF ON SKIN: Gently wash with plenty of soap and water.
P310	Immediately call a POISON CENTER or doctor/ physician.
P322	Specific measures (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P361	Remove/Take off immediately all contaminated clothing.
P363	Wash contaminated clothing 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	:	1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene
Formula	:	$C_{10}H_5Cl_7$
Molecular weight	:	373.32 g/mol
CAS-No.	:	76-44-8
EC-No.	:	200-962-3
Index-No.	:	602-046-00-2

Hazardous components

Component	Classification	Concentration
Heptachlor		
	Acute Tox. 2; Carc. 2; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H300 + H310, H351, H373, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

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

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

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

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.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
Heptachlor	76-44-8	TWA	0.050000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Skin contact does contribute to exposure. Confirmed animal carcinogen with unknown relevance to humans		
		TWA	0.5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		

		TWA	0.500000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.500000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		TWA	0.05 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

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

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	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
LD50 Oral - Rat - 40.0 mg/kg

Inhalation: No data available

LD50 Dermal - Rat - 119.0 mg/kg

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

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

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Heptachlor)
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: PC0700000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.007 mg/l - 96.0 h
Toxicity to daphnia and other aquatic	LC50 - Daphnia magna (Water flea) - 0.078 mg/l - 48 h

invertebrates

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential

Bioaccumulation	Pimephales promelas (fathead minnow) - 276 d - 0.00043 mg/l
	Bioconcentration factor (BCF): 23,814

12.4 Mobility in soil
No data available

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

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2811 Class: 6.1 Packing group: II
Proper shipping name: Toxic solids, organic, n.o.s. (Heptachlor)
Reportable Quantity (RQ): 1 lbs
Marine pollutant:yes
Poison Inhalation Hazard: No

IMDG
UN number: 2811 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Heptachlor)
Marine pollutant:yes

IATA
UN number: 2811 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, organic, n.o.s. (Heptachlor)

15. REGULATORY INFORMATION

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

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

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Heptachlor	76-44-8	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Heptachlor	76-44-8	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Heptachlor	76-44-8	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Heptachlor	76-44-8	2007-09-28
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Heptachlor	76-44-8	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.
H373	May cause damage to organs through prolonged or repeated exposure.

HMIS Rating

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

NFPA Rating

Health hazard:	3
Fire Hazard:	0
Reactivity Hazard:	0

Further information

Preparation Information

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

Version: 5.6 Revision Date: 04/24/2015 Print Date: 02/09/2016

SAFETY DATA SHEET

Version 5.7
Revision Date 11/03/2015
Print Date 02/18/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Heptane
Product Number	:	246654
Brand	:	Sigma-Aldrich
Index-No.	:	601-008-00-2
CAS-No.	:	142-82-5

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)
Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Aspiration hazard (Category 1), H304
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)

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H410	Very toxic to aquatic life with long lasting effects.

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.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P331	Do NOT induce vomiting.
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.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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_7H_{16}
Molecular weight	:	100.20 g/mol
CAS-No.	:	142-82-5
EC-No.	:	205-563-8
Index-No.	:	601-008-00-2
Registration number	:	01-2119457603-38-XXXX

Hazardous components

Component	Classification	Concentration
Heptane		
	Flam. Liq. 2; Skin Irrit. 2; STOT SE 3; Asp. Tox. 1; Aquatic Acute 1; Aquatic Chronic 1; H225, H304, H315, H336, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Flash back possible over considerable distance.

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.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. Discharge into the environment must be avoided.

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
Store under inert gas. 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
Heptane	142-82-5	TWA	85.000000 ppm 350.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		C	440.000000 ppm 1,800.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
	Remarks	15 minute ceiling value		
		TWA	500.000000 ppm 2,000.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	400.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation		
		STEL	500.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation		
		TWA	400.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation		
		STEL	500.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation		
		TWA	400 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation		
		STEL	500 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation		

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: 65 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, 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 ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -91 °C (-132 °F)
f)	Initial boiling point and boiling range	98 °C (208 °F)
g)	Flash point	-3.99 °C (24.82 °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: 7 %(V) Lower explosion limit: 1.1 %(V)
k)	Vapour pressure	110.7 hPa (83.0 mmHg) at 37.7 °C (99.9 °F) 53.3 hPa (40.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available

m)	Relative density	0.684 g/mL at 25 °C (77 °F)
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	log Pow: > 3.000
p)	Auto-ignition temperature	223.0 °C (433.4 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

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

LC50 Inhalation - Rat - 4 h - 103,000 mg/m3

Inhalation: Irritating to respiratory system.

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation
(OECD Test Guideline 405)

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.

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
May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Additional Information
RTECS: MI7700000

Prolonged or repeated exposure to skin causes defatting and dermatitis., Central nervous system depression, narcosis, Damage to the lungs.

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Carassius auratus (goldfish) - 4 mg/l - 24.0 h
	LC50 - Tilapia mossambica - 375 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 1.50 mg/l - 48 h

12.2 Persistence and degradability

Ratio BOD/ThBOD	3.5 %

12.3 Bioaccumulative potential
Indication of bioaccumulation.

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.

Do not empty into drains. Avoid release to the environment.

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: 1206 Class: 3 Packing group: II
Proper shipping name: Heptanes
Reportable Quantity (RQ):
Marine pollutant:yes
Poison Inhalation Hazard: No

IMDG
UN number: 1206 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: HEPTANES
Marine pollutant:yes

IATA
UN number: 1206 Class: 3 Packing group: II
Proper shipping name: Heptanes

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
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Heptane	142-82-5	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Heptane	142-82-5	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Heptane	142-82-5	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
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

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: 5.7 Revision Date: 11/03/2015 Print Date: 02/18/2016

MATERIAL SAFETY DATA SHEET

ERA A Waters Company

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

MANUFACTURER: ERA (Environmental Resource Associates)
ADDRESS: 6000 W. 54th Avenue
Arvada, CO, 80002 U.S.A.

BUSINESS PHONE: 303-431-8454
FAX: 303-421-0159 **EMAIL:** info@eraqc.com
CHEMICAL EMERGENCY PHONE: 352-535-5053 (INFOTRAC)

Product Name(s): Hexavalent Chromium 1000 mg/L
Catalog / Part Number(s): 019, 973, 186004178
MSDS Creation Date: November 22, 2005
Revision Date: September 29, 2009

MSDS Reference Number: 019

SECTION 2: HAZARDS IDENTIFICATION

Toxic. Harmful by inhalation. May cause cancer. Risk of cancer depends on duration and level of exposure. The matrix of each standard is a K2Cr2O7/water mixture listed below which is classified as dangerous by Directive 199/45/EC. Use only as directed and in accordance with good laboratory practices.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

				EXPOSURE LIMITS		EU LABEL
CHEMICAL INGREDIENT NAME	CAS NUMBER	EC NUMBER	% BY WT.	OSHA	ACGIH	HAZARD LABEL
Potassium dichromate	7778-50-9	231-906-6	≤0.1	0.1 mg/m3 PEL	0.05 mg/m3	

Notes: This standard is 125 mL of a mixture containing potassium dichromate salt with the balance being ≥99.9% water. Hexavalent chromium is a known human carcinogen. Exposure Limits are 8-Hour TWA (Time Weighted Average) unless designated C (Ceiling) or STEL (Short Term Exposure Limit). Other components considered Non-Hazardous under OSHA 1910.1200 (HazCom) as they are not present in concentrations exceeding 1% (or 0.1% if considered a known or potential carcinogen). Material Use: Analytical reagent or certified reference material used in laboratories. Uses also include research and development.

SECTION 4: FIRST-AID MEASURES

Inhalation: Remove to fresh air.
Skin Contact: Flush with water.
Eye Contact: Immediately flush with water for a minimum of 15 minutes.
Ingestion: Get medical attention
After following first aid measures, seek medical attention.

SECTION 5: FIRE-FIGHTING MEASURES

Flammable Properties: Not flammable.
Extinguishing Media: Dry chemical, carbon dioxide or appropriate foam.
Unique Aspects Contributing To a Fire: None.
Special Fire Fighting Procedures: None.
Note: As in any fire, wear self-contained breathing apparatus, and full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Absorb liquid with spill pillow or other absorbent. Ventilate and wash spill site after material pick up is complete. Place wastes into closed containers for proper disposal.

SECTION 7: HANDLING AND STORAGE

Handle in accordance with good laboratory practices. Store in a dry well-ventilated place. This product is intended for use only by people trained in the safety and handling of chemicals and laboratory preparations.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Handle in accordance with good laboratory practices. Wash thoroughly after handling.
Respiratory Protection: Not normally needed. If exposure limits are exceeded, use approved respirator.
Eye Protection: Safety glasses with side shields or safety goggles
Skin Protection: Neoprene or other chemical resistant gloves.
Engineering Controls: Not normally needed. If exposure limits are exceeded, work in a fume hood.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

DATA FOR MATRIX:

Appearance:	Clear to yellow	Specific Gravity:	NA	Melting Point:	NA
Physical State:	Liquid	Flash Point:	NA	Vapor Pressure:	NA
Odor:	NA	Explosion Limits:	NA	Vapor Density (air=1):	NA
pH:	NA	Boiling Point:	NA	Solubility in Water:	Soluble

SECTION 10: STABILITY AND REACTIVITY

Hazardous Polymerization Will Not Occur __X__ May Occur____ Stability: Stable __X__ Unstable ____
Hazardous Decomposition/Combustion Products: NA
Conditions and Materials to Avoid: Oxidizing agents.

SECTION 11: TOXICOLOGICAL INFORMATION

Primary Route(s) of Exposure Under Normal Use: Skin contact: may cause skin irritation or be harmful if absorbed through skin. Eye contact: may cause eye irritation. Inhalation: hamful if inhaled, may be irritation to mucous membranes and upper respiratory tract. Ingestion: harmful if swallowed.

Target Organ(s): Lungs, kidneys, blood.

Acute Effects: Harmful by inhalation. May cause sensitization by inhalation and skin contact. Ingestion can cause vomiting.
Potassium dichromate: Oral, child: LDLO=26 mg/kg; Oral, man: LDLO=143 mg/kg; Oral, rat:LD50=25 mg/kg; Skin, rabbit:LD50=14 mg/kg.

Chronic Effects: Carcinogen; Teratogen; May cause heritable gentic damage. Reproductive hazard; May impair fertility. May cause harm to the unborn child.

Other Information: Chemical Ingredient(s) potassium dichromate is classified as carcinogen(s) by OSHA, IARC (Group 1), NTP, ACGIH (A1), or California. California Prop-65: This product is or contains chemicals known to the state of California to cause cancer.

SECTION 12: ECOLOGICAL INFORMATION

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Avoid release into the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

To determine proper disposal, consult applicable federal, state and local environmental control regulations.

SECTION 14: TRANSPORT INFORMATION

Shipment Name/Type: Non-hazardous for transport.
UN Number: NA Shipping/Hazardous Class: NA Packing Group: NA
Shipping regulations are based on combinations of criteria such as quantity, class and packaging according to DOT, IATA and (49) CFR.

SECTION 15: REGULATORY INFORMATION

EU Symbol of Danger: Toxic (T) concentration ≤0.1 C <0.2%
EU Risk Phrases: May cause cancer [R45]; May cause heritable genetic damage [R46]; Harmful by inhalation [R20].

U.S. TSCA: Listed
Canada: This product has been classified according to the hazard criteria of the CPR and this MSDS contains all the information required by the CPR.

SECTION 16: OTHER INFORMATION

United States EPA Regulatory Information:		NFPA Rating:	Health: 3	Flammability: 0	Reactivity: 0
SARA 313:	Yes (0.1% deminimis)				
CERCLA RQ:	10 lbs	HMIS Rating:	Health: 3	Flammability: 0	Physical Hazard: 0

NOTE: NA = Data not available, not established, determined or not pertinent.

DISCLAIMER: The information contained herein has been compiled from data presented in various technical sources believed to be accurate. This information is intended to be used only as a guide and does not purport to be complete. ERA makes no warranties and assumes no liability in connection with the use of this information. It is the user's responsibility to determine the suitability of this information and to assure the adoption of necessary precautions.

Safety data for indeno[1,2,3-cd]pyrene

Glossary of terms on this data sheet.

General

Synonyms: 1,10-(1,2-phenylene)pyrene, 1,10-(o-phenylene)pyrene, o-phenylenepyrene, 2,3-phenylenepyrene, 2,3,o-phenylenepyrene, IP
Use:
Molecular formula: $C_{22}H_{12}$
CAS No: 193-39-5
EINECS No: 205-893-2

Physical data

Appearance: solid
Melting point: 161 - 163 C
Boiling point: 536 C
Vapour density:
Vapour pressure:
Density (g cm^{-3}):
Flash point:
Explosion limits:
Autoignition temperature:
Water solubility:

Stability

Stable. Incompatible with strong oxidizing agents.

Toxicology

Limited evidence that this material may be carcinogenic.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given here.)

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)
R40.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)
Non-hazardous for air, sea and road freight.

Personal protection

Treat as potentially hazardous - many multi-ring aromatic compounds are suspected carcinogens.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)
S36 S37 S45.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.]

SAFETY DATA SHEET

Version 5.6
Revision Date 12/02/2015
Print Date 04/30/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Iodomethane
Product Number	:	67692
Brand	:	Sigma-Aldrich
Index-No.	:	602-005-00-9
CAS-No.	:	74-88-4

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 #	:	(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
Acute toxicity, Dermal (Category 3), H311
Skin irritation (Category 2), H315
Serious eye damage (Category 1), H318
Respiratory sensitisation (Category 1), H334
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

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 + H311	Toxic if swallowed or in contact with skin
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H318	Causes serious eye damage.
H330	Fatal if inhaled.

H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May cause respiratory irritation.
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.
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/ eye protection/ face protection.
P284	Wear respiratory protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/ physician.
P320	Specific treatment is urgent (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P361	Remove/Take off immediately all contaminated clothing.
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

Vesicant., Rapidly absorbed through skin.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Methyl iodide
Formula	:	CH_3I
Molecular weight	:	141.94 g/mol
CAS-No.	:	74-88-4
EC-No.	:	200-819-5
Index-No.	:	602-005-00-9

Hazardous components

Component	Classification	Concentration
Methyl iodide		
	Acute Tox. 3; Acute Tox. 2; Acute Tox. 3; Skin Corr. 1A; Eye Dam. 1; Resp. Sens. 1; Skin Sens. 1; Carc. 2; STOT SE 3; H301 + H311, H314, H317, H330, H334, H335, 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. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Continue rinsing eyes during transport to hospital.Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen iodide

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 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.

Light sensitive. Moisture sensitive.

7.3 Specific end use(s)

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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Methyl iodide	74-88-4	TWA	2.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Eye damage Danger of cutaneous absorption		
		TWA	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Eye damage Danger of cutaneous absorption		
		TWA	5.000000 ppm 28.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation The value in mg/m3 is approximate.		
		TWA	2.000000 ppm 10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: > 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: > 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type 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: -64 °C (-83 °F) - lit.
f)	Initial boiling point and boiling range	41 - 43 °C (106 - 109 °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	Upper explosion limit: 66 %(V) Lower explosion limit: 8.5 %(V)
k)	Vapour pressure	544 hPa (408 mmHg) at 20 °C (68 °F) 1,660 hPa (1,245 mmHg) at 55 °C (131 °F)
l)	Vapour density	4.90 - (Air = 1.0)
m)	Relative density	2.28 g/cm3 at 25 °C (77 °F)
n)	Water solubility	14 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 1.5 at 20 °C (68 °F)
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

Relative vapour density	4.90 - (Air = 1.0)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.
Contains the following stabiliser(s):
Silver (%)

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Strong bases, Oxygen

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 - 76 mg/kg

LC50 Inhalation - Rat - 4 h - 1,300 mg/m3

LD50 Dermal - Guinea pig - 800 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Causes severe burns.
(Draize Test)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Risk of serious damage to eyes.
(Draize Test)

Respiratory or skin sensitisation
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:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Methyl iodide)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

Nausea, Dizziness, Headache, Blurred vision, Weakness, Drowsiness, Ataxia., Confusion., Convulsions, narcosis, Pulmonary edema. Effects may be delayed.

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

Biodegradability	aerobic - Exposure time 28 d Result: 16 % - Not readily biodegradable. (Closed Bottle test)

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
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2644 Class: 6.1 Packing group: I
Proper shipping name: Methyl iodide
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: Hazard zone B

IMDG
UN number: 2644 Class: 6.1 Packing group: I EMS-No: F-A, S-A

Proper shipping name: METHYL IODIDE

IATA
UN number: 2644 Class: 6.1
Proper shipping name: Methyl iodide
IATA Passenger: Not permitted for transport
IATA Cargo: 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
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Methyl iodide	74-88-4	2007-07-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Methyl iodide	74-88-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Silver	7440-22-4	1993-04-24
Methyl iodide	74-88-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Methyl iodide	74-88-4	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Methyl iodide	74-88-4	2007-09-28

16. OTHER INFORMATION

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

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Dam.	Serious eye damage
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H318	Causes serious eye damage.
H330	Fatal if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
Resp. Sens.	Respiratory sensitisation
Skin Corr.	Skin corrosion

HMIS Rating
Health hazard: 3

Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

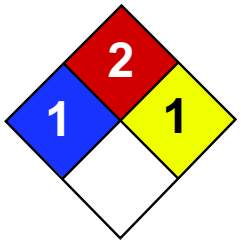
Health hazard:	4
Fire Hazard:	0
Reactivity Hazard:	0

Further information

Preparation Information

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

Version: 5.6 Revision Date: 12/02/2015 Print Date: 04/30/2016



Health	1
Fire	2
Reactivity	1
Personal Protection	E

Material Safety Data Sheet
Iron Metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Iron Metal

Catalog Codes: SLI2047, SLI1996

CAS#: 7439-89-6

RTECS: NO4565500

TSCA: TSCA 8(b) inventory: Iron Metal

CI#: Not applicable.

Synonym:

Chemical Name: Iron

Chemical Formula: Fe

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Iron Metal, powder	7439-89-6	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to liver, cardiovascular system, upper respiratory tract, pancreas. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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

Skin Contact: Wash with soap and water. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Explosive in presence of open flames and sparks, of heat.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Chlorine Trifluoride reacts with iron with incandescence. Powdered iron reacts with fluorine below redness with incandescence. Reduced iron decomposes with nitrogen dioxide @ ordinary temperature with incandescence. Reacting mass formed by mixture of phosphorus and iron can become incandescent when heated. This material is flammable in powder form only.

Special Remarks on Explosion Hazards: Material in powdered form can explode when exposed to heat or flame

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe dust. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

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

Section 8: Exposure Controls/Personal Protection

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

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid metallic powder.)

Odor: Odorless.

Taste: Tasteless.

Molecular Weight: 55.85 g/mole

Color: Black to Grey.

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

Boiling Point: 3000°C (5432°F)

Melting Point: 1535°C (2795°F)

Critical Temperature: Not available.

Specific Gravity: Density: 7.86 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, ignition sources, incompatible materials, water/moisture, air, dust generation.

Incompatibility with various substances:
Reactive with oxidizing agents, acids. Slightly reactive to reactive with moisture.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:
Hot iron(wire) burns in Chlorine gas. Violent decompositon of hydrogen peroxide (53% by weight or greater) may be caused by contact with iron. Readily oxidizes in moist air forming rust. Reactive with halogens. Incompatible with acetaldehyde, ammonium peroxodisulfate, chloroformamidinum, chloric acid, ammonium nitrate, dinitorgen tetroxide, nitryl fluoride, polystyrene, sodium acetylide, potassium dichromate, peroxyformic acid, sulfuric acid, sodium carbide. Readily attacked by dilute mineral acids and or attacked or dissolved by organic acids. Not appreciably attacked by cold sulfuric acid, or nitric acid, but is attacked by hot acids.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 30000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: liver, cardiovascular system, upper respiratory tract, pancreas.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Iron metal filings or dust: May cause skin irritation by mechanical action. Iron metal wire: Not likely to cause skin irritation Eyes: Iron metal filings or dust: Can irritate eyes by mechanical action. Iron metal wire: No hazard. Will not cause eye irritation. Inhalation: Iron dust: Can irritate the respiratory tract by mechanical action. Iron metal wire or filings: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Iron metal wire: Not an ingestion hazard: Iron metal filings or dust: The amount of ingested iron which constitutes a toxic dose is not well defined. Proposed toxic doses of elemental iron are 20 mg/kg for gastrointestinal irritation to greater than 60 mg/kg for systemic toxicity. Gastrointestinal effects are the first signs to appear, with hemorrhagic vomiting and diarrhea, hematochezia, abdominal pain, lethargy, metabolic acidosis, coagulaopathy, shock, coma and convulsions developing from 0 to 6 hours after ingestion. Leukocytosis may also occur. An asymptomatic phase may ensue at 6 to 12 hours postingestion, followed by hypoglycemia or hyperglycemia, hepatic and renal failure, severe acidosis, cyanosis, fever, CNS depression (lethargy, restlessness and/or confusion seizures), hypotension, and cardiovascular collapse/cardiac failure in 12 to 48 hours. Hepatic cirrhosis, gastrointestinal scarring and/or strictures may arise in 2 to 6 weeks. It may also cause an anaphylactoid reaction. Non-cardiogenic pulmonary edema also develop in severe cases of iron intoxication. Chronic Potential Health Effects: Inhalation: Chronic inhalation of iron dust can lead to accumulation in the lungs and a characteristic stippled appearance on X-rays. This condition, called SIDEROSIS, is considered benign in that it does not interfere with lung function and does not predispose to other disease. Chronic inhalation of iron dust may also cause fibrosis in the lungs. Ingestion: Clinical signs of iron overload appear when the total body iron is 5 to 10 times higher than normal. Neurobehavioral defects including depression, decreased activity, habituation, reflex startle, and conditioned avoidance response performance may occur. However, similiar effects were also seen in iron defficiency. It is therefore likely that these behavioral effects are secondary to general toxicity. High serum iron levels may be associated with an increased risk of fatal acute myocardial infarction (MI). Skin: Prolonged or repeated contact may cause hypersensivity.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Metal powder, flammable, n.o.s. (Iron metal powder) UNNA: 3089 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California Director's List of Hazardous Substances: Iron Metal TSCA 8(b) inventory: Iron Metal

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS B-4: Flammable solid.

DSCL (EEC):
R11- Highly flammable. S16- Keep away from sources of ignition - No smoking. S22- Do not breathe dust.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 2

Reactivity: 1

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 2

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:52 PM

Last Updated: 11/06/2008 12:00 PM

SAFETY DATA SHEET

Version 5.4
Revision Date 06/02/2016
Print Date 09/16/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Isopropyl acetate
Product Number	:	90871
Brand	:	Sigma-Aldrich
Index-No.	:	607-024-00-6
CAS-No.	:	108-21-4

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
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

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.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.

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.

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
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.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

Repeated exposure may cause skin dryness or cracking.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_5H_{10}O_2$
Molecular weight	:	102.13 g/mol
CAS-No.	:	108-21-4
EC-No.	:	203-561-1
Index-No.	:	607-024-00-6

Hazardous components

Component	Classification	Concentration
Isopropyl acetate		
	Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
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.

Moisture sensitive.
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
Isopropyl acetate	108-21-4	TWA	250.000000 ppm 950.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	The value in mg/m3 is approximate.		

		TWA	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation		
		TWA	100.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation		
		STEL	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation		
		STEL	200.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation		
		See Appendix D - Substances with No Established RELs		
		See Appendix D - Substances with No Established RELs		
		TWA	250 ppm 950 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		PEL	250 ppm 950 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	310 ppm 1,185 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: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 120 min
Material tested:Butoject® (KCL 897 / Aldrich Z677647, 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 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 Colour: colourless
b)	Odour	pleasant, aromatic
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -73 °C (-99 °F)
f)	Initial boiling point and boiling range	85 - 91 °C (185 - 196 °F)
g)	Flash point	4 °C (39 °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: 8 %(V) Lower explosion limit: 1.8 %(V)
k)	Vapour pressure	63 hPa (47 mmHg) at 20 °C (68 °F)
l)	Vapour density	3.53 - (Air = 1.0)
m)	Relative density	0.872 g/mL at 25 °C (77 °F)
n)	Water solubility	31.9 g/l at 20 °C (68 °F) - soluble
o)	Partition coefficient: n-octanol/water	log Pow: 1.28 at 20 °C (68 °F)
p)	Auto-ignition temperature	460 °C (860 °F) at 1,013 hPa (760 mmHg)
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

Relative vapour density	3.53 - (Air = 1.0)

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
acids, Bases, Oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - 6,750 mg/kg

LC50 Inhalation - Rat - 8 h - 50,600 mg/m3

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
reverse mutation assay
S. typhimurium
Result: negative

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: Not available

prolonged or repeated exposure can cause:, Nausea, Headache, Vomiting, narcosis

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	static test LC50 - Leuciscus idus melanotus - 265 mg/l - 48 h

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 20 d Result: 100 % - Readily biodegradable (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: 1220 Class: 3 Packing group: II
Proper shipping name: Isopropyl acetate
Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG
UN number: 1220 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ISOPROPYL ACETATE

IATA
UN number: 1220 Class: 3 Packing group: II
Proper shipping name: Isopropyl acetate

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
Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Isopropyl acetate	108-21-4	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Isopropyl acetate	108-21-4	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Isopropyl acetate	108-21-4	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
STOT SE	Specific target organ toxicity - single exposure

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

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: 5.4 Revision Date: 06/02/2016 Print Date: 09/16/2017

SAFETY DATA SHEET

Version 5.8
Revision Date 03/06/2015
Print Date 02/18/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Isopropyl alcohol
Product Number	:	W292907
Brand	:	Aldrich
Index-No.	:	603-117-00-0
CAS-No.	:	67-63-0

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

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.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.

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.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312	Call a POISON CENTER or doctor/ physician if you feel unwell.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

May form explosive peroxides.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	2-Propanol sec-Propyl alcohol Isopropyl alcohol Isopropanol
Formula	:	C_3H_8O
Molecular weight	:	60.10 g/mol
CAS-No.	:	67-63-0
EC-No.	:	200-661-7
Index-No.	:	603-117-00-0

Hazardous components

Component	Classification	Concentration
2-Propanol		
	Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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
Carbon oxides

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.

Handle and store under inert gas. hygroscopic

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
2-Propanol	67-63-0	TWA	200.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment		

		Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	400 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	400.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	400.000000 ppm 980.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	400.000000 ppm 980.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	500.000000 ppm 1,225.000000 mg/m3	USA. NIOSH Recommended Exposure Limits

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
2-Propanol	67-63-0	Acetone	40.0000 mg/l	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
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: 60 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
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 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 Colour: colourless
b)	Odour	alcohol-like
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -89.5 °C (-129.1 °F) - lit.
f)	Initial boiling point and boiling range	82 °C (180 °F) - lit.
g)	Flash point	12.0 °C (53.6 °F) - closed cup
h)	Evaporation rate	3.0
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or	Upper explosion limit: 12.7 %(V) Lower explosion limit: 2 %(V)

	explosive limits	
k)	Vapour pressure	43.2 hPa (32.4 mmHg) at 20.0 °C (68.0 °F) 58.7 hPa (44.0 mmHg) at 25.0 °C (77.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.785 g/cm3 at 25 °C (77 °F)
n)	Water solubility	completely soluble
o)	Partition coefficient: n-octanol/water	log Pow: 0.05
p)	Auto-ignition temperature	425.0 °C (797.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	20.8 mN/m at 25.0 °C (77.0 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Test for peroxide formation before distillation or evaporation. Test for peroxide formation or discard after 1 year.
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. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Oxidizing agents, Acid anhydrides, Aluminium, Halogenated compounds, Acids

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 - 5,045 mg/kg
Remarks: Behavioral:Altered sleep time (including change in righting reflex). Behavioral:Somnolence (general depressed activity).

LC50 Inhalation - Rat - 8 h - 16000 ppm

LD50 Dermal - Rabbit - 12,800 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation - 24 h

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.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (2-Propanol)
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
Inhalation, Oral - May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: NT8050000

Central nervous system depression, prolonged or repeated exposure can cause:, Nausea, Headache, Vomiting, narcosis, Drowsiness, Overexposure may cause mild, reversible liver effects., Aspiration may lead to:, Lung oedema, Pneumonia
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Kidney - Irregularities - Based on Human Evidence
Kidney - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 9,640.00 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 5,102.00 mg/l - 24 h
	Immobilization EC50 - Daphnia magna (Water flea) - 6,851 mg/l - 24 h
Toxicity to algae	EC50 - Desmodesmus subspicatus (green algae) - > 2,000.00 mg/l - 72 h
	EC50 - Algae - > 1,000.00 mg/l - 24 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No bioaccumulation is to be expected (log Pow <= 4).

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: 1219 Class: 3 Packing group: II
Proper shipping name: Isopropanol
Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG
UN number: 1219 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ISOPROPANOL

IATA
UN number: 1219 Class: 3 Packing group: II
Proper shipping name: Isopropanol

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
2-Propanol	67-63-0	1987-01-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2-Propanol	67-63-0	1987-01-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2-Propanol	67-63-0	1987-01-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
2-Propanol	67-63-0	1987-01-01

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.

Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

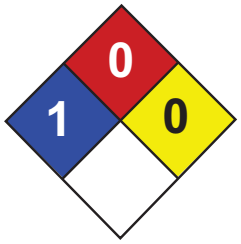
Further information

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: 03/06/2015 Print Date: 02/18/2016



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

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

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Non-flammable in presence of open flames and sparks, of shocks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

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

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

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

Section 8: Exposure Controls/Personal Protection

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

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

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

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungsby mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually abssorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, deliriuim, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:21 PM

Last Updated: 11/06/2008 12:00 PM

SAFETY DATA SHEET

Version 4.6
Revision Date 03/02/2015
Print Date 02/07/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Manganese
Product Number	:	463728
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, 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)
Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260
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)

H260	In contact with water releases flammable gases which may ignite spontaneously.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P223	Keep away from any possible contact with water, because of violent reaction and possible flash fire.
P231 + P232	Handle under inert gas. Protect from moisture.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.

P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
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		
	Water-react. 1; Aquatic Acute 3; Aquatic Chronic 3; H260, H412	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Dry powder Carbon dioxide (CO2)

Unsuitable extinguishing media
Water

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

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

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. 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.Keep away from sources of ignition - No smoking.
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.
Never allow product to get in contact with water during storage.

Moisture sensitive. Keep in a dry place.

7.3 Specific end use(s)

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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

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 Adopted values or notations enclosed are those for which changes are proposed in the NIC 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 Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) varies		
		TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2014 Adoption varies		
		TWA	0.020000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2014 Adoption varies		
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment varies		
		TWA	0.02 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 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
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, Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder 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: 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	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
Reacts violently with water.

10.4 Conditions to avoid
Exposure to moisture

10.5 Incompatible materials
acids, Halogens, Bases, Phosphorus, Sulphur oxides, Peroxides

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 - 9,000 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation - 24 h

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

Carcinogenicity - Rat - Intramuscular
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Tumorigenic:Tumors at site or application.

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

May cause reproductive disorders.

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: OO9275000

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.

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 40 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.
Harmful to aquatic life.

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: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)

Poison Inhalation Hazard: No

IMDG
UN number: 3208 Class: 4.3 Packing group: I EMS-No: F-G, S-N
Proper shipping name: METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S. (Manganese)

IATA
UN number: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)
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

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

SARA 311/312 Hazards
Reactivity Hazard, 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
Aquatic Chronic	Chronic aquatic toxicity
H260	In contact with water releases flammable gases which may ignite spontaneously.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	2

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	2
Special hazard.I:	W

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 03/02/2015 Print Date: 02/07/2016

SAFETY DATA SHEET

Version 4.6
Revision Date 03/02/2015
Print Date 02/07/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Manganese
Product Number	:	463728
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, 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)
Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260
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)

H260	In contact with water releases flammable gases which may ignite spontaneously.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P223	Keep away from any possible contact with water, because of violent reaction and possible flash fire.
P231 + P232	Handle under inert gas. Protect from moisture.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.

P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
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		
	Water-react. 1; Aquatic Acute 3; Aquatic Chronic 3; H260, H412	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Dry powder Carbon dioxide (CO2)

Unsuitable extinguishing media
Water

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

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

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. 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.Keep away from sources of ignition - No smoking.
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.
Never allow product to get in contact with water during storage.

Moisture sensitive. Keep in a dry place.

7.3 Specific end use(s)

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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

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 Adopted values or notations enclosed are those for which changes are proposed in the NIC 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 Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) varies		
		TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2014 Adoption varies		
		TWA	0.020000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2014 Adoption varies		
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment varies		
		TWA	0.02 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 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
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, Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder 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: 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	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
Reacts violently with water.

10.4 Conditions to avoid
Exposure to moisture

10.5 Incompatible materials
acids, Halogens, Bases, Phosphorus, Sulphur oxides, Peroxides

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 - 9,000 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation - 24 h

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

Carcinogenicity - Rat - Intramuscular
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Tumorigenic:Tumors at site or application.

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

May cause reproductive disorders.

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: OO9275000

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.

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 40 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.
Harmful to aquatic life.

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: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)

Poison Inhalation Hazard: No

IMDG
UN number: 3208 Class: 4.3 Packing group: I EMS-No: F-G, S-N
Proper shipping name: METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S. (Manganese)

IATA
UN number: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)
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

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

SARA 311/312 Hazards
Reactivity Hazard, 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
Aquatic Chronic	Chronic aquatic toxicity
H260	In contact with water releases flammable gases which may ignite spontaneously.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	2

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	2
Special hazard.I:	W

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 03/02/2015 Print Date: 02/07/2016

MATERIAL SAFETY DATA SHEET

Date Printed: 02.04.2016
Date Updated: 07.08.2012
Version 1.9

Section 1 - Product and Company Information

Product Name	M-CRESOL APPROX 99%
Product Number	C5015
Brand	SIGMA
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
M-CRESOL	108-39-4	Yes

Formula	C7H8O
Synonyms	3-Cresol * m-Cresol (ACGIH:OSHA) * m-Cresole * m-Cresylic acid * 1-Hydroxy-3-methylbenzene * m-Hydroxytoluene * 3-Hydroxytoluene * m-Kresol * m-Methylphenol * 3-Methylphenol * m-Oxytoluene * Phenol, 3-methyl- (9CI) * RCRA waste number U052 * m-Toluol
RTECS Number:	GO6125000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic.
Toxic in contact with skin and if swallowed. Causes burns.
Readily absorbed through skin. Combustible. Target organ(s):
Central nervous system. Lungs.

HMIS RATING

HEALTH: 3*
FLAMMABILITY: 2
REACTIVITY: 1

NFPA RATING

HEALTH: 3
FLAMMABILITY: 2
REACTIVITY: 1

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately. Do not induce vomiting.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
186,800 °F 86,000 °C Method: closed cup

EXPLOSION LIMITS
Lower: 1,060 % Upper: 1,350 %

AUTOIGNITION TEMP
558,00 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Combustible liquid. Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Cover with dry lime or soda ash, pick up, keep in a closed container, and hold for waste disposal. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Do not get in eyes, on

skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Keep away from heat and open flame. Store in a cool dry place.
Unsuitable: May discolor on exposure to air and light.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face 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.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.
Other: Faceshield (8-inch minimum).

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Discard contaminated shoes. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	TWA	5 PPM
Remarks: Skin			
USA	MSHA Standard-air	TWA	5 PPM (22 MG/M3)
USA	OSHA.	PEL	8H TWA 5 PPM (22 MG/M3) (SKIN)
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	2.3 PPM

Section 9 - Physical/Chemical Properties

Appearance Physical State: Liquid

Property	Value	At Temperature or Pressure
Molecular Weight	108,1400 AMU	
pH	N/A	
BP/BP Range	200,000. - 203,000 °C.	
MP/MP Range	8,000. - 10,000 °C.	
Freezing Point	N/A	
Vapor Pressure	< 1,000000000 mmHg	20,00 °C
Vapor Density	3,720 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	1,0340 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	

Evaporation Rate	N/A	
Viscosity	12,900 Pas	25,000 °C
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	186,800 °F 86,000 °C	Method: closed cup
Explosion Limits	Lower: 1,060 % Upper: 1,350 %	
Flammability	N/A	
Autoignition Temp	558,00 °C	
Refractive Index	1,5420	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	Other Solvents: SOLUBLE IN ACETONE, ETHANOL, MISCIBLE IN ALCOHOL,ETHER	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.
Materials to Avoid: Oxidizing agents, Bases.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: Causes burns.
Skin Absorption: Toxic if absorbed through skin. Readily absorbed through skin.
Eye Contact: Causes burns.
Inhalation: May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.
Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)

Central nervous system. Eyes. Liver. Kidneys. Lungs.

SIGNS AND SYMPTOMS OF EXPOSURE

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin.
Inhalation may result in spasm, inflammation and edema of the larynxand bronchi, chemical pneumonitis, and pulmonary edema.
Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Exposure can cause: Damage to the eyes. Damage to the kidneys. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Oral
Rat
242,000000 mg/kg
LD50
Remarks: Behavioral:Somnolence (general depressed activity). Behavioral:Convulsions or effect on seizure threshold. Gastrointestinal:Peritonitis.

Inhalation
Rat
> 710,000 mg/m3
LC50

Skin
Rat
1100,000000 mg/kg
LD50

Oral
Mouse
828,000000 mg/kg
LD50

Intraperitoneal
Mouse
168 MG/KG
LD50

Skin
Rabbit
2050,000000 mg/kg
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Gastrointestinal:Changes in structure or function of salivary glands.

IRRITATION DATA

Skin
Rabbit
517,000000 mg
24H
Remarks: Severe irritation effect

Eyes
Rabbit
103,000000 mg
Remarks: Severe irritation effect

CHRONIC EXPOSURE - CARCINOGEN

Species: Mouse
Route of Application: Skin
Dose: 2280 MG/KG
Exposure Time: 20W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and Appendages: Other: Tumors.

CHRONIC EXPOSURE - TERATOGEN

Species: Rabbit
Dose: 134 GM/KG
Route of Application: Subcutaneous
Exposure Time: (6-18D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

CHRONIC EXPOSURE - MUTAGEN

Species: Human
Dose: 10 UMOL/L
Exposure Time: 4H
Cell Type: HeLa cell
Mutation test: DNA inhibition

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: EC50 Algae
Time: 24,0 h
Value: 110,000 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 24,0 h
Value: 25,000 mg/l

Test Type: LC50 Fish
Species: Leuciscus idus
Time: 48,0 h
Value: 17,000. - 19,000 mg/l.

Test Type: LC50 Fish
Species: Onchorhynchus mykiss (Rainbow trout)
Time: 96,0 h
Value: 8,900 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Cresols
UN#: 2076
Class: 6.1
Packing Group: Packing Group II
Hazard Label: Toxic substances.
Hazard Label: Corrosive
PIH: Not PIH

IATA
Proper Shipping Name: Cresols, liquid (o-, m-, p-)

IATA UN Number: 2076
Hazard Class: 6.1
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T
Indication of Danger: Toxic.
R: 24/25-34
Risk Statements: Toxic in contact with skin and if swallowed. Causes burns.
S: 36/37/39-45
Safety Statements: Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic.
Risk Statements: Toxic in contact with skin and if swallowed. Causes burns.
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
US Statements: Readily absorbed through skin. Combustible.
Target organ(s): Central nervous system. Lungs.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 1,000 %
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

```
ERROR: undefined
OFFENDING COMMAND: get

STACK:

/quit
-dictionary-
-mark-
```

SAFETY DATA SHEET

Creation Date 26-Sep-2009 **Revision Date** 26-Jun-2014 **Revision Number** 1

1. Identification

Product Name **Methyl acetate**

Cat No. : **AC371830000; AC371830010; AC371830025; AC371831000**

Synonyms Acetic acid, methyl ester; Methyl ethanoate.

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
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor
Causes serious eye irritation
May cause drowsiness or dizziness

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
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
Wear protective gloves/protective clothing/eye protection/face protection
Keep cool
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 (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
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
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
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)
Repeated exposure may cause skin dryness or cracking

3. Composition / information on ingredients

Component	CAS-No	Weight %
Methyl acetate	79-20-9	>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. Obtain medical attention.

Ingestion Clean mouth with water. 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 Carbon dioxide (CO_2). Dry chemical. Use water spray to cool unopened containers. chemical foam.

Unsuitable Extinguishing Media No information available

Flash Point -10 °C / 14 °F

Method - No information available

Autoignition Temperature 455 °C / 851 °F

Explosion Limits
Upper 16.0%
Lower 3.1%
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Flammable. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated.

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	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation.
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 Avoid contact with skin and eyes. Do not breathe dust. Do not breathe vapors or spray mist. Remove all sources of ignition. Use only non-sparking tools. Wash hands before breaks and immediately after handling the product.

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
Methyl acetate	TWA: 200 ppm STEL: 250 ppm	(Vacated) TWA: 200 ppm (Vacated) TWA: 610 mg/m^3 (Vacated) STEL: 250 ppm (Vacated) STEL: 760 mg/m^3 TWA: 200 ppm TWA: 610 mg/m^3	IDLH: 3100 ppm TWA: 200 ppm TWA: 610 mg/m^3 STEL: 250 ppm STEL: 760 mg/m^3

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Methyl acetate	TWA: 200 ppm TWA: 606 mg/m^3 STEL: 250 ppm STEL: 757 mg/m^3	TWA: 200 ppm TWA: 610 mg/m^3 STEL: 250 ppm STEL: 760 mg/m^3	TWA: 200 ppm STEL: 250 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 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	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-98 °C / -144.4 °F
Boiling Point/Range	57.4 °C / 135.3 °F @ 760 mmHg
Flash Point	-10 °C / 14 °F
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	16.0%
Lower	3.1%
Vapor Pressure	220 mbar @ 20 °C
Vapor Density	2.8 (Air = 1.0)
Relative Density	0.930
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	455 °C / 851 °F
Decomposition temperature	No information available
Viscosity	0.38 mPa s at 20 °C
Molecular Formula	C3 H6 O2
Molecular Weight	74.08

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. Excess heat. Incompatible products. Exposure to moisture.

Incompatible Materials Acids, Bases

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization No information available.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Methyl acetate	5000 mg/kg (Rat)	5 g/kg (Rabbit)	16000 ppm (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

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
Methyl acetate	79-20-9	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 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

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.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Methyl acetate	120 mg/L EC50 > 72 h	295 - 348 mg/L LC50 96 h 250 - 350 mg/L LC50 96 h	EC50 = 6000 mg/L 16 h EC50 = 6100 mg/L 30 min	1026.7 mg/L EC50 = 48 h

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility .

Component	log Pow
Methyl acetate	0.18

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	UN1231
Proper Shipping Name	METHYL ACETATE
Hazard Class	3
Packing Group	II

TDG

UN-No	UN1231
Proper Shipping Name	METHYL ACETATE
Hazard Class	3
Packing Group	II

IATA

UN-No	1231
Proper Shipping Name	METHYL ACETATE
Hazard Class	3
Packing Group	II

IMDG/IMO

UN-No	1231
Proper Shipping Name	METHYL ACETATE
Hazard Class	3
Packing Group	II

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Methyl acetate	X	X	-	201-185-2	-		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)

Component	TSCA 12(b)
Methyl acetate	Section 4

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
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
Methyl acetate	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 B2 Flammable liquid
D2B Toxic materials

16. Other information

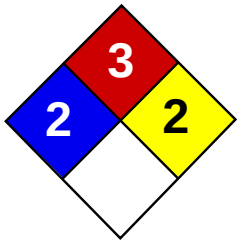
Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 26-Sep-2009
Revision Date 26-Jun-2014
Print Date 26-Jun-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



Health	2
Fire	3
Reactivity	3
Personal Protection	H

Material Safety Data Sheet
Methyl methacrylate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Methyl methacrylate

Catalog Codes: SLM3310

CAS#: 80-62-6

RTECS: OZ5075000

TSCA: TSCA 8(b) inventory: Methyl methacrylate

CI#: Not available.

Synonym:

Chemical Formula: CH2:C(CH3)COOCH3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Methyl methacrylate	80-62-6	100

Toxicological Data on Ingredients: Methyl methacrylate: ORAL (LD50): Acute: 7872 mg/kg [Rat]. VAPOR (LC50): Acute: 5303.3 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

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

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

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

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 421°C (789.8°F)

Flash Points: CLOSED CUP: 13°C (55.4°F). OPEN CUP: 19°C (66.2°F).

Flammable Limits: LOWER: 2.1% UPPER: 12.5%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of heat.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as metals, acids, alkalis.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 CEIL: 125 (ppm) TWA: 410 CEIL: 510 (mg/m3)Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 100.12 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 100°C (212°F)

Melting Point: -48°C (-54.4°F)

Critical Temperature: Not available.

Specific Gravity: 0.936 (Water = 1)

Vapor Pressure: 29 mm of Hg (@ 20°C)

Vapor Density: 3.45 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.049 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Partially soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Yes.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 7872 mg/kg [Rat]. Acute toxicity of the vapor (LC50): 5303.3 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Embryotoxic and/or foetotoxic in animal.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Methyl methacrylate monomer, inhibited : UN1247 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Methyl methacrylate Massachusetts RTK: Methyl methacrylate TSCA 8(b) inventory: Methyl methacrylate SARA 313 toxic chemical notification and release reporting: Methyl methacrylate CERCLA: Hazardous substances.: Methyl methacrylate

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R36/38- Irritating to eyes and skin.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 3

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:40 PM

Last Updated: 05/21/2013 12:00 PM

Methyl chloride (Refrigerant gas R 40)

Safety Data Sheet P-4622

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1980 Revision date: 10/17/2016 Supersedes: 10/14/2015

SECTION: 1. Product and company identification

1.1. Product identifier

Product form	:	Substance
Name	:	Methyl chloride (Refrigerant gas R 40)
CAS No	:	74-87-3
Formula	:	CH3Cl
Other means of identification	:	methylchloride, halocarbon 40, monochoromethane

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

Use of the substance/mixture : Industrial use. Use as directed.

1.3. Details of the supplier of the safety data sheet

Praxair, Inc.
10 Riverview Drive
Danbury, CT 06810-6268 - USA
T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146
www.praxair.com

1.4. Emergency telephone number

Emergency number : Onsite Emergency: 1-800-645-4633

CHEMTREC, 24hr/day 7days/week
— Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887
(collect calls accepted, Contract 17729)

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

GHS-US classification

Flam. Gas 1	H220
Liquefied gas	H280
Acute Tox. 4 (Inhalation:gas)	H332
Carc. 2	H351
STOT RE 2	H373

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS02 GHS04 GHS07 GHS08

Signal word (GHS-US) : DANGER

Hazard statements (GHS-US) :
H220 - **EXTREMELY FLAMMABLE GAS**
H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
H332 - HARMFUL IF INHALED
H351 - SUSPECTED OF CAUSING CANCER
H373 - MAY CAUSE DAMAGE TO ORGANS (LUNG, KIDNEYS, LIVER, CENTRAL NERVOUS SYSTEM) THROUGH PROLONGED OR REPEATED EXPOSURE
CGA-HG04 - MAY FORM EXPLOSIVE MIXTURES WITH AIR
CGA-HG01 - MAY CAUSE FROSTBITE

Precautionary statements (GHS-US) :
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from Heat, Open flames, Sparks, Hot surfaces. - No smoking
P260 - Do not breathe gas

P262 - Do not get in eyes, on skin, or on clothing
P271+P403 - Use and store only outdoors or in a well-ventilated place
P280+P284 - Wear protective gloves, protective clothing, eye protection, respiratory protection, and/or face protection
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely
P381 - Eliminate all ignition sources if safe to do so
P405 - Store locked up
P501 - Dispose of contents/container in accordance with container Supplier/owner instructions
CGA-PG05 - Use a back flow preventive device in the piping
CGA-PG12 - Do not open valve until connected to equipment prepared for use
CGA-PG06 - Close valve after each use and when empty
CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F)

2.3. Other hazards

Other hazards not contributing to the classification : Contact with liquid may cause cold burns/frostbite.

2.4. Unknown acute toxicity (GHS US)

No data available

SECTION 3: Composition/Information on ingredients

3.1. Substance

Name	Product identifier	%
Methyl chloride (Refrigerant gas R 40) (Main constituent)	(CAS No) 74-87-3	100

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, trained personnel should give oxygen. Call a physician.

First-aid measures after skin contact : The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

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

No additional information available

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

Obtain medical assistance.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide, Dry chemical, Water spray or fog. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : **EXTREMELY FLAMMABLE GAS**. If venting or leaking gas catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device.

Explosion hazard : **EXTREMELY FLAMMABLE GAS**. Forms explosive mixtures with air and oxidizing agents.

Reactivity : No reactivity hazard other than the effects described in sub-sections below.

5.3. Advice for firefighters

Firefighting instructions : **DANGER! Toxic, flammable liquefied gas**

Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1910 Subpart L—Fire Protection.

Special protective equipment for fire fighters : Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.

Other information : Containers are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : **DANGER: Flammable, liquefied gas.** FORMS EXPLOSIVE MIXTURES WITH AIR. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if safe to do so. Reduce vapors with fog or fine water spray, taking care not to spread liquid with water. Shut off flow if safe to do so. Ventilate area or move container to a well-ventilated area. Flammable vapors may spread from leak and could explode if reignited by sparks or flames. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an appropriate device.

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only non-sparking tools. Use only explosion-proof equipment

Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g, wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store only where temperature will not exceed 125°F (52°C). Post "No Smoking/No Open Flames" signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g, NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Methyl chloride (Refrigerant gas R 40) (74-87-3)		
ACGIH	ACGIH TLV-TWA (ppm)	50 ppm
ACGIH	ACGIH TLV-STEL (ppm)	100 ppm
USA OSHA	OSHA PEL (TWA) (ppm)	100 ppm
USA OSHA	OSHA PEL (Ceiling) (ppm)	200 ppm
USA IDLH	US IDLH (mg/m³)	≈ mg/m³
USA IDLH	US IDLH (ppm)	2000 ppm

8.2. Exposure controls

Appropriate engineering controls : Use an explosion-proof local exhaust system. Local exhaust and general ventilation must be adequate to meet exposure standards. MECHANICAL (GENERAL): **Inadequate - Use only in a closed system.** Use explosion proof equipment and lighting. A canopy-type, forced-draft fume hood is preferred.

Eye protection : Wear safety glasses when handling cylinders; vapor-proof goggles and a face shield during cylinder changeout or whenever contact with product is possible. Select eye protection in accordance with OSHA 29 CFR 1910.133.

Skin and body protection : Wear metatarsal shoes and work gloves for cylinder handling, and protective clothing where needed. Wear appropriate chemical gloves during cylinder changeout or wherever contact with product is possible. Select per OSHA 29 CFR 1910.132, 1910.136, and 1910.138.

Respiratory protection : When workplace conditions warrant respirator use, follow a respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable). Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).

Thermal hazard protection : Wear cold insulating gloves when transfilling or breaking transfer connections.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Gas

Appearance : Colorless gas.

Molecular mass : 50.5 g/mol

Color : Colorless.

Odor	:	Sweetish. Ethereal.
Odor threshold	:	< 0.01 ppm
pH	:	Not applicable.
Relative evaporation rate (butyl acetate=1)	:	No data available
Relative evaporation rate (ether=1)	:	Not applicable.
Melting point	:	-97.7 °C (-143.86°F)
Freezing point	:	No data available
Boiling point	:	-24.2 °C (-11.6°F)
Flash point	:	Not applicable.
Critical temperature	:	143.1 °C (289.6°F)
Auto-ignition temperature	:	632 °C (1170°F)
Decomposition temperature	:	No data available
Flammability (solid, gas)	:	8.1 - 17.4 vol %
Vapor pressure	:	5.1 bar (73.4 psia)(@21.1°C/70°F)
Critical pressure	:	66.5 bar (966 psia)
Relative vapor density at 20 °C	:	No data available
Relative density	:	0.92 (at 20°C/68°F)
Density	:	0.921 g/cm³ (at 20 °C)
Relative gas density	:	1.743 (at 21.1°C/70°F, 1 atm)
Solubility	:	Water: 6310 mg/l
Log Pow	:	0.91
Log Kow	:	Not applicable.
Viscosity, kinematic	:	Not applicable.
Viscosity, dynamic	:	Not applicable.
Explosive properties	:	Not applicable.
Oxidizing properties	:	None.
Explosion limits	:	No data available

9.2. Other information

Gas group	:	Liquefied gas
Additional information	:	Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

May occur.

10.4. Conditions to avoid

Avoid temperature above 752°F (400°C).

10.5. Incompatible materials

May react with aluminium. Reaction with aluminum may form pyrophoric trimethyl aluminum or aluminum alkyls. Oxidizing agents. Magnesium. Zinc. Potassium. Sodium. Aluminum chloride. Ethylene. Moisture. Rubber.

10.6. Hazardous decomposition products

Carbon dioxide. Carbon monoxide. Chlorine. On heating/burning: release of toxic and corrosive gases/vapors hydrogen chloride : formation of small quantities of phosgene.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Inhalation:gas: HARMFUL IF INHALED.

Methyl chloride (Refrigerant gas R 40) (\f)74-87-3	
LD50 oral rat	1800 mg/kg
LC50 inhalation rat (mg/l)	5300 mg/m³ (Exposure time: 4 h)
LC50 inhalation rat (ppm)	8300 ppm/1h
ATE US (oral)	1800.000 mg/kg body weight
ATE US (gases)	8300.000 ppm/1h

Skin corrosion/irritation : Not classified
pH: Not applicable.

Serious eye damage/irritation : Not classified
pH: Not applicable.

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : SUSPECTED OF CAUSING CANCER.

Methyl chloride (Refrigerant gas R 40) (74-87-3)	
IARC group	3 - Not classifiable

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : MAY CAUSE DAMAGE TO ORGANS (LUNG, KIDNEYS, LIVER, CENTRAL NERVOUS SYSTEM) THROUGH PROLONGED OR REPEATED EXPOSURE.

Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No known ecological damage caused by this product.

Methyl chloride (Refrigerant gas R 40) (74-87-3)	
LC50 fish 1	550 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])

12.2. Persistence and degradability

Methyl chloride (Refrigerant gas R 40) (74-87-3)	
Persistence and degradability	The substance is biodegradable. Unlikely to persist.

12.3. Bioaccumulative potential

Methyl chloride (Refrigerant gas R 40) (74-87-3)	
Log Pow	0.91
Log Kow	Not applicable.
Bioaccumulative potential	Not expected to bioaccumulate due to the low log Kow (log Kow < 4). Refer to section 9.

12.4. Mobility in soil

Methyl chloride (Refrigerant gas R 40) (74-87-3)	
Mobility in soil	No data available.
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Other adverse effects

Other adverse effects : May cause pH changes in aqueous ecological systems.

Effect on ozone layer : None

Global warming potential [CO2=1] : 13

Effect on the global warming : Contains Fluorinated greenhouse gases covered by the Kyoto protocol

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Regional legislation (waste) : U.S. - RCRA (Resource Conservation & Recovery Act) - Basis for Listing - Appendix VII. U.S. - RCRA (Resource Conservation & Recovery Act) - Constituents for Detection Monitoring. U.S. - RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261. U.S. - RCRA (Resource Conservation & Recovery Act) - List for Hazardous Constituents. U.S. - RCRA (Resource Conservation & Recovery Act) - Part 268 Appendix III - Halogenated Organic Compounds (HOCs). U.S. - RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards. U.S. - RCRA (Resource Conservation & Recovery Act) - TSD Facilities Ground Water Monitoring. U.S. - RCRA (Resource Conservation & Recovery Act) - U Series Wastes - Acutely Toxic Wastes & Other Hazardous Characteristics.

Waste disposal recommendations : Do not attempt to dispose of residual or unused quantities. Return container to supplier.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN1063 Methyl chloride, 2.1

UN-No.(DOT) : UN1063

Proper Shipping Name (DOT) : Methyl chloride

Class (DOT) : 2.1 - Class 2.1 - Flammable gas 49 CFR 173.115

Hazard labels (DOT) : 2.1 - Flammable gas

DOT Special Provisions (49 CFR 172.102) : N86 - UN pressure receptacles made of aluminum alloy are not authorized
T50 - When portable tank instruction T50 is referenced in Column (7) of the 172.101 Table, the applicable liquefied compressed gases are authorized to be transported in portable tanks in accordance with the requirements of 173.313 of this subchapter

Additional information

Emergency Response Guide (ERG) Number : 115

Other information : No supplementary information available.

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers: - Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

Transport by sea

UN-No. (IMDG) : 1063

Proper Shipping Name (IMDG) : METHYL CHLORIDE (REFRIGERANT GAS R 40)

Class (IMDG) : 2 - Gases

MFAG-No : 115

Air transport

UN-No. (IATA) : 1063

Proper Shipping Name (IATA) : Methyl chloride

Class (IATA) : 2

Civil Aeronautics Law : Gases under pressure/Gases flammable under pressure

SECTION 15: Regulatory information

15.1. US Federal regulations

Methyl chloride (Refrigerant gas R 40) (74-87-3)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Subject to reporting requirements of United States SARA Section 313	
CERCLA RQ	100 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Delayed (chronic) health hazard Sudden release of pressure hazard Fire hazard
SARA Section 313 - Emission Reporting	1.0 %

15.2. International regulations

CANADA

Methyl chloride (Refrigerant gas R 40) (74-87-3)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

Methyl chloride (Refrigerant gas R 40) (74-87-3)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.2.2. National regulations

Methyl chloride (Refrigerant gas R 40) (74-87-3)
Listed on the AICS (Australian Inventory of Chemical Substances) Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China) Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory Listed on the Korean ECL (Existing Chemicals List) Listed on NZIoC (New Zealand Inventory of Chemicals) Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances) Japanese Poisonous and Deleterious Substances Control Law Japanese Pollutant Release and Transfer Register Law (PRTR Law) Listed on the Canadian IDL (Ingredient Disclosure List) Listed on INSQ (Mexican National Inventory of Chemical Substances)

15.3. US State regulations

Methyl chloride (Refrigerant gas R 40)(74-87-3)	
U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	Yes
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	Yes
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

Other information : When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product

Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information

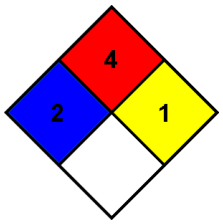
The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair, Inc, it is the user's obligation to determine the conditions of safe use of the product

Praxair SDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your Praxair sales representative, local distributor, or supplier, or download from www.praxair.com. If you have questions regarding Praxair SDSs, would like the document number and date of the latest SDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (Phone: 1-800-PRAXAIR/1-800-772-9247; Address: Praxair Call Center, Praxair, Inc, P.O. Box 44, Tonawanda, NY 14151-0044)

NFPA health hazard : 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

NFPA fire hazard : 4 - Will rapidly or completely vaporize at normal pressure and temperature, or is readily dispersed in air and will burn readily.

NFPA reactivity : 1 - Normally stable, but can become unstable at elevated temperatures and pressures or may react with water with some release of energy, but not violently.



HMIS III Rating

Health : 2 Moderate Hazard - Temporary or minor injury may occur

Flammability : 4 Severe Hazard

Physical : 2 Moderate Hazard

SDS US (GHS HazCom 2012) - Praxair

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

Methylcyclohexane

Version 1.5 Revision Date 2014-03-20

SECTION 1: Identification of the substance/mixture and of the company/undertaking

Product information

Trade name : Methylcyclohexane
Material : 1098852, 1021714, 1021712, 1028351, 1021711, 1024851, 1028352, 1024850, 1021713

EC-No.Registration number

Chemical Name	CAS-No. EC-No. Index No.	Legal Entity Registration number
Methylcyclohexane	108-87-2 203-624-3 601-018-00-7	01-2119556887-18-XXXX

Relevant Identified Uses Supported : Solvent in other applications
Use in polymer processing – professional, Solvent
Use in coatings – professional, Solvent
Lubricants - Professional, Solvent
Use as a cleaning agent – professional, Solvent
Solvent in other applications- Professional

Company : Chevron Phillips Chemical Company LP
Specialty Chemicals
10001 Six Pines Drive
The Woodlands, TX 77380

Local : Chevron Phillips Chemicals International N.V.
Brusselsesteenweg 355
B-3090 Overijse
Belgium

MSDS Requests: (800) 852-5530
Technical Information: (832) 813-4862
Responsible Party: Product Safety Group
Email:msds@cpchem.com

Emergency telephone:

Health:
866.442.9628 (North America)
1.832.813.4984 (International)
Transport:
North America: CHEMTREC 800.424.9300 or 703.527.3887

Asia: +800 CHEMCALL (+800 2436 2255)
EUROPE: BIG +32.14.584545 (phone) or +32.14583516 (telefax)
South America SOS-Cotec Inside Brazil: 0800.111.767 Outside Brazil: +55.19.3467.1600

Responsible Department	:	Product Safety and Toxicology Group
E-mail address	:	MSDS@CPChem.com
Website	:	www.CPChem.com

SECTION 2: Hazards identification

Classification of the substance or mixture
REGULATION (EC) No 1272/2008

Aspiration hazard, Category 1	H304: May be fatal if swallowed and enters airways.
Skin irritation, Category 2	H315: Causes skin irritation.
Flammable liquids, Category 2	H225: Highly flammable liquid and vapor.
Specific target organ systemic toxicity - single exposure, Category 3 , Central nervous system	H336: May cause drowsiness or dizziness.
Acute toxicity, Category 1	H400: Very toxic to aquatic life.
Chronic aquatic toxicity, Category 2	H411: Toxic to aquatic life with long lasting effects.

Classification (67/548/EEC, 1999/45/EC)

Highly flammable	R11: Highly flammable.
Harmful	R65: Harmful: may cause lung damage if swallowed.
Irritant	R38: Irritating to skin.
Dangerous for the environment	R51/53: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. R67: Vapors may cause drowsiness and dizziness.

Label elements

Labeling (REGULATION (EC) No 1272/2008)

Hazard pictograms :

Signal Word	:	Danger	
Hazard Statements	:	H225	Highly flammable liquid and vapor.
		H304	May be fatal if swallowed and enters airways.
		H315	Causes skin irritation.
		H336	May cause drowsiness or dizziness.
		H411	Toxic to aquatic life with long lasting effects.
Precautionary Statements	:	**Prevention:**	

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P243	Take precautionary measures against static discharge.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.

SECTION 3: Composition/information on ingredients

Synonyms : Cyclohexylmethane
Hexahydrotoluene
MCH
Methylcyclohexane (Pure Grade)

Molecular formula : C7H14

Mixtures

Hazardous ingredients

Chemical Name	CAS-No. EC-No. Index No.	Classification (67/548/EEC)	Classification (REGULATION (EC) No 1272/2008)	Concentration [wt%]
Methylcyclohexane	108-87-2 203-624-3 601-018-00-7	F; R11 Xn; R65 Xi; R38 R67 N; R51-R53	Asp. Tox. 1; H304 Skin Irrit. 2; H315 Flam. Liq. 2; H225 STOT SE 3; H336 Aquatic Acute 1; H400 Aquatic Chronic 2; H411	99,8 - 100

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

SECTION 4: First aid measures

General advice : Move out of dangerous area. Show this material safety data sheet to the doctor in attendance. Material may produce a serious, potentially fatal pneumonia if swallowed or vomited.

If inhaled : Consult a physician after significant exposure. If unconscious place in recovery position and seek medical advice.

In case of skin contact : If on skin, rinse well with water. If on clothes, remove clothes.

In case of eye contact : Flush eyes with water as a precaution. Remove contact

lenses. Protect unharmed eye. Keep eye wide open while rinsing. If eye irritation persists, consult a specialist.

If swallowed	:	Keep respiratory tract clear. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician. Take victim immediately to hospital.

SECTION 5: Firefighting measures

Flash point	:	-5,5 °C (22,1 °F) Method: Tagliabue Open Cup
Autoignition temperature	:	285 °C (545 °F)
Suitable extinguishing media	:	Alcohol-resistant foam. Carbon dioxide (CO2). Dry chemical.
Unsuitable extinguishing media	:	High volume water jet.
Specific hazards during fire fighting	:	Do not allow run-off from fire fighting to enter drains or water courses.
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.
Further information	:	Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. For safety reasons in case of fire, cans should be stored separately in closed containments. Use a water spray to cool fully closed containers.
Fire and explosion protection	:	Do not spray on an open flame or any other incandescent material. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapors). Use only explosion-proof equipment. Keep away from open flames, hot surfaces and sources of ignition.
Hazardous decomposition products	:	Hydrocarbons. Carbon oxides.

SECTION 6: Accidental release measures

Personal precautions	:	Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.
Environmental precautions	:	Prevent product from entering drains. Prevent further leakage or spillage if safe to do so. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods for cleaning up	:	Contain spillage, and then collect with non-combustible

absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

SECTION 7: Handling and storage

Handling

Advice on safe handling : Avoid formation of aerosol. Do not breathe vapors/dust. Avoid exposure - obtain special instructions before use. Avoid contact with skin and eyes. For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Take precautionary measures against static discharges. Provide sufficient air exchange and/or exhaust in work rooms. Open drum carefully as content may be under pressure. Dispose of rinse water in accordance with local and national regulations.

Advice on protection against fire and explosion : Do not spray on an open flame or any other incandescent material. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapors). Use only explosion-proof equipment. Keep away from open flames, hot surfaces and sources of ignition.

Storage

Requirements for storage areas and containers : No smoking. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Observe label precautions. Electrical installations / working materials must comply with the technological safety standards.

SECTION 8: Exposure controls/personal protection

Ingredients with workplace control parameters

SK

Súčast	Podstata	Hodnota	Kontrolné parametre	Poznámka
METHYLCYCLOHEXANE	SK OEL	NPEL priemerný	200 ppm, 810 mg/m3	
	SK OEL	NPEL krátkodobý	400 ppm, 1.620 mg/m3	

SI

Komponente	Osnova	Vrednost	Parametri nadzora	Pripomba
METHYLCYCLOHEXANE	SI OEL	MV	500 ppm, 2.000 mg/m3	

PT

Componentes	Bases	Valor	Parâmetros de controlo	Nota
METHYLCYCLOHEXANE	PT OEL	VLE-MP	400 ppm,	

PL

Składniki	Podstawa	Wartość	Parametry dotyczące kontroli	Uwaga
METHYLCYCLOHEXANE	PL NDS	NDS	1.600 mg/m3	
	PL NDS	NDSch	3.000 mg/m3	

NO

Komponenter	Grunnlag	Verdi	Kontrollparametere	Nota
METHYLCYCLOHEXANE	AN 361	TWA	200 ppm, 800 mg/m3	

LT

Komponentai	Pagrindas, bazė	Vertė	Kontrolės parametrai	Pastaba
METHYLCYCLOHEXANE	LT OEL	IPRD	50 mg/m3	

IE

Ingredients	Basis	Value	Control parameters	Note
Methylcyclohexane	IE OEL	OELV - 8 hrs (TWA)	400 ppm, 1.600 mg/m3	

GR

Συστατικά	Βάση	Τιμή	Παράμετροι ελέγχου	Σημείωση
METHYLCYCLOHEXANE	GR OEL	TWA	500 ppm, 2.000 mg/m3	
	GR OEL	STEL	500 ppm, 2.000 mg/m3	

FR

Composants	Base	Valeur	Paramètres de contrôle	Note
METHYLCYCLOHEXANE	FR VLE	VME	400 ppm, 1.600 mg/m3	normal,

normal Valeurs limites indicatives

FI

Aineosat	Peruste	Arvo	Valvontaa koskevat muuttujat	Huomautus
METHYLCYCLOHEXANE	FI OEL	HTP-arvot 8h	400 ppm, 1.600 mg/m3	
	FI OEL	HTP-arvot 15 min	500 ppm, 2.000 mg/m3	

ES

Componentes	Base	Valor	Parámetros de control	Nota
METHYLCYCLOHEXANE	ES VLA	VLA-ED	400 ppm, 1.630 mg/m3	

EE

Komponendid, osad	Alused	Väärtus	Kontrolliparameetrid	Märkused
METHYLCYCLOHEXANE	EE OEL	Piirnorm	400 ppm, 1.600 mg/m3	

DK

Komponenter	Basis	Værdi	Kontrolparametre	Note
METHYLCYCLOHEXANE	DK OEL	GV	200 ppm, 805 mg/m3	

DE

Inhaltsstoffe	Grundlage	Wert	Zu überwachende Parameter	Bemerkung
METHYLCYCLOHEXANE	DE TRGS 900	AGW	200 ppm, 810 mg/m3	DFG,

DFG Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe der DFG (MAK-Kommission)

CZ

Složky	Základ	Hodnota	Kontrolní parametry	Poznámka
METHYLCYCLOHEXANE	CZ OEL	PEL	1.500 mg/m3	I,
	CZ OEL	NPK-P	2.000 mg/m3	I,

I dráždí sliznice (oči, dýchací cesty) resp. kůži

CH

Inhaltsstoffe	Grundlage	Wert	Zu überwachende Parameter	Bemerkung
METHYLCYCLOHEXANE	CH SUVA	MAK-wert	400 ppm, 1.600 mg/m3	
	CH SUVA	STEL	800 ppm, 3.200 mg/m3	

BE

Bestanddelen	Basis	Waarde	Controleparameters	Opmerking
METHYLCYCLOHEXANE	BE OEL	TGG 8 hr	400 ppm, 1.633 mg/m3	

AT

Inhaltsstoffe	Grundlage	Wert	Zu überwachende Parameter	Bemerkung
METHYLCYCLOHEXANE	AT OEL	TMW	400 ppm, 1.600 mg/m3	
	AT OEL	KZW	1.600 ppm, 6.400 mg/m3	

DNEL : End Use: Workers
Routes of exposure: Inhalation
Potential health effects: Systemic effects
Value: 64,3 mg/m3

DNEL : End Use: Workers
Routes of exposure: Inhalation
Potential health effects: Acute effects
Value: 1354,6 mg/m3

DNEL	:	End Use: Workers Routes of exposure: Skin contact Potential health effects: Systemic effects Value: 1,7 mg/kg
PNEC	:	Fresh water Value: 0,00326 mg/l
PNEC	:	Marine water Value: 0,000326 mg/l
PNEC	:	Fresh water sediment Value: 0,088 mg/kg
PNEC	:	Marine sediment Value: 0,0088 mg/kg
PNEC	:	Soil Value: 0,127 mg/kg

Engineering measures

Adequate ventilation to control airborned concentrations below the exposure guidelines/limits. Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Personal protective equipment

Respiratory protection	:	Wear a supplied-air NIOSH approved respirator unless ventilation or other engineering controls are adequate to maintain minimal oxygen content of 19.5% by volume under normal atmospheric pressure. Wear a NIOSH approved respirator that provides protection when working with this material if exposure to harmful levels of airborne material may occur, such as:. Air-Purifying Respirator for Organic Vapors. Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, exposure levels are not known, or other circumstances where air-purifying respirators may not provide adequate protection.
Hand protection	:	The suitability for a specific workplace should be discussed with the producers of the protective gloves. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Eye protection	:	Eye wash bottle with pure water. Tightly fitting safety goggles.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. Wear as appropriate:. Flame retardant

protective clothing. Footwear protecting against chemicals.

Hygiene measures : When using do not eat or drink. When using do not smoke. Wash hands before breaks and at the end of workday.

For additional details, see the Exposure Scenario in the Annex portion

SECTION 9: Physical and chemical properties

Information on basic physical and chemical properties

Appearance

Form	:	Liquid
Physical state	:	Liquid
Color	:	Colorless
Odor	:	Mild

Safety data

Flash point	:	-5,5 °C (22,1 °F) Method: Tagliabue Open Cup
Lower explosion limit	:	1,2 %(V)
Upper explosion limit	:	6,7 %(V)
Oxidizing properties	:	no
Autoignition temperature	:	285 °C (545 °F)
Molecular formula	:	C7H14
Molecular weight	:	98,21 g/mol
pH	:	No data available
Freezing point	:	-127 °C (-197 °F)
Boiling point/boiling range	:	100,4 °C (212,7 °F)
Vapor pressure	:	1,60 PSI at 37,8 °C (100,0 °F)
Relative density	:	0,774, 15,6 °C(60,1 °F)
Density	:	771,7 g/l
Water solubility	:	Negligible
Viscosity, dynamic	:	0,732 cP
Relative vapor density	:	3 (Air = 1.0)
Evaporation rate	:	1
Percent volatile	:	> 99 %

SECTION 10: Stability and reactivity

Chemical stability : This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Possibility of hazardous reactions

Conditions to avoid : Heat, flames and sparks.

Materials to avoid : May react with oxygen and strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

Other data : No decomposition if stored and applied as directed.

SECTION 11: Toxicological information

Acute oral toxicity

Methylcyclohexane : LD50: 4.000 - 4.500 mg/kg
Species: rabbit

Acute inhalation toxicity

Methylcyclohexane : LC50: > 26,3 mg/l
Exposure time: 1 h
Species: mouse
Test atmosphere: vapor

Acute dermal toxicity

Methylcyclohexane : LD50: > 2.000 mg/kg
Species: rabbit
Method: OECD Test Guideline 402
Information given is based on data obtained from similar substances.

Skin irritation

Methylcyclohexane : Skin irritation

Eye irritation

Methylcyclohexane : No eye irritation

Sensitization

Methylcyclohexane : Did not cause sensitization on laboratory animals.

Repeated dose toxicity

Methylcyclohexane : Species: rat, male
Sex: male
Application Route: oral gavage

Dose: 62.5, 250, 1000 mg/kg
Exposure time: 28 d
Number of exposures: daily, 7d/wk
NOEL: 250 mg/kg
Lowest observable effect level: 1.000 mg/kg
Method: OECD Guideline 422

Species: rat, female
Sex: female
Application Route: oral gavage
Dose: 62.5, 250, 1000 mg/kg
Exposure time: 46 d
Number of exposures: daily, 7 d/wk
NOEL: 250 mg/kg
Lowest observable effect level: 1.000 mg/kg
Method: OECD Guideline 422

Reproductive toxicity

Methylcyclohexane : Species: rat
Sex: male
Application Route: oral gavage
Dose: 62.5, 250, 1000 mg/kg
Number of exposures: daily, 7 d/wk
Test period: 28
Method: OECD Guideline 422
NOAEL Parent: 1.000 mg/kg
NOAEL F1: 1.000 mg/kg

Species: rat
Sex: female
Application Route: oral gavage
Dose: 62.5, 250, 1000 mg/kg
Number of exposures: daily, 7 d/wk
Test period: 46
Method: OECD Guideline 422
NOAEL Parent: 1.000 mg/kg
NOAEL F1: 1.000 mg/kg

Species: rat
Sex: male and female
Application Route: inhalation (vapor)
Dose: 500, 2000, 7000 ppm
Number of exposures: daily, 7 d/wk
Test period: 28
Method: OECD Test Guideline 416
NOAEL Parent: 500 ppm
NOAEL F1: 500 ppm
NOAEL F2: 2000 ppm
Information given is based on data obtained from similar substances.

Developmental Toxicity

Methylcyclohexane : Species: rat
Application Route: Inhalation
Dose: 500, 2000, 7000 ppm
Number of exposures: 6 hr/d, 7 d/wk
Test period: GD 7 - 16

Method: OECD Guideline 414
NOAEL Teratogenicity: 7000 ppm
NOAEL Maternal: 500 ppm
Information given is based on data obtained from similar substances.

Species: rabbit
Application Route: Inhalation
Dose: 500, 2000, 7000 ppm
Number of exposures: 6 hr/d, 7 d/wk
Test period: GD 6 - 18
Method: OECD Guideline 414
NOAEL Teratogenicity: 7000 ppm
NOAEL Maternal: 500 ppm
Information given is based on data obtained from similar substances.

Methylcyclohexane
Aspiration toxicity : May be fatal if swallowed and enters airways.

CMR effects

Methylcyclohexane : Carcinogenicity: Not available
Mutagenicity: Tests on bacterial or mammalian cell cultures did not show mutagenic effects.
Teratogenicity: Animal testing did not show any effects on fetal development.
Reproductive toxicity: Animal testing did not show any effects on fertility.

Methylcyclohexane
Further information : Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. Concentrations substantially above the TLV value may cause narcotic effects. Solvents may degrease the skin.

SECTION 12: Ecological information

Toxicity to fish

Methylcyclohexane : LC50: 2,07 mg/l
Exposure time: 96 h
Species: Fish
semi-static test

Toxicity to daphnia and other aquatic invertebrates

Methylcyclohexane : EC50: 0,326 mg/l
Exposure time: 48 h
Species: Daphnia magna (Water flea)
semi-static test

Toxicity to algae

Methylcyclohexane : ErC50: 0,336 mg/l
Exposure time: 72 h
Species: Pseudokirchneriella subcapitata (green algae)

static test

Toxicity to bacteria

Methylcyclohexane	:	IC50: 29 mg/l Exposure time: 15 h Growth inhibition

Biodegradability

Methylcyclohexane	:	aerobic 0 % Testing period: 28 d Method: OECD Test Guideline 301F

Acute aquatic toxicity

Methylcyclohexane	:	Very toxic to aquatic life.

Chronic aquatic toxicity

Methylcyclohexane	:	Toxic to aquatic life with long lasting effects.

Toxicity Data on Soil

Methylcyclohexane	:	No data available

Other organisms relevant to the environment

Methylcyclohexane	:	No data available

Impact on Sewage Treatment

Methylcyclohexane	:	No data available

Results of PBT assessment

Methylcyclohexane	:	Non-classified PBT substance, Non-classified vPvB substance
Additional ecological information	:	Toxic to aquatic life with long lasting effects.

SECTION 13: Disposal considerations

The information in this MSDS pertains only to the product as shipped.

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

Product	:	The product should not be allowed to enter drains, water courses or the soil. Do not contaminate ponds, waterways or ditches with chemical or used container. Send to a licensed waste management company.
Contaminated packaging	:	Empty remaining contents. Dispose of as unused product. Do not re-use empty containers. Do not burn, or use a cutting torch on, the empty drum.

For additional details, see the Exposure Scenario in the Annex portion

SECTION 14: Transport information

The shipping descriptions shown here are for bulk shipments only, and may not apply to shipments in non-bulk packages (see regulatory definition).

Consult the appropriate domestic or international mode-specific and quantity-specific Dangerous Goods Regulations for additional shipping description requirements (e.g., technical name or names, etc.) Therefore, the information shown here, may not always agree with the bill of lading shipping description for the material. Flashpoints for the material may vary slightly between the MSDS and the bill of lading.

US DOT (UNITED STATES DEPARTMENT OF TRANSPORTATION)
UN2296, METHYLCYCLOHEXANE, 3, II

IMO / IMDG (INTERNATIONAL MARITIME DANGEROUS GOODS)
UN2296, METHYLCYCLOHEXANE, 3, II, (-5,5 °C), MARINE POLLUTANT, (METHYLCYCLOHEXANE)

IATA (INTERNATIONAL AIR TRANSPORT ASSOCIATION)
UN2296, METHYLCYCLOHEXANE, 3, II

ADR (AGREEMENT ON DANGEROUS GOODS BY ROAD (EUROPE))
UN2296, METHYLCYCLOHEXANE, 3, II, (D/E), ENVIRONMENTALLY HAZARDOUS, (METHYLCYCLOHEXANE)

RID (REGULATIONS CONCERNING THE INTERNATIONAL TRANSPORT OF DANGEROUS GOODS (EUROPE))
UN2296, METHYLCYCLOHEXANE, 3, II, ENVIRONMENTALLY HAZARDOUS, (METHYLCYCLOHEXANE)

ADN (EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY INLAND WATERWAYS)
UN2296, METHYLCYCLOHEXANE, 3, II, ENVIRONMENTALLY HAZARDOUS, (METHYLCYCLOHEXANE)

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Other information	:	**Methylcyclohexane, S.T. 2, Cat. Y**

SECTION 15: Regulatory information

National legislation

Chemical Safety Assessment

Ingredients : methylcyclohexane 203-624-3

Major Accident Hazard Legislation : 96/82/EC Update: 2003
Dangerous for the environment
9b
Quantity 1: 200 t
Quantity 2: 500 t

: 96/82/EC Update: 2003
Highly flammable
7b
Quantity 1: 5.000 t
Quantity 2: 50.000 t

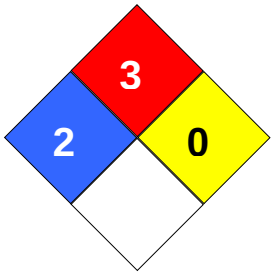
Water contaminating class (Germany) : WGK 2 water endangering

Notification status

Europe REACH	:	On the inventory, or in compliance with the inventory
United States of America TSCA	:	On the inventory, or in compliance with the inventory
Canada DSL	:	On the inventory, or in compliance with the inventory
Australia AICS	:	On the inventory, or in compliance with the inventory
New Zealand NZIoC	:	On the inventory, or in compliance with the inventory
Japan ENCS	:	On the inventory, or in compliance with the inventory
Korea KECI	:	On the inventory, or in compliance with the inventory
Philippines PICCS	:	On the inventory, or in compliance with the inventory
China IECSC	:	On the inventory, or in compliance with the inventory

SECTION 16: Other information

NFPA Classification : Health Hazard: 2
Fire Hazard: 3
Reactivity Hazard: 0



Further information

Legacy MSDS Number : 34310

Significant changes since the last version are highlighted in the margin. This version replaces all previous versions.

The information in this MSDS pertains only to the product as shipped.

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

Key or legend to abbreviations and acronyms used in the safety data sheet			
ACGIH	American Conference of Government Industrial Hygienists	LD50	Lethal Dose 50%
AICS	Australia, Inventory of Chemical Substances	LOAEL	Lowest Observed Adverse Effect Level
DSL	Canada, Domestic Substances List	NFPA	National Fire Protection Agency
NDSL	Canada, Non-Domestic Substances List	NIOSH	National Institute for Occupational Safety & Health
CNS	Central Nervous System	NTP	National Toxicology Program
CAS	Chemical Abstract Service	NZIoC	New Zealand Inventory of Chemicals
EC50	Effective Concentration	NOAEL	No Observable Adverse Effect Level
EC50	Effective Concentration 50%	NOEC	No Observed Effect Concentration
EGEST	EOSCA Generic Exposure Scenario Tool	OSHA	Occupational Safety & Health Administration
EOSCA	European Oilfield Specialty Chemicals Association	PEL	Permissible Exposure Limit
EINECS	European Inventory of Existing Chemical Substances	PICCS	Philippines Inventory of Commercial Chemical Substances
MAK	Germany Maximum Concentration Values	PRNT	Presumed Not Toxic
GHS	Globally Harmonized System	RCRA	Resource Conservation Recovery Act
>=	Greater Than or Equal To	STEL	Short-term Exposure Limit
IC50	Inhibition Concentration 50%	SARA	Superfund Amendments and Reauthorization Act.
IARC	International Agency for Research on Cancer	TLV	Threshold Limit Value
IECSC	Inventory of Existing Chemical Substances in China	TWA	Time Weighted Average
ENCS	Japan, Inventory of Existing and New Chemical Substances	TSCA	Toxic Substance Control Act
KECI	Korea, Existing Chemical Inventory	UVCB	Unknown or Variable Composition, Complex Reaction Products, and Biological Materials
<=	Less Than or Equal To	WHMIS	Workplace Hazardous Materials Information System
LC50	Lethal Concentration 50%		

Full text of R-phrases referred to under sections 2 and 3

R11	Highly flammable.
R38	Irritating to skin.
R51	Toxic to aquatic organisms.
R51/53	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R53	May cause long-term adverse effects in the aquatic environment.
R65	Harmful: may cause lung damage if swallowed.
R67	Vapors may cause drowsiness and dizziness.

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

H225	Highly flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H400	Very toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

Annex

1. Short title of Exposure Scenario: **Solvent in other applications**

Main User Groups	:	**SU 3:** Industrial uses: Uses of substances as such or in preparations at industrial sites
Sector of use	:	**SU3:** Industrial Manufacturing (all)
Process category	:	**PROC1:** Use in closed process, no likelihood of exposure **PROC2:** Use in closed, continuous process with occasional controlled exposure **PROC3:** Use in closed batch process (synthesis or formulation) **PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises **PROC7:** Industrial spraying **PROC8a:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities **PROC8b:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities **PROC10:** Roller application or brushing **PROC13:** Treatment of articles by dipping and pouring
Environmental release category	:	**ERC4:** Industrial use of processing aids in processes and products, not becoming part of articles

2.1 Contributing scenario controlling environmental exposure for:ERC4: Industrial use of processing aids in processes and products, not becoming part of articles

Concentration of the Substance in Mixture/Article	:	5-25%

Environment factors not influenced by risk management

Flow rate	:	90.000 m3/d

Other given operational conditions affecting environmental exposure

Emission or Release Factor: Air	:	0,3 %
Emission or Release Factor: Water	:	0,003 %
Emission or Release Factor: Soil	:	0,1 %
Local release rate: Air	:	0,66 kg/day
Local release rate: Water	:	0,0065 kg/day
Local release rate: Soil	:	40 kg/day

Technical conditions and measures / Organizational measures

Air	:	Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: 70 %)
Water	:	Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%): (Effectiveness: > 96,4 %)

Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant	:	Municipal sewage treatment plant, No

Flow rate of sewage treatment plant effluent	:	2.000 m3/d
Sludge Treatment	:	Agricultural soil, No

2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed process, no likelihood of exposure

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	One hand face only (240 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Personal Protection, None required
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC2: Use in closed, continuous process with occasional controlled exposure

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves (Effectiveness: 90 %)

Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC3: Use in closed batch process (synthesis or formulation)

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	One hand face only (240 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation- inhalation:, Yes (Effectiveness: 90 %)

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC7: Industrial spraying

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

: 1500 cm2

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation-dermal:, Yes (Effectiveness: 95 %)

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Two hands (960 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation- inhalation:, Yes (Effectiveness: 90 %)

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC8b: Transfer of

substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Two hands (960 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation- inhalation:, Yes (Effectiveness: 95 %)

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC10: Roller application or brushing

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	1 - 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Two hands (960 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation- inhalation:, Yes (Effectiveness: 90 %)

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC13: Treatment of articles by dipping and pouring

Product characteristics

Concentration of the Substance in Mixture/Article : 5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use

Exposure duration : > 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management

Exposed skin area : Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor : Indoor

Technical conditions and measures

Local exhaust ventilation- inhalation:, Yes (Effectiveness: 90 %)

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

3. Exposure estimation and reference to its source

Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value type	Level of Exposure	Risk characterization ratio
ERC4	Petrorisk		Freshwater		0,00018 mg/L	
			Freshwater sediment		0,0043 mg/kg dry weight (d.w.)	
			Marine water		0,000018 mg/L	
			Marine sediment		0,00043 mg/kg dry weight (d.w.)	
			Sewage treatment plant		0,0018 mg/L	
			Agricultural soil		0,0000012 mg/kg	

ERC4: Industrial use of processing aids in processes and products, not becoming part of articles

Workers/Consumers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value type	Level of Exposure	Risk characterization ratio
PROC1	EasyTRA		Worker – dermal, long-term – systemic	0,020571 mg/kg/d	
			Worker – inhalation, long-term – systemic	0,024547 mg/m3	
			Worker – long-term – systemic Combined routes	0,024078 mg/kg/d	
PROC2	EasyTRA		Worker – dermal, long-term – systemic	0,082286 mg/kg/d	

			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	1,836 mg/kg/d	
PROC3	EasyTRA		Worker – dermal, long-term – systemic	0,041143 mg/kg/d	
			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	3,548 mg/kg/d	
PROC4	EasyTRA		Worker – dermal, long-term – systemic	0,411429 mg/kg/d	
			Worker – inhalation, long-term – systemic	4,909 mg/m3	
			Worker – long-term – systemic Combined routes	1,113 mg/kg/d	
PROC7	EasyTRA		Worker – dermal, long-term – systemic	0,128571 mg/kg/d	
			Worker – inhalation, long-term – systemic	30,683 mg/m3	
			Worker – long-term – systemic Combined routes	4,512 mg/kg/d	
PROC8a	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	2,576 mg/kg/d	
PROC8b	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	3,068 mg/m3	
			Worker – long-term – systemic Combined routes	1,261 mg/kg/d	
PROC10	EasyTRA		Worker – dermal, long-term – systemic	0,987429 mg/kg/d	
			Worker – inhalation, long-term – systemic	7,364 mg/m3	
			Worker – long-term – systemic Combined routes	2,039 mg/kg/d	
PROC13	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	2,576 mg/kg/d	

PROC1: Use in closed process, no likelihood of exposure

PROC2: Use in closed, continuous process with occasional controlled exposure

PROC3: Use in closed batch process (synthesis or formulation)

PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

PROC7: Industrial spraying

PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

PROC10: Roller application or brushing

PROC13: Treatment of articles by dipping and pouring

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Predicted releases are not expected to lead to environmental concentrations which would exceed the PNEC when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

1. Short title of Exposure Scenario: **Use in polymer processing – professional**

Main User Groups	:	**SU 22:** Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
Sector of use	:	**SU 22, SU0:** Professional uses: Public domain (administration, education, entertainment, services, craftsmen), Other
Process category	:	**PROC1:** Use in closed process, no likelihood of exposure **PROC2:** Use in closed, continuous process with occasional controlled exposure **PROC6:** Calendering operations **PROC8a:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities **PROC8b:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities **PROC14:** Production of mixtures or articles by tabletting, compression, extrusion, pelletization; Industrial setting; **PROC21:** Low energy manipulation of substances bound in materials and/ or articles
Environmental release category	:	**ERC8a, ERC8d:** Wide dispersive indoor use of processing aids in open systems, Wide dispersive outdoor use of processing aids in open systems
Further information	:	Processing of formulated polymers including material transfers, moulding and forming activities, material re-works and associated maintenance.

2.1 Contributing scenario controlling environmental exposure for:ERC8a, ERC8d: Wide dispersive indoor use of processing aids in open systems, Wide dispersive outdoor use of processing aids in open systems

Concentration of the Substance in Mixture/Article	:	5-25%

Environment factors not influenced by risk management

Flow rate	:	90.000 m3/d

Other given operational conditions affecting environmental exposure

Emission or Release Factor: Air	:	98 %
Emission or Release Factor: Water	:	1 %
Emission or Release Factor: Soil	:	1 %
Local release rate: Water	:	1,6 kg/day
Local release rate: Air	:	160 kg/day
Local release rate: Soil	:	0,0033 kg/day

Technical conditions and measures / Organizational measures

Air	:	Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: 0 %)
Water	:	Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%): (Effectiveness: > 96,4 %)

Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant	:	Municipal sewage treatment plant, No
Flow rate of sewage treatment plant effluent	:	2.000 m3/d
Sludge Treatment	:	Agricultural soil, Yes, applicable

2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed process, no likelihood of exposure

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	One hand face only (240 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Personal Protection, None required
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC2: Use in closed, continuous process with occasional controlled exposure

Product characteristics

Concentration of the Substance in Mixture/Article : 5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use
Exposure duration : > 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management
Exposed skin area : Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure
Outdoor / Indoor : Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC6: Calendering operations

Product characteristics
Concentration of the Substance in Mixture/Article : 5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use
Exposure duration : 1 - 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management
Exposed skin area : Two hands (960 cm2)

Other operational conditions affecting workers exposure
Outdoor / Indoor : Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics
Concentration of the Substance in : 5-25%

Mixture/Article

Physical Form (at time of use) : Liquid substance

Frequency and duration of use
Exposure duration : > 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management
Exposed skin area : Two hands (960 cm2)

Other operational conditions affecting workers exposure
Outdoor / Indoor : Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Protective gloves, Yes, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

Product characteristics
Concentration of the Substance in Mixture/Article : 5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use
Exposure duration : > 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management
Exposed skin area : Two hands (960 cm2)

Other operational conditions affecting workers exposure
Outdoor / Indoor : Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Protective gloves, Yes, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC14: Production of mixtures or articles by tabletting, compression, extrusion, pelletization; Industrial setting;

Product characteristics
Concentration of the Substance in : 5-25%

Mixture/Article

Physical Form (at time of use) : Liquid substance

Frequency and duration of use
Exposure duration : > 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management
Exposed skin area : Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure
Outdoor / Indoor : Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Protective gloves, Yes, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC21: Low energy manipulation of substances bound in materials and/ or articles

Product characteristics
Concentration of the Substance in Mixture/Article : 5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use
Exposure duration : > 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management
Exposed skin area : Skin
: 1980 cm2

Other operational conditions affecting workers exposure
Outdoor / Indoor : Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Protective gloves, Yes, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

3. Exposure estimation and reference to its source

Environment

Contributing Scenario	Exposure Assessment	Specific conditions	Compartment	Value type	Level of Exposure	Risk characterization

	Method					ratio
ERC8a, ERC8d	Petrorisk		Freshwater		0,0000065 mg/L	
			Freshwater sediment		0,000035 mg/kg dry weight (d.w.)	
			Marine water		0,0000001 mg/L	
			Marine sediment		0,0000035 mg/kg dry weight (d.w.)	
			Sewage treatment plant		0,000015 mg/L	
			Agricultural soil		0,00001 mg/kg	

ERC8a: Wide dispersive indoor use of processing aids in open systems
ERC8d: Wide dispersive outdoor use of processing aids in open systems

Workers/Consumers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value type	Level of Exposure	Risk characterization ratio
PROC1	EasyTRA		Worker – dermal, long-term – systemic	0,020571 mg/kg/d	
			Worker – inhalation, long-term – systemic	0,024547 mg/m3	
			Worker – long-term – systemic Combined routes	0,024078 mg/kg/d	
PROC2	EasyTRA		Worker – dermal, long-term – systemic	0,082286 mg/kg/d	
			Worker – inhalation, long-term – systemic	49,093 mg/m3	
			Worker – long-term – systemic Combined routes	7,096 mg/kg/d	
PROC6	EasyTRA		Worker – dermal, long-term – systemic	0,987429 mg/kg/d	
			Worker – inhalation, long-term – systemic	14,728 mg/m3	
			Worker – long-term – systemic Combined routes	3,091 mg/kg/d	
PROC8a	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	4,33 mg/kg/d	
PROC8b	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	2,576 mg/kg/d	
PROC14	EasyTRA		Worker – dermal, long-term – systemic	0,205714 mg/kg/d	
			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	3,712 mg/kg/d	
PROC21	EasyTRA		Worker – dermal, long-term – systemic	0,169714 mg/kg/d	
			Worker – inhalation, long-term – systemic		

			Worker – long-term – systemic Combined routes	0,169714 mg/kg/d	

PROC1: Use in closed process, no likelihood of exposure

PROC2: Use in closed, continuous process with occasional controlled exposure

PROC6: Calendering operations

PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

PROC14: Production of mixtures or articles by tabletting, compression, extrusion, pelletization; Industrial setting;

PROC21: Low energy manipulation of substances bound in materials and/ or articles

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Predicted releases are not expected to lead to environmental concentrations which would exceed the PNEC when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

1. Short title of Exposure Scenario: **Use in coatings – professional**

Main User Groups	:	**SU 22:** Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
Sector of use	:	**SU 22, SU0:** Professional uses: Public domain (administration, education, entertainment, services, craftsmen), Other
Process category	:	**PROC1:** Use in closed process, no likelihood of exposure **PROC2:** Use in closed, continuous process with occasional controlled exposure **PROC3:** Use in closed batch process (synthesis or formulation) **PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises **PROC5:** Mixing or blending in batch processes for formulation of mixtures and articles (multistage and/or significant contact) Industrial setting; **PROC8a:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities **PROC8b:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities **PROC10:** Roller application or brushing **PROC11:** Non industrial spraying

		PROC13: Treatment of articles by dipping and pouring **PROC15:** Use as laboratory reagent **PROC19:** Hand-mixing with intimate contact and only PPE available
Environmental release category	:	**ERC8a, ERC8d:** Wide dispersive indoor use of processing aids in open systems, Wide dispersive outdoor use of processing aids in open systems
Further information	:	Covers the use in coatings (paints, inks, adhesives, etc) including exposures during use (including materials receipt, storage, preparation and transfer from bulk and semi-bulk, application by spray, roller, brush, spreader by hand or similar methods, and film formation), and equipment cleaning, maintenance and associated laboratory activities.

2.1 Contributing scenario controlling environmental exposure for:ERC8a, ERC8d: Wide dispersive indoor use of processing aids in open systems, Wide dispersive outdoor use of processing aids in open systems

Concentration of the Substance in Mixture/Article	:	5-25%

Environment factors not influenced by risk management

Flow rate	:	90.000 m3/d

Other given operational conditions affecting environmental exposure

Emission or Release Factor: Air	:	98 %
Emission or Release Factor: Water	:	1 %
Emission or Release Factor: Soil	:	1 %
Local release rate: Water	:	1,1 kg/day
Local release rate: Air	:	11 kg/day
Local release rate: Soil	:	0,000002 kg/day

Technical conditions and measures / Organizational measures

Air	:	Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: 0 %)
Water	:	Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%): (Effectiveness: > 96,4 %)

Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant	:	Municipal sewage treatment plant, No
Flow rate of sewage treatment plant effluent	:	2.000 m3/d
Sludge Treatment	:	Agricultural soil, Yes, applicable

2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed process, no likelihood of exposure

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use
Exposure duration : > 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management
Exposed skin area : One hand face only (240 cm2)

Other operational conditions affecting workers exposure
Outdoor / Indoor : Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Personal Protection, None required
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC2: Use in closed, continuous process with occasional controlled exposure

Product characteristics
Concentration of the Substance in Mixture/Article : 5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use
Exposure duration : > 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management
Exposed skin area : Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure
Outdoor / Indoor : Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC3: Use in closed batch process (synthesis or formulation)

Product characteristics
Concentration of the Substance in Mixture/Article : 5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	One hand face only (240 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC4, PROC5, PROC13: Use in batch and other process (synthesis) where opportunity for exposure arises, Mixing or blending in batch processes for formulation of mixtures and articles (multistage and/or significant contact) Industrial setting;, Treatment of articles by dipping and pouring

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC8a, PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use
Exposure duration : > 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management
Exposed skin area : Two hands (960 cm2)

Other operational conditions affecting workers exposure
Outdoor / Indoor : Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC10: Roller application or brushing

Product characteristics
Concentration of the Substance in Mixture/Article : 5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use
Exposure duration : 1 - 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management
Exposed skin area : Two hands (960 cm2)

Other operational conditions affecting workers exposure
Outdoor / Indoor : Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC11: Non industrial spraying

Product characteristics
Concentration of the Substance in Mixture/Article : 1-5%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use

Exposure duration	:	1 - 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Skin
	:	1500 cm2

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 95 %)

2.2 Contributing scenario controlling worker exposure for: PROC15: Use as laboratory reagent

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	One hand face only (240 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC19: Hand-mixing with intimate contact and only PPE available

Product characteristics

Concentration of the Substance in Mixture/Article	:	1-5%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration : 15 - 60 min
Frequency of use : 5 days/week

Human factors not influenced by risk management

Exposed skin area : Skin
: 1980 cm2

Other operational conditions affecting workers exposure

Outdoor / Indoor : Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

3. Exposure estimation and reference to its source

Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value type	Level of Exposure	Risk characterization ratio
ERC8a, ERC8d	Petrorisk		Freshwater		0,000006 mg/L	
			Freshwater sediment		0,000055 mg/kg dry weight (d.w.)	
			Marine water		0,000099 µg/L	
			Marine sediment		0,0000024 mg/kg dry weight (d.w.)	
			Sewage treatment plant		0,0000099 mg/L	
			Agricultural soil		0,0000069 mg/kg	

ERC8a: Wide dispersive indoor use of processing aids in open systems
ERC8d: Wide dispersive outdoor use of processing aids in open systems

Workers/Consumers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value type	Level of Exposure	Risk characterization ratio
PROC1	EasyTRA		Worker – dermal, long-term – systemic	0,020571 mg/kg/d	
			Worker – inhalation, long-term – systemic	0,024547 mg/m3	
			Worker – long-term – systemic Combined routes	0,024078 mg/kg/d	
PROC2	EasyTRA		Worker – dermal, long-term – systemic	0,082286 mg/kg/d	
			Worker – inhalation, long-term – systemic	49,093 mg/m3	
			Worker – long-term – systemic Combined routes	7,096 mg/kg/d	
PROC3	EasyTRA		Worker – dermal, long-	0,041143 mg/kg/d	

			term – systemic		
			Worker – inhalation, long-term – systemic	61,366 mg/m3	
			Worker – long-term – systemic Combined routes	8,808 mg/kg/d	
PROC4	EasyTRA		Worker – dermal, long-term – systemic	0,411429 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	2,165 mg/kg/d	
PROC5	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	14,728 mg/m3	
			Worker – long-term – systemic Combined routes	2,598 mg/kg	
PROC13	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	4,33 mg/kg	
PROC8a	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	4,33 mg/kg/d	
PROC8b	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	2,576 mg/kg/d	
PROC10	EasyTRA		Worker – dermal, long-term – systemic	0,987429 mg/kg/d	
			Worker – inhalation, long-term – systemic	14,728 mg/m3	
			Worker – long-term – systemic Combined routes	3,091 mg/kg/d	
PROC11	EasyTRA		Worker – dermal, long-term – systemic	1,286 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	3,039 mg/kg/d	
PROC15	EasyTRA		Worker – dermal, long-term – systemic	0,020571 mg/kg/d	
			Worker – inhalation, long-term – systemic	2,455 mg/m3	
			Worker – long-term – systemic Combined routes	0,371236 mg/kg/d	
PROC19	EasyTRA		Worker – dermal, long-term – systemic	0,565714 mg/kg/d	
			Worker – inhalation, long-term – systemic	1,636 mg/m3	
			Worker – long-term – systemic Combined routes	0,799491 mg/kg/d	

PROC1: Use in closed process, no likelihood of exposure

PROC2: Use in closed, continuous process with occasional controlled exposure

PROC3: Use in closed batch process (synthesis or formulation)

PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

PROC5: Mixing or blending in batch processes for formulation of mixtures and articles (multistage and/or significant contact) Industrial setting;

PROC13: Treatment of articles by dipping and pouring

PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

PROC10: Roller application or brushing

PROC11: Non industrial spraying

PROC15: Use as laboratory reagent

PROC19: Hand-mixing with intimate contact and only PPE available

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Predicted releases are not expected to lead to environmental concentrations which would exceed the PNEC when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

1. Short title of Exposure Scenario: **Lubricants - Professional**

Main User Groups	:	**SU 22:** Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
Sector of use	:	**SU 22, SU0:** Professional uses: Public domain (administration, education, entertainment, services, craftsmen), Other
Process category	:	**PROC1:** Use in closed process, no likelihood of exposure **PROC2:** Use in closed, continuous process with occasional controlled exposure **PROC3:** Use in closed batch process (synthesis or formulation) **PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises **PROC8a:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities **PROC8b:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities **PROC9:** Transfer of substance or preparation into small

		containers (dedicated filling line, including weighing) **PROC10:** Roller application or brushing **PROC11:** Non industrial spraying **PROC13:** Treatment of articles by dipping and pouring **PROC17:** Lubrication at high energy conditions and in partly open process **PROC18:** Greasing at high energy conditions **PROC20:** Heat and pressure transfer fluids in dispersive, professional use but closed systems
Environmental release category	:	**ERC8a, ERC8d, ERC9a, ERC9b:** Wide dispersive indoor use of processing aids in open systems, Wide dispersive outdoor use of processing aids in open systems, Wide dispersive indoor use of substances in closed systems, Wide dispersive outdoor use of substances in closed systems
Further information	:	Covers the use of formulated lubricants in closed and open systems including transfer operations, operation of engines and similar articles, reworking on reject articles, equipment maintenance and disposal of waste oil.

2.1 Contributing scenario controlling environmental exposure for:ERC8a, ERC8d, ERC9a, ERC9b: Wide dispersive indoor use of processing aids in open systems, Wide dispersive outdoor use of processing aids in open systems, Wide dispersive indoor use of substances in closed systems, Wide dispersive outdoor use of substances in closed systems

Concentration of the Substance in Mixture/Article	:	5-25%

Environment factors not influenced by risk management

Flow rate	:	90.000 m3/d

Other given operational conditions affecting environmental exposure

Emission or Release Factor: Air	:	40 %
Emission or Release Factor: Water	:	5 %
Emission or Release Factor: Soil	:	5 %
Local release rate: Water	:	5,6 kg/day
Local release rate: Air	:	44 kg/day
Local release rate: Soil	:	0,011 kg/day

Technical conditions and measures / Organizational measures

Air	:	Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: 0 %)
Water	:	Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%): (Effectiveness: > 96,4 %)

Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant	:	Municipal sewage treatment plant, No
Flow rate of sewage treatment plant effluent	:	2.000 m3/d
Sludge Treatment	:	Agricultural soil, Yes, applicable

2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed

process, no likelihood of exposure

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	One hand face only (240 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

None required
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC2: Use in closed, continuous process with occasional controlled exposure

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC3: Use in closed batch process (synthesis or formulation)

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	One hand face only (240 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC4, PROC9, PROC13, PROC20: Use in batch and other process (synthesis) where opportunity for exposure arises, Transfer of substance or preparation into small containers (dedicated filling line, including weighing), Treatment of articles by dipping and pouring, Heat and pressure transfer fluids in dispersive, professional use but closed systems

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC8a, PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at

non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Two hands (960 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC10, PROC18: Roller application or brushing, Greasing at high energy conditions

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	1 - 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Two hands (960 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC11: Non industrial spraying

Product characteristics

Concentration of the Substance in Mixture/Article	:	1 - 5%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	1 - 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Skin
	:	1500 cm2

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 95 %)

2.2 Contributing scenario controlling worker exposure for: PROC17: Lubrication at high energy conditions and in partly open process

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	1 - 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Two hands (960 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 95 %)

3. Exposure estimation and reference to its source

Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value type	Level of Exposure	Risk characterization ratio
ERC8a, ERC8d, ERC9a, ERC9b	Petrorisk		Freshwater		0,0000049 mg/L	
			Freshwater sediment		0,00012 mg/kg dry weight (d.w.)	
			Marine water		0,00049 µg/L	
			Marine sediment		0,000012 mg/kg dry weight (d.w.)	
			Sewage treatment plant		0,000049 mg/L	
			Agricultural soil		0,000035 mg/kg	

ERC8a: Wide dispersive indoor use of processing aids in open systems
ERC8d: Wide dispersive outdoor use of processing aids in open systems
ERC9a: Wide dispersive indoor use of substances in closed systems
ERC9b: Wide dispersive outdoor use of substances in closed systems

Workers/Consumers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value type	Level of Exposure	Risk characterization ratio
PROC1	EasyTRA		Worker – dermal, long-term – systemic	0,020571 mg/kg/d	
			Worker – inhalation, long-term – systemic	0,024547 mg/m3	
			Worker – long-term – systemic Combined routes	0,024078 mg/kg/d	
PROC2	EasyTRA		Worker – dermal, long-term – systemic	0,082286 mg/kg/d	
			Worker – inhalation, long-term – systemic	49,093 mg/m3	
			Worker – long-term – systemic Combined routes	7,096 mg/kg/d	
PROC3	EasyTRA		Worker – dermal, long-term – systemic	0,041143 mg/kg/d	
			Worker – inhalation, long-term – systemic	61,366 mg/m3	
			Worker – long-term – systemic Combined routes	8,808 mg/kg/d	
PROC4	EasyTRA		Worker – dermal, long-term – systemic	0,411429 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	2,165 mg/kg/d	
PROC9	EasyTRA		Worker – dermal, long-term – systemic	0,411429 mg/kg/d	
			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	3,918 mg/kg/d	
PROC13	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	4,33 mg/kg/d	
PROC20	EasyTRA		Worker – dermal, long-	0,102857 mg/kg/d	

			term – systemic		
			Worker – inhalation, long-term – systemic	4,909 mg/m3	
			Worker – long-term – systemic Combined routes	0,804186 mg/kg/d	
PROC8a	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	4,33 mg/kg/d	
PROC8b	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	2,576 mg/kg/d	
PROC10	EasyTRA		Worker – dermal, long-term – systemic	0,987429 mg/kg/d	
			Worker – inhalation, long-term – systemic	14,728 mg/m3	
			Worker – long-term – systemic Combined routes	3,091 mg/kg/d	
PROC18	EasyTRA		Worker – dermal, long-term – systemic	0,493714 mg/kg/d	
			Worker – inhalation, long-term – systemic	29,456 mg/m3	
			Worker – long-term – systemic Combined routes	4,702 mg/kg/d	
PROC11	EasyTRA		Worker – dermal, long-term – systemic	1,286 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	3,039 mg/kg/d	
PROC17	EasyTRA		Worker – dermal, long-term – systemic	0,987429 mg/kg/d	
			Worker – inhalation, long-term – systemic	14,728 mg/m3	
			Worker – long-term – systemic Combined routes	3,091 mg/kg/d	

PROC1: Use in closed process, no likelihood of exposure

PROC2: Use in closed, continuous process with occasional controlled exposure

PROC3: Use in closed batch process (synthesis or formulation)

PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

PROC13: Treatment of articles by dipping and pouring

PROC20: Heat and pressure transfer fluids in dispersive, professional use but closed systems

PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

PROC10: Roller application or brushing

PROC18: Greasing at high energy conditions

PROC11: Non industrial spraying

PROC17: Lubrication at high energy conditions and in partly open process

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Predicted releases are not expected to lead to environmental concentrations which would exceed the PNEC when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

1. Short title of Exposure Scenario: **Use as a cleaning agent – professional**

Main User Groups	:	**SU 22:** Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
Sector of use	:	**SU 22, SU0:** Professional uses: Public domain (administration, education, entertainment, services, craftsmen), Other
Process category	:	**PROC1:** Use in closed process, no likelihood of exposure **PROC2:** Use in closed, continuous process with occasional controlled exposure **PROC3:** Use in closed batch process (synthesis or formulation) **PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises **PROC8a:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities **PROC8b:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities **PROC10:** Roller application or brushing **PROC11:** Non industrial spraying **PROC13:** Treatment of articles by dipping and pouring
Environmental release category	:	**ERC8a, ERC8d:** Wide dispersive indoor use of processing aids in open systems, Wide dispersive outdoor use of processing aids in open systems
Further information	:	Covers the use as a component of cleaning products including pouring/unloading from drums or containers; and exposures during mixing/diluting in the preparatory phase and cleaning activities (including spraying, brushing, dipping, wiping automated and by hand).

2.1 Contributing scenario controlling environmental exposure for:ERC8a, ERC8d: Wide

dispersive indoor use of processing aids in open systems, Wide dispersive outdoor use of processing aids in open systems

Concentration of the Substance in Mixture/Article	:	5-25%

Environment factors not influenced by risk management

Flow rate	:	90.000 m3/d

Other given operational conditions affecting environmental exposure

Emission or Release Factor: Air	:	2 %
Emission or Release Factor: Water	:	0,0001 %
Emission or Release Factor: Soil	:	0 %
Local release rate: Water	:	1,1 kg/day
Local release rate: Air	:	22 kg/day
Local release rate: Soil	:	
Remarks	:	There is no direct exposure to soil.

Technical conditions and measures / Organizational measures

Air	:	Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: 0 %)
Water	:	Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%): (Effectiveness: > 96,4 %)

Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant	:	Municipal sewage treatment plant, No
Flow rate of sewage treatment plant effluent	:	2.000 m3/d
Sludge Treatment	:	Agricultural soil, Yes, applicable

2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed process, no likelihood of exposure

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	One hand face only (240 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

None required
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC2: Use in closed, continuous process with occasional controlled exposure

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC3: Use in closed batch process (synthesis or formulation)

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	One hand face only (240 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures
Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation
Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC4, PROC13: Use in batch and other process (synthesis) where opportunity for exposure arises, Treatment of articles by dipping and pouring

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC8a, PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Two hands (960 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)

Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC10: Roller application or brushing

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	1 - 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Two hands (960 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC11: Non industrial spraying

Product characteristics

Concentration of the Substance in Mixture/Article	:	1-5%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	1 - 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Skin
	:	1500 cm2

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 95 %)

3. Exposure estimation and reference to its source

Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value type	Level of Exposure	Risk characterization ratio
ERC8a, ERC8d	Petrorisk		Freshwater		0,000005 mg/L	
			Freshwater sediment		0,000032 mg/kg dry weight (d.w.)	
			Marine water		0,000014 µg/L	
			Marine sediment		0,000056 µg/kg dry weight (d.w.)	
			Sewage treatment plant		0,00099 ng/L	
			Agricultural soil		0,00046 mg/kg	

ERC8a: Wide dispersive indoor use of processing aids in open systems
ERC8d: Wide dispersive outdoor use of processing aids in open systems

Workers/Consumers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value type	Level of Exposure	Risk characterization ratio
PROC1	EasyTRA		Worker – dermal, long-term – systemic	0,020571 mg/kg/d	
			Worker – inhalation, long-term – systemic	0,024547 mg/m3	
			Worker – long-term – systemic Combined routes	0,024078 mg/kg/d	
PROC2	EasyTRA		Worker – dermal, long-term – systemic	0,082286 mg/kg/d	
			Worker – inhalation, long-term – systemic	49,093 mg/m3	
			Worker – long-term – systemic Combined routes	7,096 mg/kg/d	
PROC3	EasyTRA		Worker – dermal, long-term – systemic	0,041143 mg/kg/d	
			Worker – inhalation, long-term – systemic	61,366 mg/m3	
			Worker – long-term – systemic Combined routes	8,808 mg/kg/d	
PROC4	EasyTRA		Worker – dermal, long-term – systemic	0,411429 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	2,165 mg/kg/d	
PROC13	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	4,33 mg/kg/d	
PROC8a	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	

			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	4,33 mg/kg/d	
PROC8b	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	2,576 mg/kg/d	
PROC10	EasyTRA		Worker – dermal, long-term – systemic	0,987429 mg/kg/d	
			Worker – inhalation, long-term – systemic	14,728 mg/m3	
			Worker – long-term – systemic Combined routes	3,091 mg/kg/d	
PROC11	EasyTRA		Worker – dermal, long-term – systemic	1,286 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	3,039 mg/kg/d	

PROC1: Use in closed process, no likelihood of exposure

PROC2: Use in closed, continuous process with occasional controlled exposure

PROC3: Use in closed batch process (synthesis or formulation)

PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

PROC13: Treatment of articles by dipping and pouring

PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

PROC10: Roller application or brushing

PROC11: Non industrial spraying

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Predicted releases are not expected to lead to environmental concentrations which would exceed the PNEC when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

1. Short title of Exposure Scenario: **Solvent in other applications- Professional**

Main User Groups : **SU 22:** Professional uses: Public domain (administration,

		education, entertainment, services, craftsmen)
Sector of use	:	**SU 22, SU0:** Professional uses: Public domain (administration, education, entertainment, services, craftsmen), Other
Process category	:	**PROC1:** Use in closed process, no likelihood of exposure **PROC2:** Use in closed, continuous process with occasional controlled exposure **PROC3:** Use in closed batch process (synthesis or formulation) **PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises **PROC8a:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities **PROC8b:** Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities **PROC10:** Roller application or brushing **PROC11:** Non industrial spraying **PROC13:** Treatment of articles by dipping and pouring
Environmental release category	:	**ERC8a, ERC8d:** Wide dispersive indoor use of processing aids in open systems, Wide dispersive outdoor use of processing aids in open systems

2.1 Contributing scenario controlling environmental exposure for:ERC8a, ERC8d: Wide dispersive indoor use of processing aids in open systems, Wide dispersive outdoor use of processing aids in open systems

Concentration of the Substance in Mixture/Article	:	5-25%

Environment factors not influenced by risk management

Flow rate	:	90.000 m3/d

Other given operational conditions affecting environmental exposure

Emission or Release Factor: Air	:	40 %
Emission or Release Factor: Water	:	5 %
Emission or Release Factor: Soil	:	0 %
Local release rate: Water	:	8,4 kg/day
Local release rate: Air	:	66 kg/day
Local release rate: Soil	:	
Remarks	:	There is no direct exposure to soil.

Technical conditions and measures / Organizational measures

Air	:	Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: 0 %)
Water	:	Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%): (Effectiveness: > 96,4 %)

Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant	:	Municipal sewage treatment plant, No
Flow rate of sewage treatment plant effluent	:	2.000 m3/d

Sludge Treatment : Agricultural soil, Yes, applicable

2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed process, no likelihood of exposure

Product characteristics

Concentration of the Substance in Mixture/Article : 5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use

Exposure duration : > 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management

Exposed skin area : One hand face only (240 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor : Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

None required
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC2: Use in closed, continuous process with occasional controlled exposure

Product characteristics

Concentration of the Substance in Mixture/Article : 5-25%

Physical Form (at time of use) : Liquid substance

Frequency and duration of use

Exposure duration : > 4 h
Frequency of use : 5 days/week

Human factors not influenced by risk management

Exposed skin area : Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor : Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC3: Use in closed batch process (synthesis or formulation)

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	One hand face only (240 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC8a, PROC8b: Transfer

of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Two hands (960 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, None required

2.2 Contributing scenario controlling worker exposure for: PROC10: Roller application or brushing

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	1 - 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Two hands (960 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

2.2 Contributing scenario controlling worker exposure for: PROC11: Non industrial

spraying

Product characteristics

Concentration of the Substance in Mixture/Article	:	1-5%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	1 - 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Skin
	:	1500 cm2

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 95 %)

2.2 Contributing scenario controlling worker exposure for: PROC13: Treatment of articles by dipping and pouring

Product characteristics

Concentration of the Substance in Mixture/Article	:	5-25%
Physical Form (at time of use)	:	Liquid substance

Frequency and duration of use

Exposure duration	:	> 4 h
Frequency of use	:	5 days/week

Human factors not influenced by risk management

Exposed skin area	:	Palms of both hands (480 cm2)

Other operational conditions affecting workers exposure

Outdoor / Indoor	:	Indoor

Technical conditions and measures

Local exhaust ventilation, No

Conditions and measures related to personal protection, hygiene and health evaluation

Protective gloves, APF 10 (Effectiveness: 90 %)
Respiratory Protection, Yes (Effectiveness: 90 %)

3. Exposure estimation and reference to its source

Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value type	Level of Exposure	Risk characterization ratio
ERC8a, ERC8d	Petrorisk		Freshwater		0,0000074 mg/L	
			Freshwater sediment		0,00018 mg/kg dry weight (d.w.)	
			Marine water		0,00074 µg/L	
			Marine sediment		0,000018 mg/kg dry weight (d.w.)	
			Sewage treatment plant		0,000074 mg/L	
			Agricultural soil		0,000052 mg/kg	

ERC8a: Wide dispersive indoor use of processing aids in open systems
ERC8d: Wide dispersive outdoor use of processing aids in open systems

Workers/Consumers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value type	Level of Exposure	Risk characterization ratio
PROC1	EasyTRA		Worker – dermal, long-term – systemic	0,020571 mg/kg/d	
			Worker – inhalation, long-term – systemic	0,024547 mg/m3	
			Worker – long-term – systemic Combined routes	0,024078 mg/kg/d	
PROC2	EasyTRA		Worker – dermal, long-term – systemic	0,082286 mg/kg/d	
			Worker – inhalation, long-term – systemic	49,093 mg/m3	
			Worker – long-term – systemic Combined routes	7,096 mg/kg/d	
PROC3	EasyTRA		Worker – dermal, long-term – systemic	0,041143 mg/kg/d	
			Worker – inhalation, long-term – systemic	61,366 mg/m3	
			Worker – long-term – systemic Combined routes	8,808 mg/kg/d	
PROC4	EasyTRA		Worker – dermal, long-term – systemic	0,411429 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	2,165 mg/kg/d	
PROC8a	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	4,33 mg/kg/d	
PROC8b	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	2,576 mg/kg/d	
PROC10	EasyTRA		Worker – dermal, long-	0,987429 mg/kg/d	

			term – systemic		
			Worker – inhalation, long-term – systemic	14,728 mg/m3	
			Worker – long-term – systemic Combined routes	3,091 mg/kg/d	
PROC11	EasyTRA		Worker – dermal, long-term – systemic	1,286 mg/kg/d	
			Worker – inhalation, long-term – systemic	12,273 mg/m3	
			Worker – long-term – systemic Combined routes	3,039 mg/kg/d	
PROC13	EasyTRA		Worker – dermal, long-term – systemic	0,822857 mg/kg/d	
			Worker – inhalation, long-term – systemic	24,547 mg/m3	
			Worker – long-term – systemic Combined routes	4,33 mg/kg/d	

PROC1: Use in closed process, no likelihood of exposure

PROC2: Use in closed, continuous process with occasional controlled exposure

PROC3: Use in closed batch process (synthesis or formulation)

PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

PROC10: Roller application or brushing

PROC11: Non industrial spraying

PROC13: Treatment of articles by dipping and pouring

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Predicted releases are not expected to lead to environmental concentrations which would exceed the PNEC when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 27-Jan-2010 **Revision Date** 02-Oct-2015 **Revision Number** 2

1. Identification

Product Name **Methylene chloride**

Cat No. : **D37-1; D37-4; D37-20; D37-200; D37-200LC; D37-500; D37FB-19; D37FB-50; D37FB-115; D37FB-200; D37POP-19; D37POPB-50; D37POPB-200; D37RB-19; D37RB-50; D37RB-115; D37RB-200; D37RS-19; D37RS-28; D37RS-50; D37RS-115; D37RS-200; D37SK-4; D37SK-4LC; D37SS-28; D37SS-50; D37SS-115; D37SS-200; D37SS-1350**

Synonyms Dichloromethane; DCM

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)

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 - Central nervous system (CNS), Respiratory system.	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Liver, Kidney, Blood.	

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation

May cause respiratory irritation
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
Wear eye/face protection
Do not breathe 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)

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

3. Composition / information on ingredients

Component	CAS-No	Weight %
Methylene chloride	75-09-2	>99.5
Methyl alcohol	67-56-1	0 - 0.4
Cyclohexene	110-83-8	0 - 0.01
2-Methyl-2-butene	513-35-9	0 - 0.01

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. Call a physician or Poison Control Center immediately.

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 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 556 °C / 1032.8 °F
Explosion Limits
Upper 23 vol %
Lower 13 vol %
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. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO_2) 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	1	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing. Keep people away from and upwind of spill/leak.

Environmental Precautions Should not be released into the environment. See Section 12 for additional ecological information.

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. Avoid ingestion and inhalation. Use only under a chemical fume hood.

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
Methylene chloride	TWA: 50 ppm	(Vacated) TWA: 500 ppm (Vacated) STEL: 2000 ppm (Vacated) Ceiling: 1000 ppm TWA: 25 ppm STEL: 125 ppm	IDLH: 2300 ppm
Methyl alcohol	TWA: 200 ppm STEL: 250 ppm Skin	(Vacated) TWA: 200 ppm (Vacated) TWA: 260 mg/m^3 (Vacated) STEL: 250 ppm (Vacated) STEL: 325 mg/m^3 Skin TWA: 200 ppm TWA: 260 mg/m^3	IDLH: 6000 ppm TWA: 200 ppm TWA: 260 mg/m^3 STEL: 250 ppm STEL: 325 mg/m^3
Cyclohexene	TWA: 300 ppm	(Vacated) TWA: 300 ppm (Vacated) TWA: 1015 mg/m^3 TWA: 300 ppm TWA: 1015 mg/m^3	IDLH: 2000 ppm TWA: 300 ppm TWA: 1015 mg/m^3

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Methylene chloride	TWA: 50 ppm TWA: 174 mg/m^3	TWA: 100 ppm TWA: 330 mg/m^3 STEL: 500 ppm STEL: 1740 mg/m^3	TWA: 50 ppm
Methyl alcohol	TWA: 200 ppm TWA: 262 mg/m^3 STEL: 250 ppm STEL: 328 mg/m^3 Skin	TWA: 200 ppm TWA: 260 mg/m^3 STEL: 250 ppm STEL: 310 mg/m^3	TWA: 200 ppm STEL: 250 ppm Skin
Cyclohexene	TWA: 300 ppm TWA: 1010 mg/m^3	TWA: 300 ppm TWA: 1015 mg/m^3	TWA: 300 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.

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	sweet
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	-97 °C / -142.6 °F
Boiling Point/Range	39 °C / 102.2 °F
Flash Point	No information available

Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	23 vol %
Lower	13 vol %
Vapor Pressure	20 mmHg @ 3502°C
Vapor Density	2.93 (Air = 1.0)
Specific Gravity	1.33
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	556 °C / 1032.8 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C H2 Cl2
Molecular Weight	84.93

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat.

Incompatible Materials Strong oxidizing agents, Strong acids, Amines

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), 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
Methylene chloride	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rat)	53 mg/L (Rat) 6 h 76000 mg/m³ (Rat) 4 h
Methyl alcohol	LD50 = 6200 mg/kg (Rat)	LD50 = 15800 mg/kg (Rabbit)	64000 ppm (Rat) 4 h 83.2 mg/L (Rat) 4 h
Cyclohexene	LD50 = 2400 µL/kg (Rat)	>200 mg/kg (Rat)	>21.6 mg/L/4h (rat)
2-Methyl-2-butene	700-2600 mg/kg (Rat)	>2000 mg/kg (Rat)	LC50 > 61000 ppm (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
Methylene chloride	75-09-2	Group 2A	Reasonably Anticipated	A3	X	A3
Methyl alcohol	67-56-1	Not listed	Not listed	Not listed	Not listed	Not listed

Cyclohexene	110-83-8	Not listed	Not listed	Not listed	Not listed	Not listed
2-Methyl-2-butene	513-35-9	Not listed	Not listed	Not listed	Not listed	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)

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 Mutagenic effects have occured in microorganisms.

Reproductive Effects Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects Developmental effects have occurred in experimental animals.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS) Respiratory system
STOT - repeated exposure Liver Kidney 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
Endocrine Disruptor Information No information available

Other Adverse Effects Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

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Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Methylene chloride	EC50:>660 mg/L/96h	Pimephales promelas: LC50:193 mg/L/96h	EC50: 1 mg/L/24 h EC50: 2.88 mg/L/15 min	EC50: 140 mg/L/48h
Methyl alcohol	Not listed	Pimephales promelas: LC50 > 10000 mg/L 96h	EC50 = 39000 mg/L 25 min EC50 = 40000 mg/L 15 min EC50 = 43000 mg/L 5 min	EC50 > 10000 mg/L 24h
Cyclohexene	Not listed	Poecillia reticulata: 7.1 mg/L/96h	Not listed	Daphnia: EC50: 5.3 mg/L/48h
2-Methyl-2-butene	Not listed	Not listed	Not listed	EC50: = 3 mg/L, 48h (Daphnia magna)

Persistence and Degradability Persistence is unlikely based on information available.
Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Methylene chloride	1.25
Methyl alcohol	-0.74

Cyclohexene	3.27

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
Methylene chloride - 75-09-2	U080	-
Methyl alcohol - 67-56-1	U154	-

14. Transport information

DOT

UN-No UN1593
Proper Shipping Name DICHLOROMETHANE
Hazard Class 6.1
Packing Group III

TDG

UN-No UN1593
Proper Shipping Name DICHLOROMETHANE
Hazard Class 6.1
Packing Group III

IATA

UN-No UN1593
Proper Shipping Name Dichloromethane
Hazard Class 6.1
Packing Group III

IMDG/IMO

UN-No UN1593
Proper Shipping Name Dichloromethane
Hazard Class 6.1
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
Methylene chloride	X	X	-	200-838-9	-		X	X	X	X	X
Methyl alcohol	X	X	-	200-659-6	-		X	X	X	X	X
Cyclohexene	X	X	-	203-807-8	-		X	X	X	X	X
2-Methyl-2-butene	X	X	-	208-156-3	-		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 %
Methylene chloride	75-09-2	>99.5	0.1
Methyl alcohol	67-56-1	0 - 0.4	1.0

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
Methylene chloride	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Methylene chloride	X		-
Methyl alcohol	X		-

OSHA Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Methylene chloride	125 ppm STEL 12.5 ppm Action Level 25 ppm 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
Methylene chloride	1000 lb 1 lb	-
Methyl alcohol	5000 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Methylene chloride	75-09-2	Carcinogen	200 µg/day 50 µg/day	Carcinogen
Methyl alcohol	67-56-1	Developmental	-	Developmental

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Methylene chloride	X	X	X	X	X
Methyl alcohol	X	X	X	X	X
Cyclohexene	X	X	X	-	X
2-Methyl-2-butene	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 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-Jan-2010
Revision Date 02-Oct-2015
Print Date 02-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

CORNELL

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

METHYL TERTIARY BUTYL ETHER

Section 1 - Product and Company Identification
METHYL TERTIARY BUTYL ETHER

Product Identification: METHYL TERTIARY BUTYL ETHER
Date of MSDS: 11/01/1990 **Technical Review Date:** 12/21/1995
FSC: 6810 **NIIN: LIIN:** 00N066437
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: GENIUM PUBLISHING CORP
Manufacturer's Address1: 1145 CATALYN ST
Manufacturer's Address2: SCHENECTADY, NY 12303-1836
Manufacturer's Country: US
General Information Telephone: 518-377-8854
Emergency Telephone: 518-377-8854
Emergency Telephone: 518-377-8854
MSDS Preparer's Name: MJ ALLISON
Proprietary: N
Reviewed: N
Published: Y
CAGE: 5Z768
Special Project Code: N

Contractor Information

Contractor's Name: GENIUM PUBLISHING CORPORATION
Contractor's Address1: 1145 CATALYN ST
Contractor's Address2: SCHENECTADY, NY 12303-1836
Contractor's Telephone: 518-377-8854
Contractor's CAGE: 5Z768

Section 2 - Compositon/Information on Ingredients
METHYL TERTIARY BUTYL ETHER

Ingredient Name: EFTS OF OVEREXP:NOSE, THROAT, SKIN & CORNEA. ASPIR OF GASOLINE-MTBE MIX MAY CAUSE LUNG PNEUM. ACUTE:CONT W/EYES (ING 4)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ETHER, TERT-BUTYL METHYL; (METHYL TERT-BUTYL ETHER) (SARA 313) (CERCLA)
Ingredient CAS Number: 1634-04-4 **Ingredient CAS Code:** M
RTECS Number: KN5250000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 100
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: N/K (FP N) **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K (FP N) **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1 LB
DOT Reporting Quantity: 1 LB
Ozone Depleting Chemical: N

Ingredient Name: FIRST AID:MOUTH IF UNCON/CONVL. IF INGEST, CONSULT MD IMMED. DO NOT INDUCE VOMIT DUE TO ASPIR PNEUM RISK. IF (ING 7)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: HYGIENE PRACT:DRINKING, SMKG, USING TOILET/APPLYING COSMETICS. CONTAMD EQUIP:NEVER WEAR CONT LENSES IN WORK (ING 23)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 10:SUBSTANTIAL MTBE EXPOS. PFT'S, CHEST X-RAYS & SUPPORTIVE CARE MAY BE NEC AFTER ASPIR EXPOSURES.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 12:(EXPLO)/WATERWAYS. MTBE IS MORE WATER SOL/OTHER

GASOLINE COMPONENTS, SO THERE MAY BE HIGHER MBTE CONC IN (ING 14)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 13:GROUNDWATER WHEN THERE IS SPILL OF GASOLINE-MTBE MIX. IT ALSO HAS MOD TO HIGH MOBILITY IN SOIL. MTBE IS (ING 15)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 14:POORLY BIODEGRADED BY MICROORGANISMS IN ACTIVATED SLUDGE. CLEANUP OF GROUNDWATER CONTAM IS DFCLT. WHEN (ING 16)

Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 15:HIGH AIR-TO-WATER RATIOS ARE USED, AIR STRIPPING SYS CAN REMOVE MTBE. PROD OF ATM DEGRADATION INCL (ING 17)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 16:T-BUTYL FORMATE, ACETONE, & METHYL RADICALS. FOLLOW APPLIC OSHA REGS (29 CFR 1910.120).
Ingredient CAS Number: Ingredient CAS Code: X

RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 18:PRACTICE GOOD PERSONAL HYGIENE & HOUSEKEEPING PROCEDURES.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 22:AREA; SOFT LENSES MAY ABSORB, & ALL LENSES CONC, IRRITANTS. REMOVE THIS MATL FROM YOUR SHOES & EQUIP. (ING 24)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M

=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 23:LAUNDER CONTAM CLOTHING BEFORE WEARING.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 3:OR SKIN MAY CAUSE IRRIT/BURNING @ HIGH CONC. INHAL MAY RSLT IN NAUS, VOMIT, SEDATION & GEN ATHESIA (CNS & (ING 5)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:

>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 4:RESP DEPRESS). INGEST OF MTBE MAY RSLT IN ASPIR PNEUM. CHRONIC:CHRONIC INHAL CAUSES NASAL & TRACHEAL INFLAMM.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 6:PERS IS COUGH/CHOCKING, ASPIR MAY HAVE ALREADY OCCURRED; TRANSPORT TO EMER MED FACILITY. AFTER FIRST AID, (ING 8)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:

>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 7:INGEST BECAUSE OF IT'S POOR ABSORBING QUALITIES. CAREFULLY OBSERVE FOR ANY DEVELOPMENT OF SYSTEMIC SIGNS. (ING 9)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 8:IF LG QTYS OF MTBE INGESTED, SYRUP OF IPECAC IS PREF TO LAVAGE IN ALERT PATIENT REQ EMESIS. IF ASPIR HAS (ING 10)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:

<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 9:OCCURRED, OBTAIN BASELINE CHEST X-RAY & VITAL SIGNS. LIVER FUNC STUDIES MAY BE INDICATED FOLLOWING (ING 11)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: OTHER PREC:PROT PROGRAM THAT INCL REGULAR TRAINING, MAINTENANCE, INSPECTION, & EVAL. AVOID HEAT & IGNIT SOURCES.(ING 19)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:

<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: RESP PROT:SCBA. WARNING! NIOSH/MSHA APPRVD AIR-PURIFYING RESPS DO NOT PROTECT WORKERS IN OXYG-DEFICIENT ATM.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: SPILL PROC:FOR DISP. FOR LG SPILLS, DIKE FAR AHEAD OF SPILL TO CNTN. DO NOT ALLOW MTBE TO ENTER ENCLOSED AREAS(ING 13)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:

% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: SUPDAT:RADICALS. IF PRESENT IS SUFFICIENT CONC, THESE PROD OF PARTIAL OXIDATION CAN POSE SERIOUS HLTH HAZARD.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: VENT:PRODUCTIVITY LOC EXHST VENT IS PREF SINCE IT PVNT CONTAM DISPERSION INTO WORK AREA BY CONTROLLING IT @ ITS SOURCE.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:

% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Section 3 - Hazards Identification, Including Emergency Overview
METHYL TERTIARY BUTYL ETHER

Health Hazards Acute & Chronic: TARGET ORGANS:UPPER RESP TRACT, CNS. MTBE INGEST & INHAL TOX ARE BASED ON ANIMAL STUDIES. HUMAN EXPOS ARE REPORTED PRIMARILY W/EXPOS TO GASOLINE-MTBE MIX & W/USE OF MTBE IN DISSOLVING GALL BLADDER STO NES BY DIRECT INFUSION. RPTS REVEAL MTBE'S PRIMARY ANESTH EFT ON CNS. PROGRESSION OF NAUS, VOMIT & (EFTS OF OVEREXP)

Signs & Symptoms of Overexposure:
HLTH HAZ:SEDATION FOLLOWED BY GEN ANESTH IS NOTED W/INCRG EXPOS. WARM/BURNING SENSATION IS REPORTED W/GALL BLADDER INSTILLATION. ELEVATED LIVER FUNC STUDIES, DUODENAL INFLAMM, KIDNEY FAILURE, BLOOD CE LL HEMOLYSIS, & FOUL BREATH ODOR ARE ALSO NOTED W/THIS PROC. ANIMAL STUDIES NOTE PRIMARY IRRIT TO MUC MEMB (ING 3)

Medical Conditions Aggravated by Exposure:
NONE REPORTED.

LD50 LC50 Mixture: LD50:(ORAL,RAT) 4 G/KG

Route of Entry Indicators:
- **Inhalation:** YES
- **Skin:** YES
- **Ingestion:** YES

Carcenogenicity Indicators
- **NTP:** NO
- **IARC:** NO
- **OSHA:** NO

Carcinogenicity Explanation: NOT RELEVANT.

Section 4 - First Aid Measures
METHYL TERTIARY BUTYL ETHER

First Aid:
EYES:GENTLY LIFT LIDS & FLUSH IMMED & CONTINUOUSLY W/FLOODING AMTS OF WATER FOR @ LEAST 15 MIN UNTIL TRANSPORTED TO EMER MED FACILITY. CONSULT MD IMMED. SKIN:QUICKLY REMOVE CONTAMD CLTHG. RINSE W/FLOO DING AMTS OF WATER FOR @ LEAST 15 MIN. FOR RED/BLISTERED SKIN, CONSULT MD. WASH AFFECTED AREA W/SOAP & WATER. INHAL:REMOVE TO FRESH AIR & SUPPORT BRTHG AS NEEDED. INGEST:NEVER GIVE ANYTHING BY (ING 6)

Section 5 - Fire Fighting Measures
METHYL TERTIARY BUTYL ETHER

Fire Fighting Procedures:
NIOSH/MSHA APPRVD SCBA & FULL PROT EQUIP(FP N) (INCLG GOGG, RUB OVER-CLTHG, GLOVES & BOOTS). IF FEASIBLE, REMOVE CNTNRS FROM FIRE-RISK AREA. OTHERWISE (SUPDAT)
Unusual Fire or Explosion Hazard:
MTBE IS EXTREMELY FLAM. VAP MAY EXPLODE IF IGNIT IN ENCLSD AREA/TRAVEL TO SOURCE OF IGNIT & FLASH BACK. @ TEMP AT/ABOVE FL PT, MTBE CAN RELS VAPS THAT (SUPDAT)
Extinguishing Media:
USE DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY, OR ALCOHOL FOAM AS EXTINGUISHING MEDIA.
Flash Point: Flash Point Text: <18F,<-8C

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): 1.6%
Upper Limit(s): 8.4%

Section 6 - Accidental Release Measures
METHYL TERTIARY BUTYL ETHER

Spill Release Procedures:
NOTIFY SFTY PERS, EVAC ALL UNNEC PERS, REMOVE ALL HEAT & IGNIT SOURCES, & PROVIDE MAX EXPLO-PROOF VENT. CLEANUP PERS SHOULD PROTECT AGAINST VAP INHAL & SKIN/EYE CONT. TAKE UP SPILLED MATL W/NONCOMBUST ABSORB MATL & PLACE IN APPROP CNTNRS (ING 12)

Section 7 - Handling and Storage
METHYL TERTIARY BUTYL ETHER

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
METHYL TERTIARY BUTYL ETHER

Repiratory Protection:
SEEK PROFESSIONAL ADVICE PRIOR TO RESP SELECTION & USE. FOLLOW OSHA RESP

REGS (29 CFR 1910.134) &, IF NEC, WEAR NIOSH/MSHA APPRVD RESP. FOR EMER/NONROUTINE OPERATIONS (CLEANING SPILLS, REACTOR VESSELS /STOR TANKS), WEAR NIOSH/MSHA (ING 20)
Ventilation:
PROVIDE GEN & LOC EXPLO-PROOF VENT SYS TO MAINTAIN AIRBORNE CONC @ LEV THAT PROMOTE WORKER SFTY & (ING 21)
Protective Gloves:
IMPERVIOUS GLOVES.
Eye Protection: ANSI APPRVD CHEM WORKERS GOGG & FSHLD.
Other Protective Equipment: IMPERVIOUS BOOTS, APRONS, & GAUNTLETS. ANSI APPRVD EMER EYE WASH & DELUGE SHOWER (FP N).
Work Hygenic Practices: NEVER EAT, DRINK/SMOKE IN WORK AREAS. PRACTICE GOOD PERSONAL HYGIENE AFTER USING MATL, EXPECIALLY BEFORE EATING,(ING 22)
Supplemental Health & Safety Information: APPEAR/ODOR:MINT OR TERPENE-LIKE ODOR. FIRE FIGHT PROC:USE WATER SPRAY TO COOL FIRE-EXPOS CNTNRS. BE AWARE OF RUNOFF FROM FIRE CTL METH. DO NOT RELS TO ENCLSD AREAS, SEWERS/WATERWAYS DUE TO POTNTL EXP LO & HLTH HAZ MTBE PRESENT. EXPLO HAZ: FORM FLAM MIXS. CNDTNS TO AVOID: IN ACID SOLNS. HAZ DECOMP:& METHYL (ING 2)

Section 9 - Physical & Chemical Properties
METHYL TERTIARY BUTYL ETHER

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 131F,55C
Melting/Freezing Point: Melting/Freezing Text: <166F,<74C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: 245 @ 77F **Vapor Density:** N/K
Percent Volatile Organic Content:
Specific Gravity: 0.7405(20C/4C)
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: NOT KNOWN
Solubility in Water: 4.8G/100G
Appearance and Odor: A CLEAR, COLORLESS LIQUID WITH A SLIGHT HYDROCARBON ODOR WITH A MILD (SUPDAT)
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
METHYL TERTIARY BUTYL ETHER

Stability Indicator: YES
Materials to Avoid:
INCOMPAT & UNSTABLE W/STRONG OXIDIZING AGENTS, STRONG ACIDS, CAUSTICS, AMINES, ALDEHYDES, AMMONIA, & CHLORINATED CMPDS.
Stability Condition to Avoid:

HEAT & IGNIT SOURCES. MTBE IS STABLE @ ROOM TEMP IN CLSD CNTNRS UNDER NORM STOR & HNDLG CNDTNS. MTBE IS UNSTABLE(SUPDAT)
Hazardous Decomposition Products:
THERM OXIDATIVE DECOMP CAN PRDCE: CO*2 & H*2O VAP; INCOMPLETE COMBUST:CO, T-BUTYL FORMATE, ACETONE, FORMIC ACID (SUPDAT)
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT.

Section 11 - Toxicological Information
METHYL TERTIARY BUTYL ETHER

Toxicological Information:
N/P

Section 12 - Ecological Information
METHYL TERTIARY BUTYL ETHER

Ecological Information:
N/P

Section 13 - Disposal Considerations
METHYL TERTIARY BUTYL ETHER

Waste Disposal Methods:
CONTACT YOUR SUPPLIER/LICENSED CONTRACTOR FOR DETAILED RECOMMENDATIONS. FOLLOW APPLIC FEDERAL, STATE, AND LOCAL REGS.

Section 14 - MSDS Transport Information
METHYL TERTIARY BUTYL ETHER

Transport Information:
N/P

Section 15 - Regulatory Information
METHYL TERTIARY BUTYL ETHER

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
METHYL TERTIARY BUTYL ETHER

Other Information:
N/P

HAZCOM Label Information

Product Identification: METHYL TERTIARY BUTYL ETHER
CAGE: 5Z768

Assigned Individual: N
Company Name: GENIUM PUBLISHING CORPORATION
Company PO Box:
Company Street Address1: 1145 CATALYN ST
Company Street Address2: SCHENECTADY, NY 12303-1836 US
Health Emergency Telephone: 518-377-8854
Label Required Indicator: Y
Date Label Reviewed: 12/21/1995
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/21/1995
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: DANGER
Health Hazard: Severe
Contact Hazard: Severe
Fire Hazard: Severe
Reactivity Hazard: Slight

8/9/2002 9:24:08 AM

Safety data sheet

according to Regulation (EC) No. 1907/2006 (REACH), amended by 2015/830/EU

m-Xylene ≥ 99%, for synthesis

article number: **3791**
Version: **2.0 en**
Replaces version of: 2016-07-04
Version: (1)

date of compilation: 2016-06-29
Revision: 2019-03-08

SECTION 1: Identification of the substance/mixture and of the company/ undertaking

1.1 Product identifier

Identification of the substance	**m-Xylene**
Article number	3791
Registration number (REACH)	It is not required to list the identified uses because the substance is not subject to registration according to REACH (< 1 t/a)
Index No	601-022-00-9
EC number	203-576-3
CAS number	108-38-3

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

Identified uses:	laboratory chemical laboratory and analytical use

1.3 Details of the supplier of the safety data sheet

Carl Roth GmbH + Co KG
Schoemperlenstr. 3-5
D-76185 Karlsruhe
Germany

Telephone: +49 (0) 721 - 56 06 0
Telefax: +49 (0) 721 - 56 06 149
e-mail: sicherheit@carlroth.de
Website: www.carlroth.de

Competent person responsible for the safety data sheet	: Department Health, Safety and Environment
e-mail (competent person)	**: sicherheit@carlroth.de**

1.4 Emergency telephone number

Emergency information service	**Poison Centre Munich: +49/(0)89 19240**

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 (CLP)

Classification acc. to GHS

Section	Hazard class	Hazard class and category	Hazard statement
2.6	flammable liquid	(Flam. Liq. 3)	H226
3.1D	acute toxicity (dermal)	(Acute Tox. 4)	H312
3.1I	acute toxicity (inhal.)	(Acute Tox. 4)	H332
3.2	skin corrosion/irritation	(Skin Irrit. 2)	H315

Classification acc. to GHS

Section	Hazard class	Hazard class and category	Hazard statement
3.3	serious eye damage/eye irritation	(Eye Irrit. 2)	H319
3.8R	specific target organ toxicity - single exposure (respiratory tract irritation)	(STOT SE 3)	H335
3.9	specific target organ toxicity - repeated exposure	(STOT RE 2)	H373
3.10	aspiration hazard	(Asp. Tox. 1)	H304

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008 (CLP)

Signal word **Danger**

Pictograms

GHS02, GHS07, GHS08

Hazard statements

H226	Flammable liquid and vapour
H304	May be fatal if swallowed and enters airways
H312+H332	Harmful in contact with skin or if inhaled
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation
H373	May cause damage to organs (respiratory system, nervous system) through prolonged or repeated exposure

Precautionary statements

Precautionary statements - prevention

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260	Do not breathe mist/vapours/spray.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statements - response

P301+P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor/...
P302+P352	IF ON SKIN: Wash with plenty of soap and water.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P331	Do NOT induce vomiting.

Labelling of packages where the contents do not exceed 125 ml

Signal word: **Danger**

Symbol(s)

H304	May be fatal if swallowed and enters airways.
P301+P310 P331	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Do NOT induce vomiting.

2.3 Other hazards

There is no additional information.

SECTION 3: Composition/information on ingredients

3.1 Substances

Name of substance	1,3-Dimethylbenzene
Index No	601-022-00-9
EC number	203-576-3
CAS number	108-38-3
Molecular formula	C_8H_{10}
Molar mass	106,2 $^{g}/_{mol}$

SECTION 4: First aid measures

4.1 Description of first aid measures

General notes

Take off contaminated clothing.

Following inhalation

Provide fresh air. In all cases of doubt, or when symptoms persist, seek medical advice.

Following skin contact

Rinse skin with water/shower. In case of skin irritation, consult a physician.

Following eye contact

Irrigate copiously with clean, fresh water for at least 10 minutes, holding the eyelids apart. In case of eye irritation consult an ophthalmologist.

Following ingestion

Rinse mouth. Do not induce vomiting. Aspiration hazard. Call a physician immediately.

4.2 Most important symptoms and effects, both acute and delayed

Irritation, Cough, Headache, Impairment of vision, Dizziness, Vertigo, Nausea, Vomiting, Diarrhoea, Breathing difficulties, Unconsciousness, Aspiration hazard

4.3 Indication of any immediate medical attention and special treatment needed

none

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Co-ordinate fire-fighting measures to the fire surroundings
water spray, foam, dry extinguishing powder, carbon dioxide (CO2)

Unsuitable extinguishing media

water jet

5.2 Special hazards arising from the substance or mixture

Combustible. Vapours are heavier than air, spread along floors and form explosive mixtures with air.

Hazardous combustion products

In case of fire may be liberated: carbon monoxide (CO), carbon dioxide (CO2)

5.3 Advice for firefighters

Vapours are heavier than air. Beware of reignition. Fight fire with normal precautions from a reasonable distance. Wear self-contained breathing apparatus.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Use personal protective equipment as required. Avoid contact with skin, eyes and clothes. Do not breathe vapour/spray. Avoidance of ignition sources.

6.2 Environmental precautions

Keep away from drains, surface and ground water. Explosive properties.

6.3 Methods and material for containment and cleaning up

Advices on how to contain a spill

Covering of drains.

Advices on how to clean up a spill

Absorb with liquid-binding material (e.g. sand, diatomaceous earth, acid- or universal binding agents).

Other information relating to spills and releases

Place in appropriate containers for disposal. Ventilate affected area.

6.4 Reference to other sections

Hazardous combustion products: see section 5. Personal protective equipment: see section 8. Incompatible materials: see section 10. Disposal considerations: see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Provide adequate ventilation as well as local exhaustion at critical locations. Avoid exposure. When not in use, keep containers tightly closed.

• Measures to prevent fire as well as aerosol and dust generation


Keep away from sources of ignition - No smoking.

Take precautionary measures against static discharge.

Advice on general occupational hygiene

Wash hands before breaks and after work. Keep away from food, drink and animal feedingstuffs. When using do not smoke.

7.2 Conditions for safe storage, including any incompatibilities

Store in a well-ventilated place. Keep container tightly closed. Protect from sunlight.

Incompatible substances or mixtures

Observe hints for combined storage.

Consideration of other advice

Ground/bond container and receiving equipment.

• Ventilation requirements

Use local and general ventilation.

• Specific designs for storage rooms or vessels

Recommended storage temperature: 15 – 25 °C.

7.3 Specific end use(s)

No information available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

National limit values

Occupational exposure limit values (Workplace Exposure Limits)

Country	Name of agent	CAS No	Identifier	TWA [ppm]	TWA [mg/m³]	STEL [ppm]	STEL [mg/m³]	Source
EU	m-xylene	108-38-3	IOELV	50	221	100	442	2000/39/EC
GB	m-xylene	108-38-3	WEL	50	220	100	441	EH40/2005

Notation

STEL Short-term exposure limit: a limit value above which exposure should not occur and which is related to a 15-minute period (unless otherwise specified)

TWA Time-weighted average (long-term exposure limit): measured or calculated in relation to a reference period of 8 hours time-weighted average (unless otherwise specified)

Biological limit values

Country	Name of agent	Parameter	Identifier	Value	Material	Source
GB	m-xylene	methylhippuric acids	BMGV	650 mmol/mol	urine	EH40/2005

Relevant DNELs/DMELs/PNECs and other threshold levels

• human health values

Endpoint	Threshold level	Protection goal, route of exposure	Used in	Exposure time
DNEL	221 mg/m³	human, inhalatory	worker (industry)	chronic - systemic effects
DNEL	442 mg/m³	human, inhalatory	worker (industry)	acute - systemic effects
DNEL	221 mg/m³	human, inhalatory	worker (industry)	chronic - local effects
DNEL	442 mg/m³	human, inhalatory	worker (industry)	acute - local effects
DNEL	212 mg/kg bw/day	human, dermal	worker (industry)	chronic - systemic effects

• environmental values

Endpoint	Threshold level	Environmental compartment
PNEC	0,25 mg/l	water
PNEC	0,044 mg/l	freshwater
PNEC	0,004 mg/l	marine water
PNEC	1,6 mg/l	sewage treatment plant (STP)
PNEC	2,52 mg/kg	freshwater sediment
PNEC	0,252 mg/kg	marine sediment
PNEC	0,852 mg/kg	soil

8.2 Exposure controls

Individual protection measures (personal protective equipment)

Eye/face protection

Use safety goggle with side protection.

Skin protection

• hand protection

Wear suitable gloves. Chemical protection gloves are suitable, which are tested according to EN 374. For special purposes, it is recommended to check the resistance to chemicals of the protective gloves mentioned above together with the supplier of these gloves.

- **type of material**

FKM (fluoro rubber)

- **material thickness**

0,4 mm.

- **breakthrough times of the glove material**

>480 minutes (permeation: level 6)

- **other protection measures**

Take recovery periods for skin regeneration. Preventive skin protection (barrier creams/ointments) is recommended.

Respiratory protection

Respiratory protection necessary at: Aerosol or mist formation. Type: A (against organic gases and vapours with a boiling point of > 65 °C , colour code: Brown).

Environmental exposure controls

Keep away from drains, surface and ground water.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state	liquid (fluid)
Colour	colourless
Odour	characteristic
Odour threshold	No data available

Other physical and chemical parameters

pH (value)	This information is not available.
Melting point/freezing point	-47,8 °C at 1.013 hPa
Initial boiling point and boiling range	139,1 °C at 1.013 hPa
Flash point	27 °C at 1.013 hPa
Evaporation rate	no data available
Flammability (solid, gas)	not relevant (fluid)
Explosive limits	
• lower explosion limit (LEL)	1,1 vol%
• upper explosion limit (UEL)	7 vol%
Explosion limits of dust clouds	not relevant
Vapour pressure	8 hPa at 20 °C
Density	0,86 $^{g}/_{cm^3}$ at 25 °C
Vapour density	3,66 (air = 1)

Bulk density	Not applicable
Relative density	Information on this property is not available.
Solubility(ies)	
Water solubility	~ 146 $^{mg}/_{l}$ at 25 °C
Partition coefficient	
n-octanol/water (log KOW)	3,2 (pH value: 7, 20 °C) (ECHA)
Soil organic carbon/water (log KOC)	2,73 (ECHA)
Auto-ignition temperature	528 °C at 1.013 hPa - ECHA
Decomposition temperature	no data available
Viscosity	
• kinematic viscosity	0,6756 $^{mm^2}/_{s}$
• dynamic viscosity	0,581 mPa s at 25 °C
Explosive properties	Shall not be classified as explosive
Oxidising properties	none

9.2 Other information

Surface tension	28,01 $^{mN}/_{m}$ (25 °C)
Temperature class (EU, acc. to ATEX)	T1 (Maximum permissible surface temperature on the equipment: 450°C)

SECTION 10: Stability and reactivity

10.1 Reactivity

Risk of ignition. In case of warming: Vapours can form explosive mixtures with air.

10.2 Chemical stability

The material is stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

10.3 Possibility of hazardous reactions

Violent reaction with: Oxidisers, Nitric acid, Sulphuric acid, Sulphur, Acids

10.4 Conditions to avoid

Keep away from heat.

10.5 Incompatible materials

plastic and rubber

10.6 Hazardous decomposition products

Hazardous combustion products: see section 5.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Exposure route	Endpoint	Value	Species	Source
oral	LD50	3.523 $^{mg}/_{kg}$	rat	ECHA

Skin corrosion/irritation

Causes skin irritation.

Serious eye damage/eye irritation

Causes serious eye irritation.

Respiratory or skin sensitisation

Shall not be classified as a respiratory or skin sensitiser.

Summary of evaluation of the CMR properties

Shall not be classified as germ cell mutagenic, carcinogenic nor as a reproductive toxicant

• Specific target organ toxicity - single exposure

May cause respiratory irritation.

• Specific target organ toxicity - repeated exposure

May cause damage to organs (respiratory system, nervous system) through prolonged or repeated exposure.

Aspiration hazard

May be fatal if swallowed and enters airways.

Symptoms related to the physical, chemical and toxicological characteristics

• If swallowed

diarrhoea, vomiting, aspiration hazard

• If in eyes

Causes serious eye irritation

• If inhaled

irritant effects, cough, breathing difficulties, pulmonary oedema

• If on skin

causes skin irritation, risk of absorption via the skin

Other information

Other adverse effects: Headache, Impairment of vision, Dizziness, Vertigo, Nausea, Dyspnoea, Unconsciousness, Liver and kidney damage, Symptoms can occur only after several hours

SECTION 12: Ecological information

12.1 Toxicity

acc. to 1272/2008/EC: Shall not be classified as hazardous to the aquatic environment.

Aquatic toxicity (acute)

Endpoint	Value	Species	Source	Exposure time
LC50	2,6 mg/l	rainbow trout	ECHA	96 h
ErC50	4,7 mg/l	algae	ECHA	72 h

Aquatic toxicity (chronic)

Endpoint	Value	Species	Source	Exposure time
EC50	2,2 mg/l	algae	ECHA	73 h
NOEC	0,714 mg/l	striped brill	ECHA	35 d
NOEC	1,57 mg/l	aquatic invertebrates	ECHA	21 d
NOEC	0,44 mg/l	algae	ECHA	73 h

12.2 Process of degradability

The substance is readily biodegradable.
Theoretical Oxygen Demand: 3,165 mg/mg
Theoretical Carbon Dioxide: 3,316 mg/mg

Process	Degradation rate	Time
oxygen depletion	90 %	28 d

12.3 Bioaccumulative potential

Does not significantly accumulate in organisms.

n-octanol/water (log KOW)	3,2 (pH value: 7, 20 °C)
BCF	>5,5 – <12,2

12.4 Mobility in soil

Henry's law constant	623 Pa m³/mol at 25 °C
The Organic Carbon normalised adsorption coefficient	2,73

12.5 Results of PBT and vPvB assessment

Data are not available.

12.6 Other adverse effects

Data are not available.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

This material and its container must be disposed of as hazardous waste. Dispose of contents/container in accordance with local/regional/national/international regulations.

Sewage disposal-relevant information

Do not empty into drains.

Waste treatment of containers/packagings

It is a dangerous waste; only packagings which are approved (e.g. acc. to ADR) may be used.

Sewage disposal-relevant information

Do not empty into drains.

Waste treatment of containers/packagings

It is a dangerous waste; only packagings which are approved (e.g. acc. to ADR) may be used.

13.2 Relevant provisions relating to waste

The allocation of waste identity numbers/waste descriptions must be carried out according to the EEC, specific to the industry and process.

13.3 Remarks

Waste shall be separated into the categories that can be handled separately by the local or national waste management facilities. Please consider the relevant national or regional provisions.

SECTION 14: Transport information

14.1	UN number	**1307**
14.2	UN proper shipping name	**XYLENES**
	Hazardous ingredients	m-Xylene
14.3	Transport hazard class(es)	
	Class	3 (flammable liquids)
14.4	Packing group	III (substance presenting low danger)
14.5	Environmental hazards	none (non-environmentally hazardous acc. to the dangerous goods regulations)

14.6 Special precautions for user

Provisions for dangerous goods (ADR) should be complied within the premises.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code

The cargo is not intended to be carried in bulk.

14.8 Information for each of the UN Model Regulations

• Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN)

UN number	1307

Proper shipping name	XYLENES
Particulars in the transport document	UN1307, XYLENES, 3, III, (D/E)
Class	3
Classification code	F1
Packing group	III
Danger label(s)	3

Excepted quantities (EQ)	E1
Limited quantities (LQ)	5 L
Transport category (TC)	3
Tunnel restriction code (TRC)	D/E
Hazard identification No	30
Emergency Action Code	3YE
• International Maritime Dangerous Goods Code (IMDG)	
UN number	1307
Proper shipping name	XYLENES
Particulars in the shipper's declaration	UN1307, XYLENES, 3, III, 27°C c.c.
Class	3
Marine pollutant	-
Packing group	III
Danger label(s)	3

Special provisions (SP)	223
Excepted quantities (EQ)	E1
Limited quantities (LQ)	5 L
EmS	F-E, S-D
Stowage category	A
• International Civil Aviation Organization (ICAO-IATA/DGR)	
UN number	1307
Proper shipping name	Xylenes
Particulars in the shipper's declaration	UN1307, Xylenes, 3, III
Class	3
Packing group	III

Danger label(s)	3

Special provisions (SP)	A3
Excepted quantities (EQ)	E1
Limited quantities (LQ)	10 L

SECTION 15: Regulatory information

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

Relevant provisions of the European Union (EU)

• Regulation 649/2012/EU concerning the export and import of hazardous chemicals (PIC)

Not listed.

• Regulation 1005/2009/EC on substances that deplete the ozone layer (ODS)

Not listed.

• Regulation 850/2004/EC on persistent organic pollutants (POP)

Not listed.

• Restrictions according to REACH, Annex XVII

Name of substance	CAS No	Wt%	Type of registration	Conditions of restriction	No
m-Xylene		100	1907/2006/EC annex XVII	R3	3
m-Xylene		100	1907/2006/EC annex XVII	R40	40

Legend

R3 1. Shall not be used in:
- ornamental articles intended to produce light or colour effects by means of different phases, for example in ornamental lamps and ashtrays,
- tricks and jokes,
- games for one or more participants, or any article intended to be used as such, even with ornamental aspects,
2. Articles not complying with paragraph 1 shall not be placed on the market.
3. Shall not be placed on the market if they contain a colouring agent, unless required for fiscal reasons, or perfume, or both, if they:
- can be used as fuel in decorative oil lamps for supply to the general public, and,
- present an aspiration hazard and are labelled with R65 or H304,
4. Decorative oil lamps for supply to the general public shall not be placed on the market unless they conform to the European Standard on Decorative oil lamps (EN 14059) adopted by the European Committee for Standardisation (CEN).
5. Without prejudice to the implementation of other Community provisions relating to the classification, packaging and labelling of dangerous substances and mixtures, suppliers shall ensure, before the placing on the market, that the following requirements are met:
(a) lamp oils, labelled with R65 or H304, intended for supply to the general public are visibly, legibly and indelibly marked as follows: 'Keep lamps filled with this liquid out of the reach of children'; and, by 1 December 2010, 'Just a sip of lamp oil - or even sucking the wick of lamps - may lead to life-threatening lung damage';
(b) grill lighter fluids, labelled with R65 or H304, intended for supply to the general public are legibly and indelibly marked by 1 December 2010 as follows: 'Just a sip of grill lighter may lead to life threatening lung damage';
(c) lamp oils and grill lighters, labelled with R65 or H304, intended for supply to the general public are packaged in black opaque containers not exceeding 1 litre by 1 December 2010.
6. No later than 1 June 2014, the Commission shall request the European Chemicals Agency to prepare a dossier, in accordance with Article 69 of the present Regulation with a view to ban, if appropriate, grill lighter fluids and fuel for decorative lamps, labelled R65 or H304, intended for supply to the general public.
7. Natural or legal persons placing on the market for the first time lamp oils and grill lighter fluids, labelled with R65 or H304, shall by 1 December 2011, and annually thereafter, provide data on alternatives to lamp oils and grill lighter fluids labelled R65 or H304 to the competent authority in the Member State concerned. Member States shall make those data available to the Commission.

Legend

R40 1. Shall not be used, as substance or as mixtures in aerosol dispensers where these aerosol dispensers are intended for supply to the general public for entertainment and decorative purposes such as the following:
- metallic glitter intended mainly for decoration,
- artificial snow and frost,
- 'whoopee' cushions,
- silly string aerosols,
- imitation excrement,
- horns for parties,
- decorative flakes and foams,
- artificial cobwebs,
- stink bombs.

2. Without prejudice to the application of other Community provisions on the classification, packaging and labelling of substances, suppliers shall ensure before the placing on the market that the packaging of aerosol dispensers referred to above is marked visibly, legibly and indelibly with:
'For professional users only'.
3. By way of derogation, paragraphs 1 and 2 shall not apply to the aerosol dispensers referred to Article 8 (1a) of Council Directive 75/324/EEC (2).
4. The aerosol dispensers referred to in paragraphs 1 and 2 shall not be placed on the market unless they conform to the requirements indicated.

• Restrictions according to REACH, Title VIII

None.

• List of substances subject to authorisation (REACH, Annex XIV)/SVHC - candidate list

not listed

• Seveso Directive

2012/18/EU (Seveso III)

No	Dangerous substance/hazard categories	Qualifying quantity (tonnes) for the application of lower and upper-tier requirements		Notes
P5c	flammable liquids (cat. 2, 3)	5.000	50.000	51)

Notation

51) Flammable liquids, categories 2 or 3 not covered by P5a and P5b

• Directive 75/324/EEC relating to aerosol dispensers

Filling batch

Deco-Paint Directive (2004/42/EC)

VOC content	100 % 860 g/l

Directive on industrial emissions (VOCs, 2010/75/EU)

VOC content	100 %
VOC content	860 g/l

Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) - Annex II

not listed

Regulation 166/2006/EC concerning the establishment of a European Pollutant Release and Transfer Register (PRTR)

not listed

Directive 2000/60/EC establishing a framework for Community action in the field of water policy (WFD)

not listed

Regulation 98/2013/EU on the marketing and use of explosives precursors

not listed

Regulation 111/2005/EC laying down rules for the monitoring of trade between the Community and third countries in drug precursors

not listed

National inventories

Substance is listed in the following national inventories:

Country	National inventories	Status
AU	AICS	substance is listed
CA	DSL	substance is listed
CN	IECSC	substance is listed
EU	ECSI	substance is listed
EU	REACH Reg.	substance is listed
JP	CSCL-ENCS	substance is listed
JP	ISHA-ENCS	substance is listed
KR	KECI	substance is listed
MX	INSQ	substance is listed
NZ	NZIoC	substance is listed
PH	PICCS	substance is listed
TW	TCSI	substance is listed
US	TSCA	substance is listed

Legend

AICS	Australian Inventory of Chemical Substances
CSCL-ENCS	List of Existing and New Chemical Substances (CSCL-ENCS)
DSL	Domestic Substances List (DSL)
ECSI	EC Substance Inventory (EINECS, ELINCS, NLP)
IECSC	Inventory of Existing Chemical Substances Produced or Imported in China
INSQ	National Inventory of Chemical Substances
ISHA-ENCS	Inventory of Existing and New Chemical Substances (ISHA-ENCS)
KECI	Korea Existing Chemicals Inventory
NZIoC	New Zealand Inventory of Chemicals
PICCS	Philippine Inventory of Chemicals and Chemical Substances
REACH Reg.	REACH registered substances
TCSI	Taiwan Chemical Substance Inventory
TSCA	Toxic Substance Control Act

15.2 Chemical Safety Assessment

No Chemical Safety Assessment has been carried out for this substance.

SECTION 16: Other information

Abbreviations and acronyms

Abbr.	Descriptions of used abbreviations
2000/39/EC	Comission Directive establishing a first list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC
ADN	Accord européen relatif au transport international des marchandises dangereuses par voies de navigation intérieures (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways)
ADR	Accord européen relatif au transport international des marchandises dangereuses par route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
BCF	bioconcentration factor
CAS	Chemical Abstracts Service (service that maintains the most comprehensive list of chemical substances)
CLP	Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures
CMR	Carcinogenic, Mutagenic or toxic for Reproduction
DGR	Dangerous Goods Regulations (see IATA/DGR)
DMEL	Derived Minimal Effect Level
DNEL	Derived No-Effect Level
EH40/2005	EH40/2005 Workplace exposure limits (http://www.nationalarchives.gov.uk/doc/open-government-licence/)
EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of Notified Chemical Substances
EmS	Emergency Schedule
GHS	"Globally Harmonized System of Classification and Labelling of Chemicals" developed by the United Nations
IATA	International Air Transport Association
IATA/DGR	Dangerous Goods Regulations (DGR) for the air transport (IATA)
ICAO	International Civil Aviation Organization
IMDG	International Maritime Dangerous Goods Code
index No	the Index number is the identification code given to the substance in Part 3 of Annex VI to Regulation (EC) No 1272/2008
IOELV	indicative occupational exposure limit value
MARPOL	International Convention for the Prevention of Pollution from Ships (abbr. of "Marine Pollutant")
NLP	No-Longer Polymer
PBT	Persistent, Bioaccumulative and Toxic
PNEC	Predicted No-Effect Concentration
ppm	parts per million
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RID	Règlement concernant le transport International ferroviaire des marchandises Dangereuses (Regulations concerning the International carriage of Dangerous goods by Rail)
STEL	short-term exposure limit
SVHC	Substance of Very High Concern
TWA	time-weighted average
VOC	Volatile Organic Compounds
vPvB	very Persistent and very Bioaccumulative
WEL	workplace exposure limit

Key literature references and sources for data

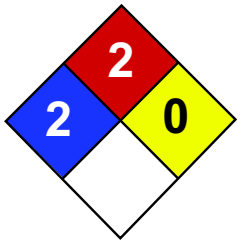
- Regulation (EC) No. 1907/2006 (REACH), amended by 2015/830/EU
- Regulation (EC) No. 1272/2008 (CLP, EU GHS)
- Dangerous Goods Regulations (DGR) for the air transport (IATA)
- International Maritime Dangerous Goods Code (IMDG)

List of relevant phrases (code and full text as stated in chapter 2 and 3)

Code	Text
H226	flammable liquid and vapour
H304	may be fatal if swallowed and enters airways
H312	harmful in contact with skin
H315	causes skin irritation
H319	causes serious eye irritation
H332	harmful if inhaled
H335	may cause respiratory irritation
H373	may cause damage to organs (respiratory system, nervous system) through prolonged or repeated exposure

Disclaimer

The above information describes exclusively the safety requirements of the product and is based on our present-day knowledge. The information is intended to give you advice about the safe handling of the product named in this safety data sheet, for storage, processing, transport and disposal. The information cannot be transferred to other products. In the case of mixing the product with other products or in the case of processing, the information on this safety data sheet is not necessarily valid for the new made-up material.



Health	2
Fire	2
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Naphthalene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Naphthalene

Catalog Codes: SLN1789, SLN2401

CAS#: 91-20-3

RTECS: QJ0525000

TSCA: TSCA 8(b) inventory: Naphthalene

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: C10H8

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Naphthalene	91-20-3	100

Toxicological Data on Ingredients: Naphthalene: ORAL (LD50): Acute: 490 mg/kg [Rat]. 533 mg/kg [Mouse]. 1200 mg/kg [Guinea pig]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 170 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant, permeator). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 567°C (1052.6°F)

Flash Points: CLOSED CUP: 88°C (190.4°F). OPEN CUP: 79°C (174.2°F).

Flammable Limits: LOWER: 0.9% UPPER: 5.9%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:
Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
Israel: TWA: 10 (ppm) TWA: 10 STEL: 15 (ppm) from ACGIH (TLV) [1995] TWA: 52 STEL: 79 (mg/m3) from ACGIH [1995]
Australia: STEL: 15 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid.)

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 128.19 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: 218°C (424.4°F)

Melting Point: 80.2°C (176.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.162 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 4.4 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.038 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in hot water, methanol, n-octanol. Very slightly dispersed in cold water. See solubility in methanol, n-octanol.

Solubility:
Partially soluble in methanol, n-octanol. Very slightly soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Highly reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: May attack some forms of rubber and plastic

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 490 mg/kg [Rat]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 170 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 305.2 ppm 96 hour(s) [Trout].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Naphthalene, refined : UN1334 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Rhode Island RTK hazardous substances: Naphthalene Pennsylvania RTK: Naphthalene Florida: Naphthalene Minnesota: Naphthalene Massachusetts RTK: Naphthalene TSCA 8(b) inventory: Naphthalene TSCA 8(a) PAIR: Naphthalene TSCA 8(d) H and S data reporting: Naphthalene: 06/01/87 SARA 313 toxic chemical notification and release reporting: Naphthalene: 1% CERCLA: Hazardous substances.: Naphthalene: 100 lbs. (45.36 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-4: Flammable solid. CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36- Irritating to eyes. R40- Possible risks of irreversible effects. R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed. R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation. R63- Possible risk of harm to the unborn child.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 2

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 01:30 PM

Last Updated: 11/06/2008 12:00 PM

SAFETY DATA SHEET

Version 4.4
Revision Date 11/04/2015
Print Date 12/17/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Butylbenzene
Product Number	:	B90203
Brand	:	Aldrich
CAS-No.	:	104-51-8

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)
Flammable liquids (Category 3), H226
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)

H226	Flammable liquid and vapour.
H410	Very toxic to aquatic life with long lasting effects.

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.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face

	protection.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.
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 : 1-Phenylbutane

Formula : $C_{10}H_{14}$
Molecular weight : 134.22 g/mol
CAS-No. : 104-51-8
EC-No. : 203-209-7

Hazardous components

Component	Classification	Concentration
Butylbenzene		
	Flam. Liq. 3; Aquatic Acute 1; Aquatic Chronic 1; H226, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

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
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. 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. Discharge into the environment must be avoided.

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 inhalation of vapour or mist.
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
Store in cool place. 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.

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
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: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
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 ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -88 °C (-126 °F) - lit.
f)	Initial boiling point and boiling range	183 °C (361 °F) - lit.
g)	Flash point	59.0 °C (138.2 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 5.8 %(V) Lower explosion limit: 0.8 %(V)
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	0.86 g/cm3 at 25 °C (77 °F)
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	log Pow: 4.26
p)	Auto-ignition temperature	412.0 °C (773.6 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available

s) Explosive properties No data available

t) Oxidizing properties No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

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

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

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

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: CY9070000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.34 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
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2709 Class: 3 Packing group: III
Proper shipping name: Butyl benzenes
Marine pollutant:yes
Poison Inhalation Hazard: No

IMDG
UN number: 2709 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: BUTYLBENZENES
Marine pollutant:yes

IATA
UN number: 2709 Class: 3 Packing group: III
Proper shipping name: Butylbenzenes

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
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Butylbenzene	104-51-8	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Butylbenzene	104-51-8	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Butylbenzene	104-51-8	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Flam. Liq.	Flammable liquids
H226	Flammable liquid and vapour.
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:	2
Physical Hazard	0

NFPA Rating

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

Further information

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

Version: 4.4 Revision Date: 11/04/2015 Print Date: 12/17/2015

Safety data sheet

according to 1907/2006/EC, Article 31

Printing date 24.08.2020 *Version number 1* *Revision: 24.08.2020*

SECTION 1: Identification of the substance/mixture and of the company/undertaking

· ***1.1 Product identifier***

· ***Product name:*** **N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide**

· ***Part number:*** *DRE-C13342360*
· ***CAS Number:***
1691-99-2
· ***EC number:***
216-887-4
· ***1.2 Relevant identified uses of the substance or mixture and uses advised against***
No further relevant information available.
· ***Application of the substance / the mixture*** *Reference material for laboratory use only*

· ***1.3 Details of the supplier of the safety data sheet***
· ***Manufacturer/Supplier:***

LGC Limited
Queens Road
Teddington
Middlesex TW11 0LY
UNITED KINGDOM

Tel :+44 (0) 20 8943 7000
Fax :+44 (0) 20 8943 2767
eMail : gb@lgcstandards.com
Web : www.lgcstandards.com

· ***Further information obtainable from:***
Product safety department
eMail : sds-request@lgcgroup.com
· ***1.4 Emergency telephone number:***
For Hazardous Materials or Dangerous Goods Incident
Spill, Leak, Fire Exposure, or Accident
Call CHEMTREC:
USA & Canada 1-800-424-9300
Rest of the world +1 703-741-5970

SECTION 2: Hazards identification

· ***2.1 Classification of the substance or mixture***
· ***Classification according to Regulation (EC) No 1272/2008***

GHS06 skull and crossbones

Acute Tox. 3	*H301*	*Toxic if swallowed.*

GHS08 health hazard

Carc. 2	*H351*	*Suspected of causing cancer.*
Repr. 1B	*H360D-H362*	*May damage the unborn child. May cause harm to breast-fed children.*
STOT RE 1	*H372*	*Causes damage to organs through prolonged or repeated exposure.*

(Contd. on page 2)

Safety data sheet

according to 1907/2006/EC, Article 31

Printing date 24.08.2020 *Version number 1* *Revision: 24.08.2020*

Product name: **N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide**

(Contd. from page 1)

GHS09 environment

Aquatic Chronic 2 H411 *Toxic to aquatic life with long lasting effects.*

GHS07

Acute Tox. 4 *H332* *Harmful if inhaled.*

· ***2.2 Label elements***

· ***Labelling according to Regulation (EC) No 1272/2008***

The substance is classified and labelled according to the CLP regulation.

· ***Hazard pictograms***

GHS06 GHS08 GHS09

· ***Signal word*** *Danger*

· ***Hazard statements***

H301 *Toxic if swallowed.*
H332 *Harmful if inhaled.*
H351 *Suspected of causing cancer.*
H360D-H362 *May damage the unborn child. May cause harm to breast-fed children.*
H372 *Causes damage to organs through prolonged or repeated exposure.*
H411 *Toxic to aquatic life with long lasting effects.*

· ***Precautionary statements***

P260 *Do not breathe dusts or mists.*
P263 *Avoid contact during pregnancy and while nursing.*
P280 *Wear protective gloves/protective clothing/eye protection/face protection.*
P301+P310 *IF SWALLOWED: Immediately call a POISON CENTER/ doctor.*
P405 *Store locked up.*
P501 *Dispose of contents/container in accordance with local/regional/national/international regulations.*

· ***Additional information:***

Restricted to professional users.

· ***2.3 Other hazards***

· ***Results of PBT and vPvB assessment***

· ***PBT:*** *Not applicable.*

· ***vPvB:*** *Not applicable.*

(Contd. on page 3)

Safety data sheet

according to 1907/2006/EC, Article 31

Printing date 24.08.2020 *Version number 1* *Revision: 24.08.2020*

Product name: **N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide**

(Contd. from page 2)

SECTION 3: Composition/information on ingredients

· ***3.1 Chemical characterisation: Substances***
· ***CAS No. Description***
1691-99-2 N-Ethyl perfluorooctane sulfonamide ethanol
· ***Identification number(s)*** *None*
· ***EC number:*** *216-887-4*
· ***RTECS:*** *RG9701350*
· ***Additional information:*** *For the wording of the listed hazard phrases refer to section 16.*

SECTION 4: First aid measures

· ***4.1 Description of first aid measures***
· ***General information:***
Immediately remove any clothing soiled by the product.
Symptoms of poisoning may occur even after several hours; therefore medical observation for at least 48 hours after the accident is recommended.
In case of irregular breathing or respiratory arrest provide artificial respiration.
· ***After inhalation:***
Supply fresh air. If required, provide artificial respiration. Keep patient warm. Consult doctor if symptoms persist.
In case of unconsciousness place patient in recovery position for transport.
Seek medical treatment.
· ***After skin contact:*** *Immediately wash with water and soap and rinse thoroughly.*
· ***After eye contact:*** *Rinse opened eye for several minutes under running water. Then consult a doctor.*
· ***After swallowing:***
Rinse mouth. Do not induce vomiting.
Call for a doctor immediately.
· ***4.2 Most important symptoms and effects, both acute and delayed*** *No further relevant information available.*
· ***4.3 Indication of any immediate medical attention and special treatment needed***
No further relevant information available.

SECTION 5: Firefighting measures

· ***5.1 Extinguishing media***
· ***Suitable extinguishing agents:*** *Use fire extinguishing methods suitable for surrounding conditions.*
· ***5.2 Special hazards arising from the substance or mixture***
Formation of toxic gases is possible during heating or in case of fire.
· ***5.3 Advice for firefighters***
· ***Protective equipment:***
Mouth respiratory protective device.
Wear self-contained respiratory protective device.

(Contd. on page 4)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 24.08.2020 *Version number 1* *Revision: 24.08.2020*

Product name: **N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide**

(Contd. from page 3)

SECTION 6: Accidental release measures

· ***6.1 Personal precautions, protective equipment and emergency procedures*** *Avoid formation of dust.*
· ***6.2 Environmental precautions:***
Inform respective authorities in case of seepage into water course or sewage system.
Do not allow to enter sewers/ surface or ground water.
· ***6.3 Methods and material for containment and cleaning up:***
Dispose of contaminated material as waste according to item 13.
Ensure adequate ventilation.
· ***6.4 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.

SECTION 7: Handling and storage

· ***7.1 Precautions for safe handling***
Ensure good ventilation/extraction at the workplace.
Remove dust thoroughly.
Store in cool, dry place in tightly closed receptacles.
· ***Information about fire - and explosion protection:*** *No special measures required.*

· ***7.2 Conditions for safe storage, including any incompatibilities***
· ***Storage:***
· ***Requirements to be met by storerooms and receptacles:***
Please refer to the manufacturer's certificate for specific storage and transport temperature conditions.
Store only in the original receptacle unless other advice is given on the CoA.
Keep container in a well-ventilated place. Keep away from sources of ignition and heat.
· ***Information about storage in one common storage facility:*** *Store away from foodstuffs.*
· ***Further information about storage conditions:*** *Keep container tightly sealed.*
· ***7.3 Specific end use(s)*** *No further relevant information available.*

SECTION 8: Exposure controls/personal protection

· ***Additional information about design of technical facilities:*** *No further data; see item 7.*

· ***8.1 Control parameters***
· ***Ingredients with limit values that require monitoring at the workplace:*** *Not required.*
· ***Additional information:*** *Lists used were valid at the time of SDS preparation.*

· ***8.2 Exposure controls***
· ***Personal protective equipment:***
· ***General protective and hygienic measures:***
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing
Wash hands before breaks and at the end of work.
Store protective clothing separately.

(Contd. on page 5)

Safety data sheet

according to 1907/2006/EC, Article 31

Printing date 24.08.2020 *Version number 1* *Revision: 24.08.2020*

Product name: **N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide**

(Contd. from page 4)

· ***Respiratory protection:***
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use self-contained respiratory protective device.

· ***Protection of hands:***
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation
The protective gloves to be used must comply with the specifications of EC Directive 89/686/EEC and the related standard EN374

Protective gloves

· ***Material of gloves*** *Fluorocarbon rubber (Viton)*

· ***Penetration time of glove material***
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

· ***Eye protection:***

Tightly sealed goggles

SECTION 9: Physical and chemical properties

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

Form:	*Solid*
Colour:	*White*
· ***Odour:***	*Odourless*
· ***Odour threshold:***	*Not determined.*
· ***pH-value:***	*Not applicable.*
· ***Change in condition***	
Melting point/freezing point:	*55-60 °C*
Initial boiling point and boiling range:	*Not determined.*
· ***Flash point:***	*Not applicable.*
· ***Flammability (solid, gas):***	*Not determined.*
· ***Ignition temperature:***	*Not determined*
· ***Decomposition temperature:***	*Not determined.*
· ***Auto-ignition temperature:***	*Not determined.*

(Contd. on page 6)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 24.08.2020 *Version number 1* *Revision: 24.08.2020*

Product name: **N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide**

(Contd. from page 5)

· ***Explosive properties:***	*Not determined.*
· ***Explosion limits:***	
Lower:	*Not determined.*
Upper:	*Not determined.*
· ***Vapour pressure:***	*Not applicable.*
· ***Density:***	*Not determined.*
· ***Relative density***	*Not determined.*
· ***Vapour density***	*Not applicable.*
· ***Evaporation rate***	*Not applicable.*
· ***Solubility in / Miscibility with***	*Chloroform (Slightly), DMSO, Ethyl Acetate (Slightly), Methanol (Slightly)*
· ***water:***	*Not determined.*
· ***Partition coefficient: n-octanol/water:***	*Not determined.*
· ***Viscosity:***	
Dynamic:	*Not applicable.*
Kinematic:	*Not applicable.*
· ***9.2 Other information***	*No further relevant information available.*

SECTION 10: Stability and reactivity

· ***10.1 Reactivity***
Stable under normal conditions.
No further relevant information available.
· ***10.2 Chemical stability*** *Stable under normal conditions.*
· ***Thermal decomposition / conditions to be avoided:***
Formation of toxic gases is possible during heating or in case of fire.
· ***10.3 Possibility of hazardous reactions*** *No dangerous reactions known.*
· ***10.4 Conditions to avoid*** *Heat.*
· ***10.5 Incompatible materials:*** *Strong oxidizing agents.*
· ***10.6 Hazardous decomposition products:***
Formation of toxic gases is possible during heating or in case of fire.

SECTION 11: Toxicological information

· ***11.1 Information on toxicological effects***
· ***Acute toxicity***
Toxic if swallowed.
Harmful if inhaled.
· ***Primary irritant effect:***
· ***Skin corrosion/irritation*** *Based on available data, the classification criteria are not met.*
· ***Serious eye damage/irritation*** *Based on available data, the classification criteria are not met.*
· ***Respiratory or skin sensitisation*** *Based on available data, the classification criteria are not met.*

(Contd. on page 7)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 24.08.2020 *Version number 1* *Revision: 24.08.2020*

Product name: **N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide**

(Contd. from page 6)

· ***CMR effects (carcinogenity, mutagenicity and toxicity for reproduction)***
Carc. 2, Repr. 1B
· ***Germ cell mutagenicity*** *Based on available data, the classification criteria are not met.*
· ***Carcinogenicity***
Suspected of causing cancer.
· ***Reproductive toxicity***
May damage the unborn child. May cause harm to breast-fed children.
· ***STOT-single exposure*** *Based on available data, the classification criteria are not met.*
· ***STOT-repeated exposure***
Causes damage to organs through prolonged or repeated exposure.
· ***Aspiration hazard*** *Based on available data, the classification criteria are not met.*

SECTION 12: Ecological information

· ***12.1 Toxicity***
· ***Aquatic toxicity:*** *No further relevant information available.*
· ***12.2 Persistence and degradability*** *No further relevant information available.*
· ***12.3 Bioaccumulative potential*** *No further relevant information available.*
· ***12.4 Mobility in soil*** *No further relevant information available.*
· ***Ecotoxicological effects:***
· ***Remark:*** *Toxic for fish*
· ***Additional ecological information:***
· ***General notes:***
Water hazard class 3 (German Regulation) (Self-assessment): extremely hazardous for water
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.
Also poisonous for fish and plankton in water bodies.
Toxic for aquatic organisms
· ***12.5 Results of PBT and vPvB assessment***
· ***PBT:*** *Not applicable.*
· ***vPvB:*** *Not applicable.*
· ***12.6 Other adverse effects*** *No further relevant information available.*

SECTION 13: Disposal considerations

· ***13.1 Waste treatment methods***
· ***Recommendation***
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
· ***European waste catalogue***
Waste disposal key numbers from EWC have to be assigned depending on origin and processing.

· ***Uncleaned packaging:***
· ***Recommendation:*** *Dispose of in accordance with national regulations.*

(Contd. on page 8)

Safety data sheet

according to 1907/2006/EC, Article 31

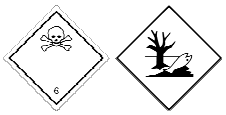
Printing date 24.08.2020 *Version number 1* *Revision: 24.08.2020*

Product name: **N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide**

(Contd. from page 7)

SECTION 14: Transport information

· **14.1 UN-Number**	
· **ADR, IMDG, IATA**	UN2811
· **ADR**	2811 TOXIC SOLID, ORGANIC, N.O.S. (N-Ethyl perfluorooctane sulfonamide ethanol), ENVIRONMENTALLY HAZARDOUS
· **IMDG**	TOXIC SOLID, ORGANIC, N.O.S. (N-Ethyl perfluorooctane sulfonamide ethanol), MARINE POLLUTANT
· **IATA**	TOXIC SOLID, ORGANIC, N.O.S. (N-Ethyl perfluorooctane sulfonamide ethanol)
· **14.3 Transport hazard class(es)**	
· **ADR, IMDG**	



· **Class**	6.1 Toxic substances.
· **Label**	6.1
· **IATA**	

· **Class**	6.1 Toxic substances.
· **Label**	6.1
· **14.4 Packing group**	
· **ADR, IMDG, IATA**	III
· **14.5 Environmental hazards:**	Environmentally hazardous substance, solid; Marine Pollutant
· **Marine pollutant:**	Symbol (fish and tree)
· **Special marking (ADR):**	Symbol (fish and tree)
· **14.6 Special precautions for user**	Warning: Toxic substances.
· **Danger code (Kemler):**	60
· **EMS Number:**	F-A,S-A
· **Stowage Category**	A
· **14.7 Transport in bulk according to Annex II of Marpol and the IBC Code**	Not applicable.

(Contd. on page 9)

Safety data sheet
according to 1907/2006/EC, Article 31

Printing date 24.08.2020 *Version number 1* *Revision: 24.08.2020*

Product name: **N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide**

(Contd. from page 8)

· ***Transport/Additional information:***

· ***ADR***	
· ***Limited quantities (LQ)***	*5 kg*
· ***Excepted quantities (EQ)***	*Code: E1* *Maximum net quantity per inner packaging: 30 g* *Maximum net quantity per outer packaging: 1000 g*
· ***Transport category***	*2*
· ***Tunnel restriction code***	*E*
· ***UN "Model Regulation":***	*UN 2811 TOXIC SOLID, ORGANIC, N.O.S. (N-ETHYL PERFLUOROOCTANE SULFONAMIDE ETHANOL), 6.1, III, ENVIRONMENTALLY HAZARDOUS*

SECTION 15: Regulatory information

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

· ***Directive 2012/18/EU***
· ***Named dangerous substances - ANNEX I*** *Substance is not listed.*
· ***Seveso category*** *E2 Hazardous to the Aquatic Environment*
· ***Qualifying quantity (tonnes) for the application of lower-tier requirements*** *200 t*
· ***Qualifying quantity (tonnes) for the application of upper-tier requirements*** *500 t*
· ***Regulation (EU) No 649/2012***
Annex I Part 1
Annex I Part 3
· ***15.2 Chemical safety assessment:*** *A Chemical Safety Assessment has not been carried out.*

SECTION 16: Other information

The information in this safety data sheet (SDS) has been prepared with due care and is true and accurate to the best of our knowledge. The user must determine the suitability of the information for its particular purpose, ensure compliance with existing laws and regulations, and be aware that other or additional safety or performance considerations may arise when using, handling and/ or storing the material. The information in this SDS does not purport to be all inclusive or a guarantee as to the properties of the material supplied, and should be used only as a guide. LGC makes no warranties or representations as to the accuracy and completeness of the information contained herein, shall not be held responsible for the suitability of this information for the user's intended purposes or the consequences of such use, and shall not be liable for any damage or loss, howsoever arising, direct or otherwise.

· ***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
IATA: International Air Transport Association
GHS: Globally Harmonised System of Classification and Labelling of Chemicals
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
PBT: Persistent, Bioaccumulative and Toxic

(Contd. on page 10)

Safety data sheet

according to 1907/2006/EC, Article 31

Printing date 24.08.2020 *Version number 1* *Revision: 24.08.2020*

Product name: **N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide**

(Contd. from page 9)

vPvB: very Persistent and very Bioaccumulative
Acute Tox. 3: Acute toxicity – Category 3
Acute Tox. 4: Acute toxicity – Category 4
Carc. 2: Carcinogenicity – Category 2
Repr. 1B: Reproductive toxicity – Category 1B
STOT RE 1: Specific target organ toxicity (repeated exposure) – Category 1
Aquatic Chronic 2: Hazardous to the aquatic environment - long-term aquatic hazard – Category 2

· ***Sources***

Tables 3.1 and 3.2 from Annex 6 of EC 1272/2008, EC 1907/2006, EH40/2005 as amended 2011, Registry of Toxic Effects of Chemical Substances (RTECS), The Dictionary of Substances and their Effects, 1st Edition, IUCLID.

· ***Data compared to the previous version altered.*** *All sections have been updated.*

N-ethyl-N-[(heptadecafluorooctyl)sulphonyl]glycine SDS

SAFETY DATA SHEETS

According to Globally Harmonized System of Classification and Labelling of Chemicals (GHS) - Sixth revised edition

Version: 1.0

Creation Date: Aug 20, 2017

Revision Date: Aug 20, 2017

1.Identification

1.1 GHS Product identifier

Product name	N-ethylperfluorooctane sulfonamidoacetic acid

1.2 Other means of identification

Product number	-
Other names	N-ethyl perfluorooctanesulfonamidoacetic acid

1.3 Recommended use of the chemical and restrictions on use

Identified uses	For industry use only.
Uses advised against	no data available

1.4 Supplier's details

1.5 Emergency phone number

Emergency phone number	-
Service hours	Monday to Friday, 9am-5pm (Standard time zone: UTC/GMT +8 hours).

2.Hazard identification

2.1 Classification of the substance or mixture

no data available

2.2 GHS label elements, including precautionary statements

Pictogram(s)	no data available
Signal word	no data available
Hazard statement(s)	no data available
Precautionary statement(s)	
Prevention	no data available
Response	no data available
Storage	no data available
Disposal	no data available

2.3 Other hazards which do not result in classification

no data available

3.Composition/information on ingredients

3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
N-ethylperfluorooctane sulfonamidoacetic acid	N-ethylperfluorooctane sulfonamidoacetic acid	2991-50-6	none	100%

4.First-aid measures

4.1 Description of necessary 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

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/effects, acute and delayed

no data available

4.3 Indication of immediate medical attention and special treatment needed, if necessary

no data available

5.Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Specific hazards arising from the chemical

no data available

5.3 Special protective actions for fire-fighters

Wear self-contained breathing apparatus for firefighting if necessary.

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. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7.Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Avoid exposure - obtain special instructions before use.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

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

8.Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure limit values

no data available

Biological limit values

no data available

8.2 Appropriate engineering controls

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

8.3 Individual protection measures, such as personal protective equipment (PPE)

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

Wear impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Respiratory protection

Wear dust mask when handling large quantities.

Thermal hazards

no data available

9.Physical and chemical properties

Physical state	no data available
Colour	no data available
Odour	no data available
Melting point/ freezing point	no data available
Boiling point or initial boiling point and boiling range	343.4oC at 760 mmHg
Flammability	no data available
Lower and upper explosion limit / flammability limit	no data available
Flash point	161.5oC
Auto-ignition temperature	no data available
Decomposition temperature	no data available
pH	no data available
Kinematic viscosity	no data available
Solubility	no data available
Partition coefficient n-octanol/water (log value)	no data available
Vapour pressure	1.27E-05mmHg at 25°C
Density and/or relative density	1.708g/cm3
Relative vapour density	no data available
Particle characteristics	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

no data available

10.6 Hazardous decomposition products

no data available

11.Toxicological information

Acute toxicity
Oral: no data available
Inhalation: no data available
Dermal: no data available
Skin corrosion/irritation

no data available

Serious eye damage/irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

no data available

Reproductive toxicity

no data available

STOT-single exposure

no data available

STOT-repeated exposure

no data available

Aspiration hazard

no data available

12.Ecological information

12.1 Toxicity

Toxicity to fish: no data available
Toxicity to daphnia and other aquatic invertebrates: no data available
Toxicity to algae: no data available
Toxicity to microorganisms: 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 Other adverse effects

no data available

13.Disposal considerations

13.1 Disposal methods

Product

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

Contaminated packaging

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

14.Transport information

14.1 UN Number

ADR/RID: no data available IMDG: no data available IATA: no data available

14.2 UN Proper Shipping Name

ADR/RID: no data available

IMDG: no data available

IATA: no data available

14.3 Transport hazard class(es)

ADR/RID: no data available IMDG: no data available IATA: no data available

14.4 Packing group, if applicable

ADR/RID: no data available IMDG: no data available IATA: no data available

14.5 Environmental hazards

ADR/RID: no IMDG: no IATA: no

14.6 Special precautions for user

no data available

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

no data available

15.Regulatory information

15.1 Safety, health and environmental regulations specific for the product in question

Chemical name	Common names and synonyms	CAS number	EC number
N-ethylperfluorooctane sulfonamidoacetic acid	N-ethylperfluorooctane sulfonamidoacetic acid	2991-50-6	none
European Inventory of Existing Commercial Chemical Substances (EINECS)			Listed.
EC Inventory			Listed.
United States Toxic Substances Control Act (TSCA) Inventory			Listed.
China Catalog of Hazardous chemicals 2015			Not Listed.
New Zealand Inventory of Chemicals (NZIoC)			Not Listed.
Philippines Inventory of Chemicals and Chemical Substances (PICCS)			Not Listed.
Vietnam National Chemical Inventory			Not Listed.
Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)			Not Listed.

16.Other information

Information on revision

Creation Date	Aug 20, 2017
Revision Date	Aug 20, 2017

Abbreviations and acronyms
CAS: Chemical Abstracts Service
ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
RID: Regulation concerning the International Carriage of Dangerous Goods by Rail
IMDG: International Maritime Dangerous Goods
IATA: International Air Transportation Association
TWA: Time Weighted Average
STEL: Short term exposure limit
LC50: Lethal Concentration 50%
LD50: Lethal Dose 50%
EC50: Effective Concentration 50%
References
IPCS - The International Chemical Safety Cards (ICSC), website: http://www.ilo.org/dyn/icsc/showcard.home
HSDB - Hazardous Substances Data Bank, website: https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm
IARC - International Agency for Research on Cancer, website: http://www.iarc.fr/
eChemPortal - The Global Portal to Information on Chemical Substances by OECD, website: http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en
CAMEO Chemicals, website: http://cameochemicals.noaa.gov/search/simple
ChemIDplus, website: http://chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp
ERG - Emergency Response Guidebook by U.S. Department of Transportation, website: http://www.phmsa.dot.gov/hazmat/library/erg
Germany GESTIS-database on hazard substance, website: http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index-2.jsp
ECHA - European Chemicals Agency, website: https://echa.europa.eu/

* Product Name: N-ethyl-N-[(heptadecafluorooctyl)sulphonyl]glyc

* Your email:

Your email will be used to sign-in to LookChem.com

* Requirements:

Quantity:
Quality Standards:
Packing:
Place of Origin:
Purity:
Standard:
Detailed Description:

* Valid for: 5 Days 10 Days 20 Days 1 Month 3 Months 6 Months

Send

SAFETY DATA SHEET

Creation Date 26-Oct-2009 **Revision Date** 02-Apr-2014 **Revision Number** 1

1. Identification

Product Name **n-Hexane**

Cat No. : **AC326920000; AC326920010; AC326920025; AC326921000; AC326922500**

Synonyms Hex

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
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Reproductive Toxicity	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 1
Target Organs - Liver, Heart, Blood.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor

May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of damaging fertility
Causes damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Do not eat, drink or smoke when using this product
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
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 skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention.
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO_2, 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)
Toxic to aquatic life with long lasting effects

3. Composition / information on ingredients

Haz/Non-haz

Component	CAS-No	Weight %
Hexane	110-54-3	>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 resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Obtain medical attention. Aspiration into lungs can produce severe lung damage.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately. If vomiting occurs, lean victim forward to reduce the risk of aspiration.

Most important symptoms/effects Breathing difficulties. . Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. 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 CO_2, dry chemical, dry sand, alcohol-resistant foam. Cool closed containers exposed to fire with water spray.

Unsuitable Extinguishing Media Water may be ineffective, This material is lighter than water and insoluble in water. The fire could easily be spread by the use of water in an area where the water cannot be contained.

Flash Point -22°C / -7.6°F

Method - No information available

Autoignition Temperature 223°C / 433.4°F

Explosion Limits
Upper 7.5 vol %
Lower 1.1 vol %

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
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.

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. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
2	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Do not flush into surface water or sanitary sewer system. 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. Take precautionary measures against static discharges.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not breathe vapors or spray mist. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharges. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded.

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
Hexane	TWA: 50 ppm Skin	(Vacated) TWA: 50 ppm (Vacated) TWA: 180 mg/m^3 TWA: 500 ppm TWA: 1800 mg/m^3	IDLH: 1100 ppm TWA: 50 ppm TWA: 180 mg/m^3

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Hexane	TWA: 50 ppm TWA: 176 mg/m^3 Skin	TWA: 50 ppm TWA: 176 mg/m^3	TWA: 50 ppm Skin

Legend
ACGIH *- American Conference of Governmental 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. Use explosion-proof electrical/ventilating/lighting/equipment.

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	Petroleum distillates
Odor Threshold	No information available.
pH	No information available.
Melting Point/Range	-95°C / -139°F
Boiling Point/Range	69°C / 156.2°F@ 760 mmHg
Flash Point	-22°C / -7.6°F
Evaporation Rate	No information available.
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	7.5 vol %
Lower	1.1 vol %
Vapor Pressure	160 mbar @ 20 °C
Vapor Density	2.97
Relative Density	0.659
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	223°C / 433.4°F
Decomposition temperature	No information available.
Viscosity	0.31 mPa s at 20 °C
Molecular Formula	C6 H14
Molecular Weight	86.18

10. Stability and reactivity

Reactive Hazard None known, based on information available.

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Heat, flames and sparks. Exposure to light. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents, Halogens

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
Hexane	25 g/kg (Rat)	3000 mg/kg (Rabbit)	48000 ppm (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
Hexane	110-54-3	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Mutagenic effects have occurred in experimental animals.

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 Respiratory system, Central nervous system (CNS).

STOT - repeated exposure Liver, Heart, Blood.

Aspiration hazard No information available.

Symptoms / effects, both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting.

Endocrine Disruptor Information No information available

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
Hexane	Not listed	2.1 - 2.98 mg/L LC50 96 h	Not listed	EC50: 3.87 mg/L/48h

Persistence and Degradability Persistence is unlikely, based on information available.

Bioaccumulation/ Accumulation No information available

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Hexane	4.11

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	UN1208
Proper Shipping Name	Hexanes
Hazard Class	3
Packing Group	II

TDG

UN-No	UN1208
Proper Shipping Name	HEXANES
Hazard Class	3
Packing Group	II

IATA

UN-No	UN1208
Proper Shipping Name	Hexanes
Hazard Class	3
Packing Group	II

IMDG/IMO

UN-No	UN1208
Proper Shipping Name	Hexanes
Hazard Class	3
Packing Group	II

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Hexane	X	X	-	203-777-6	-		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 %
Hexane	110-54-3	>95	1.0

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 Not applicable

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Hexane	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
Hexane	5000 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
Hexane	X	X	X	X	X

U.S. Department of Transportation

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

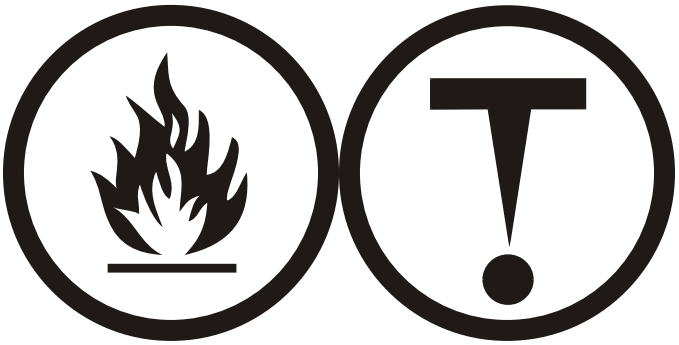
U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade 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	26-Oct-2009
Revision Date	02-Apr-2014
Print Date	02-Apr-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 04-Oct-2010 **Revision Date** 10-Feb-2015 **Revision Number** 1

1. Identification

Product Name **Nickel, powder**

Cat No. : **AC193610000; AC193610250; AC193611000; AC193615000**

Synonyms Raney alloy

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 Sensitization	Category 1
Carcinogenicity	Category 2
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Kidney, Blood.	

Label Elements

Signal Word
Danger

Hazard Statements
May cause an allergic skin reaction
Causes damage to organs through prolonged or repeated exposure
Suspected of causing cancer

Precautionary Statements

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
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Contaminated work clothing should not be allowed out of the workplace
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)
Harmful to aquatic life with long lasting effects

3. Composition / information on ingredients

Component	CAS-No	Weight %
Nickel powder	7440-02-0	>95

4. First-aid measures

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

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

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.

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

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

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 400 °C / 752 °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
Combustible material.

Hazardous Combustion Products
Nickel 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. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
3	1	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas. Avoid dust formation.

Environmental Precautions Should not be released into the environment. 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. Avoid dust formation.

7. Handling and storage

Handling Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Do not breathe vapors/dust. Do not ingest.

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
Nickel powder	TWA: 1.5 mg/m³	(Vacated) TWA: 1 mg/m³ TWA: 1 mg/m³	IDLH: 10 mg/m³ TWA: 0.015 mg/m³

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Nickel powder	TWA: 1 mg/m³	TWA: 1 mg/m³	TWA: 1 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 Use only under a chemical fume hood. 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	Brown
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	1455 °C / 2651 °F
Boiling Point/Range	2730 °C / 4946 °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 mmHg @ 1810 °C
Vapor Density	No information available
Relative Density	No information available
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	400 °C / 752 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	Ni
Molecular Weight	58.7

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Nickel 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
Nickel powder	9000 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 May cause sensitization by skin contact Nickel and nickel compounds may cause a form of dermatitis known as nickel itch. May cause an allergic skin reaction

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Nickel powder	7440-02-0	Group 2B	Reasonably Anticipated	Not listed	X	Not listed

IARC: (International Agency for Research on Cancer) *Group 2B - Possibly Carcinogenic to Humans*

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 Kidney Blood

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

Other Adverse Effects See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity
Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Do not empty into drains. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nickel powder	0.18 mg/L EC50 = 72 h 0.174 - 0.311 mg/L EC50 96 h	10.4 mg/L LC50 96 h 1.3 mg/L LC50 96 h 100 mg/L LC50 96 h	Not listed	1 mg/L EC50 = 48 h 100 mg/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
- **UN-No** UN3089
- **Proper Shipping Name** METAL POWDERS, FLAMMABLE, N.O.S.
- **Hazard Class** 4.1
- **Packing Group** II

TDG
- **UN-No** UN3089
- **Proper Shipping Name** METAL POWDERS, FLAMMABLE, N.O.S.
- **Hazard Class** 4.1
- **Packing Group** II

IATA

UN-No 3089
Proper Shipping Name METAL POWDERS, FLAMMABLE, N.O.S.
Hazard Class 4.1
Packing Group II

IMDG/IMO

UN-No 3089
Proper Shipping Name METAL POWDERS, FLAMMABLE, N.O.S.
Hazard Class 4.1
Packing Group II

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Nickel powder	X	X	-	231-111-4	-		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 %
Nickel powder	7440-02-0	>95	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
Nickel powder	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Nickel powder	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
Nickel powder	100 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals:

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Nickel powder	7440-02-0	Carcinogen	-	Carcinogen

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nickel powder	X	X	X	X	X

U.S. Department of Transportation

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

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

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

WHMIS Hazard Class D2A Very toxic materials

16. Other information

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

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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

AccuStandard, Inc.
125 Market St., New Haven, CT 06513 USA
Tel: 203-786-5290 Fax: 203-786-5287

SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1.1 - Product Identifiers

Catalog Name: PFOS-004S

Description: N-Methyl perfluorooctanesulonamidoacetic acid in Methanol

1.2 - Relevant Identified Uses of the Substance or Mixture

Laboratory Chemical Reference Material

1.3 - Supplier Details

Company: AccuStandard, Inc.
125 Market St.
New Haven, CT 06513 USA

Telephone Number: 203-786-5290

Fax: 203-786-5287

Email: edocs@accustandard.com

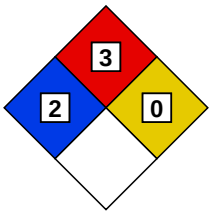
1.4 - Emergency Telephone Number

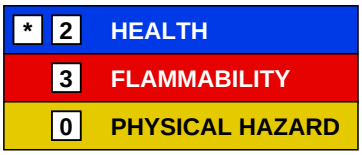
Emergency Phone #: AccuStandard, Inc.
1-203-502-7070 (USA)
+001-203-502-7070 (International)

24 hours / 7 days a week

SECTION 2 - HAZARDS IDENTIFICATION

2.1 - GHS Label Elements





Signal Word: Danger

Hazard Codes:

H225 - Highly Flammable (Flammable liquids, category 2)

H301 - Toxic if swallowed. (Acute toxicity, oral, category 3)

H311 - Toxic if absorbed through skin. (Acute toxicity, dermal, category 3)

H315 - Irritating to skin. (Skin corrosion/irritation, category 2)

H320 - Irritating to eyes. (Eye damage/irritation, category 2B)

H332 - Harmful if inhaled. (Acute toxicity, inhalation, category 4)

H336 - Overexposure may cause dizziness, nausea, muscle weakness, narcosis and respiratory failure.

H360 - California Proposition 65 Warning: This product contains a component (or components) that may cause birth defects or other reproductive harm in a quantity greater than or equal to 0.1%.

H370 - Causes damage to organs. (Specific target organ toxicity, single exposure, category 1)

Precautionary Codes:

SECTION 2 - HAZARDS IDENTIFICATION *- continued*

2.1 - GHS Label Elements *- continued*

P202 - This product should only by used by persons trained in the safe handling of hazardous chemicals.

P233 - Store in a tightly closed container. (P404)

P262 - Do not get in eyes, on skin or clothing.

P264 - Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

P280 - Protective gloves must be worn to prevent skin contact.

P284 - Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), or a risk assessment shows air-purifying respirators are appropriate, use of a NIOSH/MSHA approved air supplied respirator is advised. Use a full-face respirator with multi-purpose combination (US) or type ABEK (EN14387) respirator cartridges in absence of proper environmental control. Always use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Engineering and/or administrative controls should be implemented to reduce exposure.

P331 - Ingestion: Do NOT induce vomiting. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person.

P338 - Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers.

P360 - Skin contact: Immediately wash skin with soap and plenty of water. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

2.2 - Other Hazards

2.2.1 - Symptom of Exposure Health/Environment

Highly Flammable (Flammable liquids, category 2)

Causes damage to organs. (Specific target organ toxicity, single exposure, category 1)

After ingestion or inhalation, initial symptoms may be only that of mild intoxication, but may become severe after 12 or 18 hours.

POISON: May be fatal or cause blindness if swallowed.

Overexposure may cause dizziness, nausea, muscle weakness, narcosis and respiratory failure.

2.2.2 - Potential Health Effects

Irritating to eyes. (Eye damage/irritation, category 2B)

Irritating to skin. (Skin corrosion/irritation, category 2)

Toxic if absorbed through skin. (Acute toxicity, dermal, category 3)

Irritating to mucous membrane and upper respiratory system.

Harmful if inhaled. (Acute toxicity, inhalation, category 4)

Toxic if swallowed. (Acute toxicity, oral, category 3)

2.2.3 - Routes of Entry

Inhalation, ingestion or skin contact.

2.2.4 - Carcinogenicity

California Proposition 65 Warning: This product contains a component (or components) that may cause birth defects or other reproductive harm in a quantity greater than or equal to 0.1%.

SECTION 3 - COMPOSITION / ANALYTES DATA

Description: N-Methyl perfluorooctanesulonamidoacetic acid in Methanol

SECTION 3 - COMPOSITION / ANALYTES DATA *- continued*

Analyte	CAS #	% Concentration	ACGIH -TLV (mg/m³)			OSHA -PEL (mg/m³)		
			TWA	STEL	Skin	TWA	STEL	Skin
N-Methylperfluorooctanesulfonamidoacetic acid (branched)	N/A	0.010						
Methanol	67-56-1	99.990				260		

SECTION 4 - FIRST AID MEASURES

4.1 - First Aid Procedures - General

Get medical assistance for all cases of overexposure.

4.2 - Eye Contact

Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. (P338)

4.3 - Skin Contact

Skin contact: Immediately wash skin with soap and plenty of water. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse. (P360)

4.4 - Inhalation

Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Seek immediate medical attention.

4.5 - Ingestion

Ingestion: Do NOT induce vomiting. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person. (P331)

SECTION 5 - FIRE FIGHTING MEASURES

5.1 - Flammable Properties

Dangerous fire and explosive hazard.

Containers can build up pressure if exposed to heat.

Vapors can travel to a source of ignition and flash back.

During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

5.2 - Extinguishing Media

Use alcohol foam, carbon dioxide, dry chemical, or water spray when fighting fires involving this material.

5.3 - Protection of Firefighters

As in any fire, wear self-contained breathing apparatus pressure demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

6.1 - Spill Response

Wear suitable protective equipment listed under Exposure Controls / Personal Protection. Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Dispose as hazardous waste. Comply with Federal, State and local regulations.

SECTION 7 - HANDLING AND STORAGE

Store in a tightly closed container. (P404)

Store in a cool area away from ignition sources and oxidizers.

Avoid breathing vapors or mists.

Use with adequate ventilation.

Do not get in eyes, on skin or clothing. (P262)

Avoid prolonged or repeated exposure.

This product should only by used by persons trained in the safe handling of hazardous chemicals. (P202)

SECTION 8 - EXPOSURE CONTROLS

8.1 - Engineering Controls/PPE

Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available. (P264)

8.2 - General Hygene Considerations

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), or a risk assessment shows air-purifying respirators are appropriate, use of a NIOSH/MSHA approved air supplied respirator is advised. Use a full-face respirator with multi-purpose combination (US) or type ABEK (EN14387) respirator cartridges in absence of proper environmental control. Always use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Engineering and/or administrative controls should be implemented to reduce exposure.

Material should be handled or transferred in an approved fume hood or with adequate ventilation.

Protective gloves must be worn to prevent skin contact. (P280)

(Chloroprene, natural rubber, nitrile, or equivalent)

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

All recommendations are advisory only and must be evaluated by an industrial hygienist and/or safety officer familiar with the specific situation of anticipated use, such as concentration and amount of the substance in the workplace. Any recommendation should not be construed as offering an approval for any specific use of the product.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear liquid

Odor: N/A

Odor Threshold: N/A

pH: N/A

Melting Point: -93.9 °C

Boiling Point: 65 °C

Flash Point: 52 °F (11 °C) (tcc)

Evaporation Rate (Butyl Acetate=1): 5.9

Flammability Class: N/A

Lower Flammability Level: 6.7

Upper Flammability Level: 36.5

Vapor Pressure: 97 mmHg (20 °C)

Vapor Density (Air = 1): 1.1 g/L

Specific Gravity: 0.791 g/cm3

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES *- continued*

Solubility in Water: Very soluble

Partition Coefficient: log Pow: -0.77

Autoignition Temperature: 385 °C

Decomposition Temperature: N/A

Viscosity: N/A

VOC Content: N/A

Percent Volatile: 99.9+

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable

Materials to Avoid: Acids
Oxidizers

Hazardous Decomposition: Oxides of carbon; Formaldehyde

Hazardous Polymerization: Will not occur

Condition to Avoid: Heat; Contact with ignition sources

SECTION 11 - TOXICOLOGICAL INFORMATION

Human Health Toxicity

See section 2 for specific toxicological information for the ingredients of this product.

LD50 (Oral): Human - 143 mg/kg; Rat - 1500 mg/kg

LD50 (Dermal) : Rabbit - >2000 mg/kg

LC50 (Inhalation): Rat - >20 mg/L

WARNING: This product contains chemicals known to the state of California to cause birth defects or other reproductive harm.

No other information related to the toxicological properties of this product is available at this time.

SECTION 12 - ECOLOGICAL INFORMATION

Environmental Toxicity

By complying with sections 6 and 7 there should be no release to the environment.

LC50 (Fish): >1000 mg/L 96H

EC50 (Aquatic Invertebrate): >1000 mg/L 48H

BCF: 1.0

Hydrolyzes readily on contact with water. Readily biodegradable.

No other information related to the ecological properties of this product is available at this time.

SECTION 13 - DISPOSAL CONSIDERATIONS

Recycle or incinerate at any EPA approved facility or dispose in compliance with Federal, State and local regulations. Empty containers must be triple-rinsed prior to disposal.

SECTION 14 - TRANSPORT INFORMATION

Transportation Information (DOT/IATA)

SECTION 14 - TRANSPORT INFORMATION *- continued*

UN Number: UN1230

Class: 3

Packing Group: II

Proper Shipping Name: Methanol

Poison by Inhalation: No

Marine Pollutant: No

SECTION 15 - REGULATORY INFORMATION

WARNING: This product contains chemicals known to the state of California to cause birth defects or other reproductive harm.

This product is subject to SARA section 313 reporting requirements.

Not all components are listed on the TSCA Inventory.

For laboratory, research and development use only. Not for manufacturing or commercial purposes.

In addition to federal and state regulations, local regulations may apply. Check with your local regulatory authorities.

SECTION 16 - OTHER INFORMATION

This document has been designed to meet the requirements of OSHA, ANSI, GHS and CHIPs regulations. Chemicals are classified using the Globally Harmonized System for Classification and Labeling of Chemicals.

The statements contained herein are offered for informational purposes only and are based on technical data that we believe to be accurate. The manufacturer will not assume any liability for the accuracy and completeness of this information. Final determination of the suitability of the material is the responsibility of the user. Although certain hazards are described herein, the user should not presume that these are the only hazards that exist. Since conditions and manner of use are outside of the manufacturers control, we make

NO WARRANTY OF MERCHANTABILITY, EXPRESSED OR IMPLIED, AND ASSUME NO LIABILITY RESULTING FROM ITS USE.

Legend : N/A = Not Available ND = Not Determined NR = Not Regulated

HMIS/NFPA HAZARD INDEX

0 - Minimal
1 - Slight
2 - Moderate
3 - Serious
4 - Severe

* - Additional Hazard

GHS HAZARD INDEX

Category 1 - Most Severe
Category 5 - Least Severe

**** End of Document ****

Material Safety Data Sheet

Version 4.0
Revision Date 07/28/2010
Print Date 12/27/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Propylbenzene
Product Number	:	P52407
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid

Target Organs

Lungs, Eyes, Kidney

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H335	May cause respiratory irritation.
H401	Toxic to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P331	Do NOT induce vomiting.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	2
Physical hazards:	0

NFPA Rating

Health hazard:	1
Fire:	2
Reactivity Hazard:	0

Potential Health Effects

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

Ingestion Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1-Phenylpropane

Formula : C_9H_{12}
Molecular Weight : 120.19 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Propylbenzene			
103-65-1	203-132-9	601-024-00-X	-

4. FIRST AID MEASURES

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

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

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

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

Methods and materials for containment and cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
For prolonged or repeated contact use protective gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

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

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	-99 °C (-146 °F) - lit.
Boiling point	159 °C (318 °F) - lit.
Flash point	42.0 °C (107.6 °F) - closed cup
Ignition temperature	450 °C (842 °F)
Lower explosion limit	0.8 %(V)
Upper explosion limit	6 %(V)
Density	0.862 g/cm3 at 25 °C (77 °F)
Water solubility	slightly soluble

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 6,040 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity).

LC50 Inhalation - rat - 2 h - 65000 ppm

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

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

Reproductive toxicity
no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
May cause respiratory irritation.

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

Aspiration hazard
May be fatal if swallowed and enters airways.

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

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

Additional Information
RTECS: DA8750000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 1.55 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - 2 mg/l - 24 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

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

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. 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: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propyl benzene
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2364 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: PROPYLBENZENE
Marine pollutant: No

IATA
UN-Number: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propylbenzene

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid

DSL Status
All components of this product are on the Canadian DSL list.

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

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

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	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

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SAFETY DATA SHEET

Version 4.7
Revision Date 05/27/2015
Print Date 04/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	*o*-Cresol
Product Number	:	C85700
Brand	:	Sigma-Aldrich
Index-No.	:	604-004-00-9
CAS-No.	:	95-48-7

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Dermal (Category 3), H311
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

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 + H311	Toxic if swallowed or in contact with skin
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P260	Do not breathe dust or mist.
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 or doctor/ physician. Rinse mouth.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
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 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
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 : 2-Methylphenol

Formula : C_7H_8O
Molecular weight : 108.14 g/mol
CAS-No. : 95-48-7
EC-No. : 202-423-8
Index-No. : 604-004-00-9

Hazardous components

Component	Classification	Concentration
o-Cresol		
	Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 2; Aquatic Chronic 2; H301 + H311, H314, H318, H411	<= 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
Take off contaminated clothing and shoes immediately. 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.Continue rinsing eyes during transport to hospital.

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
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
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.

Air and light sensitive. 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
o-Cresol	95-48-7	TWA	5.000000 ppm 22.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin contact does contribute to exposure.		

		TWA	5.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Eye, skin, & Upper Respiratory Tract irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC 2010 Revision or addition to the notice of intended changes See Notice of Intended Changes (NIC) Danger of cutaneous absorption		
		TWA	2.300000 ppm 10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	20.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen Danger of cutaneous absorption		

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 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 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: powder Colour: white
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	4.5 at 25.00000 g/l
e)	Melting point/freezing point	Melting point/range: 29 - 31 °C (84 - 88 °F) - lit.
f)	Initial boiling point and boiling range	191 °C (376 °F) - lit.
g)	Flash point	81.0 °C (177.8 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 58 %(V) Lower explosion limit: 1.3 %(V)
k)	Vapour pressure	3.1 hPa (2.3 mmHg) at 60.0 °C (140.0 °F) 1.3 hPa (1.0 mmHg) at 38.2 °C (100.8 °F) 0.4 hPa (0.3 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.05 g/cm3 at 20.00 °C (68.00 °F)
n)	Water solubility	25 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	599.0 °C (1,110.2 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

Oxidizing agents

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 - 121.0 mg/kg
Remarks: Behavioral:Convulsions or effect on seizure threshold. Lungs, Thorax, or Respiration:Dyspnea. Gastrointestinal:Ulceration or bleeding from stomach.

LC50 Inhalation - Rat - 1 h - > 1,220 mg/m3
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Behavioral:Somnolence (general depressed activity).

LD50 Dermal - Rabbit - 890.0 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Severe skin irritation - 24 h
(Draize Test)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Severe eye irritation
(Draize Test)

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: GO6300000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Central nervous system depression, Diarrhoea, Gastrointestinal disturbance

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Leuciscus idus (Golden orfe) - 10.00 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 15.8 mg/l - 48 h
Toxicity to algae	EC50 - SELENASTRUM - 100.00 mg/l - 72 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.
Toxic to aquatic life with long lasting effects.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3455 Class: 6.1 (8) Packing group: II
Proper shipping name: Cresols, solid
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 3455 Class: 6.1 (8) Packing group: II EMS-No: F-A, S-B
Proper shipping name: CRESOLS, SOLID

IATA
UN number: 3455 Class: 6.1 (8) Packing group: II
Proper shipping name: Cresols, solid

15. REGULATORY INFORMATION

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
o-Cresol	95-48-7	2007-07-01

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
o-Cresol	95-48-7	2007-07-01

Massachusetts Right To Know Components

	CAS-No.	Revision Date
o-Cresol	95-48-7	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
o-Cresol	95-48-7	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
o-Cresol	95-48-7	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
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Eye Dam.	Serious eye damage
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	2
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 05/27/2015 Print Date: 04/01/2016

Material Safety Data Sheet

Version 5.0
Revision Date 11/13/2012
Print Date 03/19/2014

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	*o*-Xylene
Product Number	:	95660
Brand	:	Fluka
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Harmful by skin absorption., Irritant, Reproductive hazard

Target Organs

Liver, Kidney, Nerves.

GHS Classification
Flammable liquids (Category 3)
Acute toxicity, Inhalation (Category 4)
Acute toxicity, Dermal (Category 4)
Skin irritation (Category 2)
Acute aquatic toxicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H226	Flammable liquid and vapour.
H312 + H332	Harmful in contact with skin or if inhaled
H315	Causes skin irritation.
H401	Toxic to aquatic life.

Precautionary statement(s)

P280	Wear protective gloves/ protective clothing.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical hazards:	1

NFPA Rating

Health hazard:	2
Fire:	3
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms	:	1,2-Dimethylbenzene
Formula	:	C_8H_{10}
Molecular Weight	:	106.17 g/mol

Component		Concentration
o-Xylene		
CAS-No.	95-47-6	-
EC-No.	202-422-2	
Index-No.	601-022-00-9	

4. FIRST AID MEASURES

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability
Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

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

Methods and materials for containment and cleaning up
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).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
o-Xylene	95-47-6	STEL	150 ppm 655 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	100 ppm 435 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	100 ppm 434 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Not classifiable as a human carcinogen			
		TWA	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Eye & Upper Respiratory Tract irritation Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen			
		STEL	150 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Eye & Upper Respiratory Tract irritation Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen			
		TWA	100 ppm 435 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	100 ppm 435 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	150 ppm 655 mg/m3	USA. NIOSH Recommended Exposure Limits

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: > 480 min
Material tested:Vitoject® (Aldrich Z677698, Size M)

Splash protection
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: > 30 min
Material tested:Camatril® (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 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.

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

Skin and body protection
Complete suit protecting against chemicals, 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.

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

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Colour	colourless

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: -26 - -23 °C (-15 - -9 °F) - lit.
Boiling point	143 - 145 °C (289 - 293 °F) - lit.
Flash point	31.0 °C (87.8 °F) - closed cup
Ignition temperature	464 °C (867 °F)
Autoignition temperature	464.0 °C (867.2 °F)
Lower explosion limit	0.9 %(V)
Upper explosion limit	6.7 %(V)
Vapour pressure	21.3 hPa (16.0 mmHg) at 37.7 °C (99.9 °F) 8.8 hPa (6.6 mmHg) at 25.0 °C (77.0 °F)
Density	0.879 g/mL at 20 °C (68 °F)
Water solubility	no data available
Partition coefficient:	log Pow: 3.12

n-octanol/water	
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
LD50 Intraperitoneal - mouse - 1,364 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (o-Xylene)
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.

Suspected human reproductive toxicant

Teratogenicity

no data available

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

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

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
narcosis, Lung irritation, chest pain, pulmonary edema, Central nervous system depression, Dermatitis, Gastrointestinal disturbance, Liver injury may occur., Kidney injury may occur., Blood disorders

Synergistic effects
no data available

Additional Information
RTECS: ZE2450000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 16.10 mg/l - 96 h
	LC50 - Carassius auratus (goldfish) - 13.00 mg/l - 24 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 1.39 - 1.87 mg/l - 48 h
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 4.70 mg/l - 72 h
	EC50 - Chlorella vulgaris (Fresh water algae) - 55.00 mg/l - 24 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

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

Toxic to aquatic life.

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

Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

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: 1307 Class: 3 Packing group: III
Proper shipping name: Xylenes
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1307 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: XYLENES
Marine pollutant: No

IATA
UN number: 1307 Class: 3 Packing group: III
Proper shipping name: Xylenes

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Harmful by skin absorption., Irritant, Reproductive hazard

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

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
o-Xylene	95-47-6	2007-07-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
o-Xylene	95-47-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
o-Xylene	95-47-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
o-Xylene	95-47-6	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

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

SAFETY DATA SHEET

Version 4.10
Revision Date 11/12/2015
Print Date 02/07/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	*p*-Cresol
Product Number	:	W233706
Brand	:	Aldrich
Index-No.	:	604-004-00-9
CAS-No.	:	106-44-5

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 toxicity, Oral (Category 3), H301
Acute toxicity, Dermal (Category 3), H311
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

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 + H311	Toxic if swallowed or in contact with skin
H314	Causes severe skin burns and eye damage.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P260	Do not breathe dust or mist.
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	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/ physician.
P322	Specific measures (see supplemental first aid instructions on this label).
P361	Remove/Take off immediately all contaminated clothing.
P363	Wash contaminated clothing 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	:	4-Methylphenol
Formula	:	C_7H_8O
Molecular weight	:	108.14 g/mol
CAS-No.	:	106-44-5
EC-No.	:	203-398-6
Index-No.	:	604-004-00-9

Hazardous components

Component	Classification	Concentration
p-Cresol		
	Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 2; Aquatic Chronic 2; H301 + H311, H314, H411	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

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

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

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

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

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

hygroscopic Air and light sensitive. Handle and store under inert gas.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
p-Cresol	106-44-5	TWA	2.3 ppm 10 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5 ppm 22 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin designation The value in mg/m3 is approximate.		

		TWA	20 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen Danger of cutaneous absorption		

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 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 particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing	Melting point/range: 31 - 37 °C (88 - 99 °F)

	point	Melting point/range: 32 - 34 °C (90 - 93 °F) - lit.
f)	Initial boiling point and boiling range	202 °C (396 °F) - lit.
g)	Flash point	85.0 °C (185.0 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Lower explosion limit: 1.1 %(V)
k)	Vapour pressure	1.3 hPa (1.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.034 g/cm3 at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 1.94
p)	Auto-ignition temperature	559.0 °C (1,038.2 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Oxidizing agents, Bases

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 207.0 mg/kg
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Olfaction:Other changes. Behavioral:Convulsions or effect on seizure threshold. Gastrointestinal:Ulceration or bleeding from stomach.

LC50 Inhalation - Rat - 1 h - > 710 mg/m3

LD50 Dermal - Rabbit - 301.0 mg/kg
Remarks: Behavioral:Tremor. Gastrointestinal:Changes in structure or function of salivary glands. Kidney, Ureter, Bladder:Other changes.

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Severe skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Severe eye irritation

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: GO6475000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, laryngitis, Dizziness, Cardiovascular effects., Muscle cramps/spasms., Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

Kidney -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - other fish - 16.00 - 24.00 mg/l - 24 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 7.9 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	LC50 - Daphnia magna (Water flea) - 1.4 mg/l - 48 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
Does not bioaccumulate.

12.4 Mobility in soil
No data available

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

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
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: 3455 Class: 6.1 (8) Packing group: II
Proper shipping name: Cresols, solid
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 3455 Class: 6.1 (8) Packing group: II EMS-No: F-A, S-B
Proper shipping name: CRESOLS, SOLID

IATA
UN number: 3455 Class: 6.1 (8) Packing group: II
Proper shipping name: Cresols, solid

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
p-Cresol	106-44-5	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
p-Cresol	106-44-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
p-Cresol	106-44-5	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
p-Cresol	106-44-5	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.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Eye Dam.	Serious eye damage
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	2
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 4.10 Revision Date: 11/12/2015 Print Date: 02/07/2016

Toronto Research Chemicals
products for innovative research

Safety Data Sheet - Version 5.0

Preparation Date 8/24/2016

Latest Revision Date (If Revised)

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product Identifier

Chemical Name Perfluorodecane Sulfonic Acid

Catalogue # P286540

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against

Product Uses To be used only for scientific research and development. Not for use in humans or animals.

1.3 Details of the Supplier of the Safety Data Sheet

Company Toronto Research Chemicals
2 Brisbane Road
Toronto, ON M3J 2J8
CANADA

Telephone +14166659696
FAX +14166654439
Email orders@trc-canada.com

1.4 Emergency Telephone Number

Emergency# +1(416) 665-9696 between 0800-1700 (GMT-5)

2. HAZARDS IDENTIFICATION

WHMIS Classification (Canada)

D2B Toxic Material Causing Other Toxic Effects
Moderate Skin/Eye/Respiratory Tract Irritant

WHMIS Symbols (Canada)

2.1/2.2 Classification of the Substance or Mixture and Label Elements

GHS Hazards Classification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Skin Irritation (Category 2)
Serious Eye Irritation (Category 2A)
Specific Target Organ Toxicity, Single Exposure; Respiratory Tract Irritation (Category 3)

GHS Hazards Identification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Signal Word Warning

GHS Hazard Statements

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.

GHS Precautionary Statements

P261	Avoid breathing dust/fume/gas/mist/vapours/spray
P280	Wear protective gloves/protective clothing/eye protection/face protection.

P305/P351/P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3 Unclassified Hazards/Hazards Not Otherwise Classified

No data available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular Formula: $C_{10}HF_{21}O_3S$ **Molecular Weight:** 600.14

CAS Registry #: 335-77-3 **EC#:**

Synonyms

1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Heneicosafluoro-1-decanesulfonic Acid
1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Henicosafluorodecane-1-sulfonate

3.2 Mixtures

Not a mixture.

4. FIRST AID MEASURES

4.1 Description of First Aid Measures

General Advice
If medical attention is required, show this safety data sheet to the doctor.

If Inhaled
If inhaled, move person to fresh air. If not breathing, give artificial respiration and consult a physician.

In Case of Skin Contact
Wash affected area with soap and water. Consult a physician if any exposure symptoms are observed.

In Case of Eye Contact
Immediately rinse eyes with plenty of water for at least 15 minutes. Consult a physician.

If Swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Do NOT induce vomiting unless advised to do so by a physician or Poison Control Center. Seek medical attention.

4.2 Most Important Symptoms and Effects, Both Acute and Delayed

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

4.3 Indication of any Immediate Medical Attention and Special Treatment Needed

No data available.

5. FIREFIGHTING MEASURES

5.1 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, Sulfur oxides, Sodium oxides, Hydrogen fluoride

5.3 Advice for Firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further Information

No data available.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. 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.

Method 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.

7. HANDLING AND STORAGE

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.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.
Keep in a dry place.

Storage conditions: Hygroscopic, -20°C Freezer, Under inert atmosphere

7.3 Specific End Uses

For scientific research and development only. Not for use in humans or animals.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control Parameters

Contains no components with established occupational exposure limits.

8.2 Exposure Controls

Appropriate Engineering Controls
A laboratory fumehood or other appropriate form of local exhaust ventilation should be used to avoid exposure.

Personal Protective Equipment
All recommendations below are advisory in nature and a risk assessment should be performed by the employer/end user prior to use of this product. The type of protective equipment must be selected based on the amount and concentration of the dangerous material being used in the workplace.

Eye/Face Protection
Safety goggles or face shield. All equipment should have been tested and approved under appropriate standards, such as NIOSH (US), CSA (Canada), or EN 166 (EU).

Skin Protection
Gloves should be used when handling this material. Gloves are to be inspected prior to use. Contaminated gloves are to be removed using proper glove removal technique so that the outer surface of the glove does not contact bare skin. Dispose of contaminated gloves after use in compliance with good laboratory practices and local requirements.

Gloves used for incidental exposures (splash protection) should be designated as “chemical resistant” by EU standard EN 374 with the resistance codes corresponding to the anticipated use of the material. Unrated gloves are not recommended.
Suggested gloves: AnsellPro Sol-Vex nitrile gloves style 37-175, 15 mil thickness.
Penetration time has not been determined.

Gloves used for prolonged direct exposure (immersion) should be designated “chemical resistant” as per EN 734 with the resistance codes corresponding to the anticipated use of the material.
Suggested gloves: AnsellPro Viton/Butyl gloves style 38-612, 4/8 mil thickness.
Penetration time has not been determined.

These recommendations may not apply if the material is mixed with any other chemical, or dissolved into a solution. A risk assessment must be performed to ensure the gloves will still offer acceptable protection.

Body Protection
Fire resistant (Nomex) lab coat or coveralls.

Respiratory Protection
Recommended respirators are NIOSH-approved N100 or CEN-approved FFP3 particulate respirators. These are to be only used as a backup to local exhaust ventilation or other engineering controls. If the respirator is the only means of protection, a full-face supplied air respirator must be used.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on Basic Physical and Chemical Properties

A) Appearance **B) Odour**

Very Dark Brown Solid

C) Odour Threshold
No data available

D) pH
No data available

E) Melting Point/Freezing Point
No data available

F) Initial Boiling Point/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/Explosive Limits
No data available

K) Vapour Pressure
No data available

L) Vapour Density
No data available

M) Relative Density
No data available

N) Solubility
Acetone (Slightly), DMSO (Slightly), Methanol (Slightly)

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 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
In the event of fire: See section 5. **Other decomposition products:** No data available.

11. TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological Effects

A) Acute Toxicity
Oral LD50: No data available.
Dermal LD50: No data available.
Inhalation LC50: No data available.

B) Skin Corrosion/Irritation
Moderate skin irritant.

C) Serious Eye Damage/Irritation
Moderate eye irritant.

D) Respiratory or Skin Sensitization
No data available

E) Germ Cell Mutagenicity
No data available

F) Carcinogenicity
No data available

G) Reproductive Toxicity/Teratogenicity
No data available

H) Single Target Organ Toxicity - Single Exposure

Moderate respiratory tract irritation.

I) Single Target Organ Toxicity - Repeated Exposure

No data available

J) Aspiration Hazard

No data available

K) Potential Health Effects and Routes of Exposure

Inhalation

May be harmful if inhaled. Causes respiratory tract irritation.

Ingestion

May be harmful if swallowed.

Skin

May be harmful if absorbed through skin. Causes skin irritation.

Eyes

Causes eye irritation.

L) Signs and Symptoms of Exposure

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

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

M) Additional Information

RTECS: Not available.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available.

12.2 Persistance 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

No data available.

12.6 Other Adverse Effects

No data available.

13. DISPOSAL CONSIDERATIONS

13.1 Waste Treatment Methods

A) Product

Product may be burned in an incinerator equipped with afterburner and scrubber. Excess and expired materials are to be offered to a licensed hazardous material disposal company. Ensure that all Federal and Local regulations regarding the disposal and destruction of this material are followed.

B) Contaminated Packaging

Dispose of as above.

C) Other Considerations

Product is not to be disposed of in sanitary sewers, storm sewers, or landfills.

14. TRANSPORT INFORMATION

14.1 UN Number

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.2 UN Proper Shipping Name

DOT (US)/IATA:

Not dangerous goods

IMDG/ARD/RID:

Not dangerous goods

14.3 Transport Hazard Class(es)

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.4 Packing Group

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.5 Environmental Hazards

DOT (US): None IATA: None IMDG: None ADR/RID: None

14.6 Special Precautions for User

None

15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of WHMIS (Canada), OSHA 1910.1200 (US), and EU Regulation EC No. 1907/2006 (European Union).

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture

A) Canada

DSL/NDSL Status: This product is not listed on the Canadian DSL/NDSL.

B) United States

TSCA Status: This product is not listed on the US EPA TSCA.

C) European Union

ECHA Status: This product is not registered with the EU ECHA.

15.2 Chemical Safety Assessment

No data available

16. OTHER INFORMATION

16.1 Revision History

Original Publication Date: 8/24/2016

16.2 List of Abbreviations

LD50	Median lethal dose of a substance required to kill 50% of a test population.
LC50	Medial lethal concentration of a substance required to kill 50% of a test population.
LDLo	Lowest known lethal dose
TDLo	Lowest known toxic dose
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
RTECS	Registry of Toxic Effects of Chemical Substances

16.3 Further Information

 The above information is believed to be correct to the best of our knowledge, but is to be only used as a guide. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Please take all due care when handling this product.

SAFETY DATA SHEET

PERFLUOROHEPTANESULPHONIC ACID

Compilation date: 07/12/2015

Revision date: 22/06/2018

Revision No: 3

Section 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name: PERFLUOROHEPTANESULPHONIC ACID

CAS number: 375-92-8

Product code: PC53170

Synonyms: 1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-PENTADECAFLUOROHEPTANE-1-SULPHONIC ACID

PERFLUOROHEPTANESULPHONIC ACID

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

1.3. Details of the supplier of the safety data sheet

Company name: Apollo Scientific Ltd

Units 3 & 4

Parkway

Denton

Manchester

M34 3SG

UK

Tel: 0161 337 9971

Fax: 0161 336 6932

Email: david.tideswell@apolloscientific.co.uk

1.4. Emergency telephone number

Emergency tel: -

Section 2: Hazards identification

2.1. Classification of the substance or mixture

Classification under CLP: Acute Tox. 4: H302+H312+H332; Skin Corr. 1B: H314

Most important adverse effects: Harmful if swallowed, in contact with skin or if inhaled Causes severe skin burns and eye damage.

2.2. Label elements

Label elements:

Hazard statements: H302+H312+H332: Harmful if swallowed, in contact with skin or if inhaled

H314: Causes severe skin burns and eye damage.

Hazard pictograms: GHS05: Corrosion

GHS07: Exclamation mark

[cont...]

Signal words: Danger

Precautionary statements: P260: Do not breathe dust.
P271: Use only outdoors or in a well-ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection.

2.3. Other hazards

PBT: This product is not identified as a PBT/vPvB substance.

Section 3: Composition/information on ingredients

3.1. Substances

Chemical identity: PERFLUOROHEPTANESULPHONIC ACID

CAS number: 375-92-8

Section 4: First aid measures

4.1. Description of first aid measures

Skin contact: Remove all contaminated clothes and footwear immediately unless stuck to skin. Drench the affected skin with running water for 10 minutes or longer if substance is still on skin. Transfer to hospital if there are burns or symptoms of poisoning.

Eye contact: Bathe the eye with running water for 15 minutes. Transfer to hospital for specialist examination.

Ingestion: Wash out mouth with water. Do not induce vomiting. Give 1 cup of water to drink every 10 minutes. If unconscious, check for breathing and apply artificial respiration if necessary. If unconscious and breathing is OK, place in the recovery position. Transfer to hospital as soon as possible.

Inhalation: Remove casualty from exposure ensuring one's own safety whilst doing so. If unconscious and breathing is OK, place in the recovery position. If conscious, ensure the casualty sits or lies down. If breathing becomes bubbly, have the casualty sit and provide oxygen if available. Transfer to hospital as soon as possible.

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

Skin contact: Blistering may occur. Progressive ulceration will occur if treatment is not immediate.

Eye contact: Corneal burns may occur. May cause permanent damage.

Ingestion: Corrosive burns may appear around the lips. Blood may be vomited. There may be bleeding from the mouth or nose.

Inhalation: There may be shortness of breath with a burning sensation in the throat. Exposure may cause coughing or wheezing.

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

Section 5: Fire-fighting measures

[cont...]

5.1. Extinguishing media

Extinguishing media: Carbon dioxide, dry chemical powder, foam. Suitable extinguishing media for the surrounding fire should be used. Use water spray to cool containers.

5.2. Special hazards arising from the substance or mixture

Exposure hazards: Corrosive. In combustion emits toxic fumes of carbon dioxide / carbon monoxide. Sulphur oxides (SOx). Hydrogen fluoride (HF).

5.3. Advice for fire-fighters

Advice for fire-fighters: Wear self-contained breathing apparatus. Wear protective clothing to prevent contact with skin and eyes.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions: Notify the police and fire brigade immediately. If outside keep bystanders upwind and away from danger point. Mark out the contaminated area with signs and prevent access to unauthorised personnel. Do not attempt to take action without suitable protective clothing - see section 8 of SDS. Turn leaking containers leak-side up to prevent the escape of liquid.

6.2. Environmental precautions

Environmental precautions: Do not discharge into drains or rivers. Contain the spillage using bunding.

6.3. Methods and material for containment and cleaning up

Clean-up procedures: Clean-up should be dealt with only by qualified personnel familiar with the specific substance. Absorb into dry earth or sand. Transfer to a closable, labelled salvage container for disposal by an appropriate method.

6.4. Reference to other sections

Section 7: Handling and storage

7.1. Precautions for safe handling

Handling requirements: Avoid direct contact with the substance. Ensure there is sufficient ventilation of the area. Do not handle in a confined space. Avoid the formation or spread of mists in the air. Only use in fume hood.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions: Store in a cool, well ventilated area. Keep container tightly closed. Moisture sensitive. Store under Argon. Recommended storage temp 2-8 °C.

Suitable packaging: Must only be kept in original packaging.

7.3. Specific end use(s)

Specific end use(s): No data available.

[cont...]

Section 8: Exposure controls/personal protection

8.1. Control parameters

Workplace exposure limits: No data available.

DNEL/PNEC Values

DNEL / PNEC No data available.

8.2. Exposure controls

Engineering measures: Ensure there is sufficient ventilation of the area.

Respiratory protection: Self-contained breathing apparatus must be available in case of emergency.

Hand protection: Impermeable gloves.

Eye protection: Tightly fitting safety goggles. Ensure eye bath is to hand.

Skin protection: Impermeable protective clothing.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

State: Low-melting solid.

Evaporation rate: No data available.

Oxidising: No data available.

Solubility in water: No data available.

Viscosity: No data available.

Boiling point/range°C: 247-249/760mm

Melting point/range°C: 13-14

Flammability limits %: lower: No data available.

upper: No data available.

Flash point°C: No data available.

Part.coeff. n-octanol/water: No data available.

Autoflammability°C: No data available.

Vapour pressure: No data available.

Relative density: No data available.

pH: No data available.

VOC g/l: No data available.

9.2. Other information

Other information: No data available.

Section 10: Stability and reactivity

10.1. Reactivity

Reactivity: Stable under recommended transport or storage conditions.

10.2. Chemical stability

Chemical stability: Stable under normal conditions.

10.3. Possibility of hazardous reactions

Hazardous reactions: Hazardous reactions will not occur under normal transport or storage conditions.

[cont...]

10.4. Conditions to avoid

Conditions to avoid: Heat. Moisture.

10.5. Incompatible materials

Materials to avoid: Strong oxidising agents. Strong acids.

10.6. Hazardous decomposition products

Haz. decomp. products: In combustion emits toxic fumes of carbon dioxide / carbon monoxide. Hydrogen fluoride (HF). Sulphur oxides (SOx)

Section 11: Toxicological information

11.1. Information on toxicological effects

Relevant hazards for product:

Hazard	Route	Basis
Acute toxicity (ac. tox. 4)	INH DRM ING	Hazardous: calculated
Skin corrosion/irritation	DRM	Hazardous: calculated
Serious eye damage/irritation	OPT	Hazardous: calculated

Symptoms / routes of exposure

Skin contact: Blistering may occur. Progressive ulceration will occur if treatment is not immediate.

Eye contact: Corneal burns may occur. May cause permanent damage.

Ingestion: Corrosive burns may appear around the lips. Blood may be vomited. There may be bleeding from the mouth or nose.

Inhalation: There may be shortness of breath with a burning sensation in the throat. Exposure may cause coughing or wheezing.

Section 12: Ecological information

12.1. Toxicity

Ecotoxicity values: No data available.

12.2. Persistence and degradability

Persistence and degradability: No data available.

12.3. Bioaccumulative potential

Bioaccumulative potential: No data available.

12.4. Mobility in soil

Mobility: No data available.

12.5. Results of PBT and vPvB assessment

PBT identification: This product is not identified as a PBT/vPvB substance.

[cont...]

12.6. Other adverse effects

Other adverse effects: No data available.

Section 13: Disposal considerations

13.1. Waste treatment methods

Disposal operations: Transfer to a suitable container and arrange for collection by specialised disposal company. MATERIAL SHOULD BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS

Disposal of packaging: Dispose of as special waste in compliance with local and national regulations Observe all federal, state and local environmental regulations.

NB: The user's attention is drawn to the possible existence of regional or national regulations regarding disposal.

Section 14: Transport information

14.1. UN number

UN number: UN1759

14.2. UN proper shipping name

Shipping name: CORROSIVE SOLID, N.O.S.

14.3. Transport hazard class(es)

Transport class: 8

14.4. Packing group

Packing group: III

14.5. Environmental hazards

Environmentally hazardous: No **Marine pollutant:** No

14.6. Special precautions for user

Tunnel code: E

Transport category: 3

Section 15: Regulatory information

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

Specific regulations: Not applicable.

15.2. Chemical Safety Assessment

Chemical safety assessment: A chemical safety assessment has not been carried out for the substance or the mixture by the supplier.

Section 16: Other information

[cont...]

Other information

Other information: This safety data sheet is prepared in accordance with Commission Regulation (EU) No 2015/830.

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* Data predicted using computational software. The OECD QSAR-Toolbox for grouping chemicals into categories. Developed by LMC bulgaria. http://echa.europa.eu/support/oecd-qsar-toolbox

~ Data predicted using computational software ACD/ToxSuite v 2.95.1 Copyright 1994-2009 ACD/labs, Copyright 2001-2009 Pharma Algorithms, Inc, Advanced Chemistry Development, Inc (ACD/Labs). http://www.acdlabs.com/products/pc_admet/tox/tox/

Phrases used in s.2 and s.3: H302+H312+H332: Harmful if swallowed, in contact with skin or if inhaled

H314: Causes severe skin burns and eye damage.

Legal disclaimer: The material is intended for research purposes only and should be handled exclusively by those who have been fully trained in safety, laboratory and chemical handling procedures. The above information is believed to be correct to the best of our knowledge. The above information is believed to be correct to the best of our knowledge at the date of its publication, but should not be considered to be all inclusive. It should be used only as a guide for safe handling, storage, transportation and disposal. We cannot guarantee that the hazards detailed in this document are the only hazards that exist for this product. This is not a warranty and Apollo Scientific Ltd shall not be held liable for any damage resulting from handling or from contact with the above product.

SAFETY DATA SHEET

Version 6.4
Revision Date 04/18/2021
Print Date 06/19/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluorooctanoic acid

Product Number : 171468
Brand : Aldrich
CAS-No. : 335-67-1

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 1B), H360
Effects on or via lactation, H362
Specific target organ toxicity - repeated exposure (Category 1), Liver, 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)	
H302	Harmful if swallowed.
H314	Causes severe skin burns and eye damage.
H351	Suspected of causing cancer.
H360	May damage fertility or the unborn child.
H362	May cause harm to breast-fed children.
H372	Causes damage to organs (Liver) 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/ vapors/ spray.
P263	Avoid contact during pregnancy/ while nursing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P308 + P313	IF exposed or concerned: 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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Pentadecafluorooctanoic acid Perfluorocaprylic acid Perfluorooctanoic acid
Formula	:	$C_8HF_{15}O_2$
Molecular weight	:	414.07 g/mol
CAS-No.	:	335-67-1
EC-No.	:	206-397-9

Component	Classification	Concentration
pentadecafluorooctanoic acid		
	Acute Tox. 4; Skin Corr.	<= 100 %

	1B; Eye Dam. 1; Carc. 2; Repr. 1B; Lact. ; STOT RE 1; H302, H314, H318, H351, H360, H362, H372	

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

In case of eye contact
After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

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

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen fluoride
Combustible.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
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

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.
Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Tightly fitting safety goggles

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 EC 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
Acid-resistant protective clothing

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: flakes Color: colorless

b)	Odor	stinging
c)	Odor Threshold	No data available
d)	pH	2.6 at 1 g/l at 20 °C (68 °F)
e)	Melting point/freezing point	Melting point/range: 55 - 56 °C (131 - 133 °F) - lit.
f)	Initial boiling point and boiling range	189 °C 372 °F at 981 hPa - 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)	Vapor pressure	0.69 hPa at 25 °C (77 °F)
l)	Vapor density	No data available
m)	Relative density	No data available
n)	Water solubility	3.4 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 6.30 - Potential bioaccumulation, (Lit.)
p)	Autoignition temperature	No data available
q)	Decomposition temperature	> 300 °C (> 572 °F) -
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

SECTION 10: Stability and reactivity

10.1 Reactivity

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Violent reactions possible with:
Strong oxidizing agents
Strong acids
Bases

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 500.1 mg/kg
(Expert judgment)

Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l
(Expert judgment)

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
Causes serious eye damage.

Respiratory or skin sensitization

Germ cell mutagenicity
No data available

No data available
No data available

Carcinogenicity
Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (pentadecafluorooctanoic acid)

NTP: No ingredient 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 on OSHA's list of regulated carcinogens.

Reproductive toxicity
May damage the unborn child.
Studies indicating a hazard to babies during the lactation period

Specific target organ toxicity - single exposure

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure. - Liver

Aspiration hazard

11.2 Additional Information
RTECS: RH0781000

Cough, Shortness of breath, Headache, Nausea, Vomiting
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

gastric pain
Nausea
Vomiting
Drowsiness
somnolence

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity
No data available

Toxicity to daphnia and other aquatic invertebrates	Remarks: No data available (pentadecafluorooctanoic acid)
Toxicity to algae	Remarks: No data available (pentadecafluorooctanoic acid)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil

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
Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 3261 Class: 8 Packing group: III
Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (pentadecafluorooctanoic acid)
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 3261 Class: 8 Packing group: III EMS-No: F-A, S-B
Proper shipping name: CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (pentadecafluorooctanoic acid)

IATA
UN number: 3261 Class: 8 Packing group: III
Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (pentadecafluorooctanoic acid)

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

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

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
pentadecafluorooctanoic acid	335-67-1	2018-02-01

New Jersey Right To Know Components

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

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Version: 6.4 Revision Date: 04/18/2021 Print Date: 06/19/2021

SAFETY DATA SHEET

Version 4.2
Revision Date 09/08/2015
Print Date 10/19/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Nonafluorobutane-1-sulfonic acid
Product Number	:	562629
Brand	:	Aldrich
CAS-No.	:	375-73-5

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)
Acute toxicity, Oral (Category 4), H302
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318

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.
H314	Causes severe skin burns and eye damage.
Precautionary statement(s)	
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312	IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated

	clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/ physician.
P321	Specific treatment (see supplemental first aid instructions on this label).
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

Reacts violently with water.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_4HF_9O_3S$
Molecular weight	:	300.10 g/mol
CAS-No.	:	375-73-5
EC-No.	:	206-793-1

Hazardous components

Component	Classification	Concentration
1,1,2,2,3,3,4,4,4-Nonafluorobutane-1-sulphonic acid		
	Acute Tox. 4; Skin Corr. 1B; Eye Dam. 1; H302, H314	<= 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

Take off contaminated clothing and shoes immediately. 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.Continue rinsing eyes during transport to hospital.

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

Dry powder

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Sulphur oxides, 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. Evacuate personnel to safe areas.
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. Do not flush with water. 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.
Never allow product to get in contact with water during storage.

Recommended storage temperature 2 - 8 °C

Handle and store under inert gas.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
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
Tightly fitting safety goggles. Faceshield (8-inch minimum). 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, Flame retardant 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 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
Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	112 - 114 °C (234 - 237 °F) at 19 hPa (14 mmHg) - 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	1.811 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
Reacts violently with water.

10.4 Conditions to avoid
Do not allow water to enter container because of violent reaction.
Exposure to moisture

10.5 Incompatible materials
Strong oxidizing agentsStrong oxidizing agents

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 430 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity). Skin and Appendages: Other: Hair. Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

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

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

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

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: EK5930000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea

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: 3265 Class: 8 Packing group: II
Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (1,1,2,2,3,3,4,4,4-Nonafluorobutane-1-sulphonic acid)

Poison Inhalation Hazard: No

IMDG
UN number: 3265 Class: 8 Packing group: II EMS-No: F-A, S-B
Proper shipping name: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (1,1,2,2,3,3,4,4,4-Nonafluorobutane-1-sulphonic acid)

IATA
UN number: 3265 Class: 8 Packing group: II
Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (1,1,2,2,3,3,4,4,4-Nonafluorobutane-1-sulphonic acid)

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

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

Pennsylvania Right To Know Components

CAS-No. Revision Date

1,1,2,2,3,3,4,4,4-Nonafluorobutane-1-sulphonic acid	375-73-5

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1,2,2,3,3,4,4,4-Nonafluorobutane-1-sulphonic acid	375-73-5	

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
Eye Dam.	Serious eye damage
H302	Harmful if swallowed.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
Skin Corr.	Skin corrosion

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 4.2 Revision Date: 09/08/2015 Print Date: 10/19/2018

SAFETY DATA SHEET

Version 6.2
Revision Date 09/18/2019
Print Date 06/19/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluorodecanoic acid

Product Number : 177741
Brand : Aldrich
CAS-No. : 335-76-2

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 1B), H360
Effects on or via lactation, H362

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.
H351	Suspected of causing cancer.
H360	May damage fertility or the unborn child.
H362	May cause harm to breast-fed children.

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 or mist.
P263	Avoid contact during pregnancy/ while nursing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : Nonadecafluorodecanoic acid
Nonadecafluorocapric acid
Perfluorodecanoic acid
Perfluorocapric acid

Formula : $C_{10}HF_{19}O_2$
Molecular weight : 514.08 g/mol
CAS-No. : 335-76-2
EC-No. : 206-400-3

Component	Classification	Concentration
Nonadecafluorodecanoic acid		
	Acute Tox. 3; Carc. 2; Repr. 1B; Lact. ; H301, H351, H360, H362	<= 100 %

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

SECTION 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

SECTION 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 fluoride

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 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.

SECTION 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): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 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
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.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Colour: white
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 77 - 81 °C (171 - 178 °F) - lit.
f)	Initial boiling point and boiling range	218 °C 424 °F at 987 hPa - lit.
g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available

k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 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
Bases, Strong oxidizing agents, Reducing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 57 mg/kg
Remarks: Behavioral:Food intake (animal).
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

Rat
DNA damage

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 on OSHA's list of regulated carcinogens.

Reproductive toxicity

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: HD9900000

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

SECTION 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

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (Nonadecafluorodecanoic acid)
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Nonadecafluorodecanoic acid)

IATA
UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (Nonadecafluorodecanoic acid)

SECTION 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

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

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Nonadecafluorodecanoic acid	335-76-2	

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.2 Revision Date: 09/18/2019 Print Date: 06/19/2021

SAFETY DATA SHEET

Version 6.3
Revision Date 04/18/2021
Print Date 07/08/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Tricosafluorododecanoic acid

Product Number : 406449
Brand : Aldrich
CAS-No. : 307-55-1

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Short-term (acute) aquatic hazard (Category 1), H400

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.
H400	Very toxic to aquatic life.

Precautionary statement(s)

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/ 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.
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.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Perfluorododecanoic acid Perfluorolauric acid
Formula	:	$C_{12}HF_{23}O_2$
Molecular weight	:	614.10 g/mol
CAS-No.	:	307-55-1
EC-No.	:	206-203-2

Component	Classification	Concentration
Tricosafluorododecanoic acid		
	Acute Tox. 4; Carc. 2; Repr. 1B; Lact. ; STOT RE 1; H302, H332, H351, H360, H362, H372 M-Factor - Aquatic Acute: 10	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 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 fluoride

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, 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.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.**Advice on 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.

Advice on protection against fire and explosion
Provide appropriate exhaust ventilation at places where dust is formed.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 11: Combustible Solids

7.3 Specific end use(s)

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients 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
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.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Color: white
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 105 - 108 °C (221 - 226 °F) - lit.
f)	Initial boiling point and boiling range	245 °C 473 °F at 987 hPa - 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)	Vapor pressure	No data available
l)	Vapor 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)	Autoignition 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

SECTION 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
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 500.1 mg/kg
(Expert judgment)

Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l
(Expert judgment)

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
Causes serious eye damage.

Respiratory or skin sensitization

Germ cell mutagenicity
No data available

No data available
No data available

Carcinogenicity
Suspected of causing cancer.

IARC: No ingredient 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 ingredient 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 on OSHA's list of regulated carcinogens.

Reproductive toxicity
May damage the unborn child.
Studies indicating a hazard to babies during the lactation period

Specific target organ toxicity - single exposure

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure. - Liver

Aspiration hazard

11.2 Additional Information
Not available

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

After absorption:

gastric pain
Nausea
Vomiting
Drowsiness
somnolence

Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity
No data available

Toxicity to daphnia and other aquatic invertebrates	Remarks: No data available (Tricosafluorododecanoic acid)
Toxicity to algae	Remarks: No data available (Tricosafluorododecanoic acid)

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.
Discharge into the environment must be avoided.

SECTION 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.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.

SECTION 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

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

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

Pennsylvania Right To Know Components

Tricosafluorododecanoic acid	CAS-No. 307-55-1	Revision Date

Tricosafluorododecanoic acid	CAS-No. 307-55-1	Revision Date

New Jersey Right To Know Components

Tricosafluorododecanoic acid	CAS-No. 307-55-1	Revision Date

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.3 Revision Date: 04/18/2021 Print Date: 07/08/2021

SAFETY DATA SHEET

Version 6.1
Revision Date 01/15/2020
Print Date 06/19/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluoroheptanoic acid

Product Number : 342041
Brand : Aldrich
CAS-No. : 375-85-9

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318

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.

H314	Causes severe skin burns and eye damage.

Precautionary statement(s)

P260	Do not breathe dust or mist.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER/doctor.
P321	Specific treatment (see supplemental first aid instructions on this label).
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	$C_7HF_{13}O_2$
Molecular weight	:	364.06 g/mol
CAS-No.	:	375-85-9
EC-No.	:	206-798-9

Component	Classification	Concentration
Perfluoroheptanoic acid		
	Acute Tox. 4; Skin Corr. 1B; Eye Dam. 1; H302, H314, H318	<= 100 %

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

SECTION 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
Take off contaminated clothing and shoes immediately. 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.Continue rinsing eyes during transport to hospital.

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

SECTION 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 fluoride
Carbon oxides, Hydrogen fluoride

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 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
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.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.Normal measures for preventive fire protection.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 8B: Non-combustible, corrosive hazardous materials

7.3 Specific end use(s)

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

SECTION 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
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 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
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Colour: beige
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/freezing point: 30 °C (86 °F)
f)	Initial boiling point and boiling range	175 °C 347 °F at 989 hPa
g)	Flash point	> 113.00 °C (> 235.40 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	1.792 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

SECTION 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 fluoride
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 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:	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 on OSHA's list of regulated carcinogens.

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

SECTION 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

SECTION 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.

SECTION 14: Transport information

DOT (US)
UN number: 3261 Class: 8 Packing group: II
Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (Perfluoroheptanoic acid)
Poison Inhalation Hazard: No

IMDG
UN number: 3261 Class: 8 Packing group: II EMS-No: F-A, S-B

Proper shipping name: CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (Perfluoroheptanoic acid)

IATA
UN number: 3261 Class: 8 Packing group: II
Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (Perfluoroheptanoic acid)

SECTION 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

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

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Perfluoroheptanoic acid	375-85-9	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Perfluoroheptanoic acid	375-85-9	

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.

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

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information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.1 Revision Date: 01/15/2020 Print Date: 06/19/2021

SAFETY DATA SHEET

Version 6.7
Revision Date 09/28/2020
Print Date 06/19/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluorohexanoic acid

Product Number : 43809
Brand : Sigma-Aldrich
CAS-No. : 307-24-4

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318

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)
H314 Causes severe skin burns and eye damage.

Precautionary statement(s)

P264	Wash skin thoroughly after handling.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C6HF11O2
Molecular weight	:	314.06 g/mol
CAS-No.	:	307-24-4
EC-No.	:	206-196-6

Component	Classification	Concentration
Undecafluorohexanoic acid		
	Skin Corr. 1B; Eye Dam. 1; H314, H318	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aider needs to protect himself. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

In case of eye contact
After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

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

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen fluoride
Not combustible.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
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
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Tightly closed.

Recommended storage temperature 2 - 8 °C

Store under argon.
Storage class (TRGS 510): 8A: Combustible, corrosive hazardous materials

7.3 Specific end use(s)

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Tightly fitting safety goggles

Skin protection
required

Body Protection
protective clothing

Respiratory protection
required when vapours/aerosols are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid
b)	Odor	No data available
c)	Odor Threshold	No data available

d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 12 - 14 °C (54 - 57 °F)
f)	Initial boiling point and boiling range	157 °C 315 °F at 989.2 hPa
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)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Relative density	1.757 g/cm3 at 20 °C (68 °F)
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition 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

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride

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

SECTION 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 sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No ingredient 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 ingredient 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 on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

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

SECTION 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

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and loc No mixing with other waste. Handle uncleaned containers like the product See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 3265 Class: 8 Packing group: II
Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (Undecafluorohexanoic acid)
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 3265 Class: 8 Packing group: II EMS-No: F-A, S-B
Proper shipping name: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (Undecafluorohexanoic acid)

IATA
UN number: 3265 Class: 8 Packing group: II
Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (Undecafluorohexanoic acid)

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

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

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

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Version: 6.7 Revision Date: 09/28/2020 Print Date: 06/19/2021

AccuStandard, Inc.
125 Market St., New Haven, CT 06513 USA
Tel: 203-786-5290 Fax: 203-786-5287

SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1.1 - Product Identifiers

Catalog Name: S-78941

Description: Perfluorohexane sulfonic acid in Methanol

1.2 - Relevant Identified Uses of the Substance or Mixture

Laboratory Chemical Reference Material

1.3 - Supplier Details

Company: AccuStandard, Inc.
125 Market St.
New Haven, CT 06513 USA

Telephone Number: 203-786-5290

Fax: 203-786-5287

Email: edocs@accustandard.com

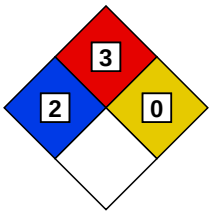
1.4 - Emergency Telephone Number

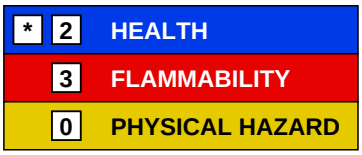
Emergency Phone #: AccuStandard, Inc.
1-203-502-7070 (USA)
+001-203-502-7070 (International)

24 hours / 7 days a week

SECTION 2 - HAZARDS IDENTIFICATION

2.1 - GHS Label Elements





Signal Word: Danger

Hazard Codes:

H225 - Highly Flammable (Flammable liquids, category 2)

H301 - Toxic if swallowed. (Acute toxicity, oral, category 3)

H311 - Toxic if absorbed through skin. (Acute toxicity, dermal, category 3)

H315 - Irritating to skin. (Skin corrosion/irritation, category 2)

H320 - Irritating to eyes. (Eye damage/irritation, category 2B)

H332 - Harmful if inhaled. (Acute toxicity, inhalation, category 4)

H336 - Overexposure may cause dizziness, nausea, muscle weakness, narcosis and respiratory failure.

H360 - California Proposition 65 Warning: This product contains a component (or components) that may cause birth defects or other reproductive harm in a quantity greater than or equal to 0.1%.

H370 - Causes damage to organs. (Specific target organ toxicity, single exposure, category 1)

Precautionary Codes:

SECTION 2 - HAZARDS IDENTIFICATION *- continued*

2.1 - GHS Label Elements *- continued*

P202 - This product should only by used by persons trained in the safe handling of hazardous chemicals.

P233 - Store in a tightly closed container. (P404)

P262 - Do not get in eyes, on skin or clothing.

P264 - Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

P280 - Protective gloves must be worn to prevent skin contact.

P284 - Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), or a risk assessment shows air-purifying respirators are appropriate, use of a NIOSH/MSHA approved air supplied respirator is advised. Use a full-face respirator with multi-purpose combination (US) or type ABEK (EN14387) respirator cartridges in absence of proper environmental control. Always use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Engineering and/or administrative controls should be implemented to reduce exposure.

P331 - Ingestion: Do NOT induce vomiting. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person.

P338 - Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers.

P360 - Skin contact: Immediately wash skin with soap and plenty of water. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

2.2 - Other Hazards

2.2.1 - Symptom of Exposure Health/Environment

Highly Flammable (Flammable liquids, category 2)

Causes damage to organs. (Specific target organ toxicity, single exposure, category 1)

After ingestion or inhalation, initial symptoms may be only that of mild intoxication, but may become severe after 12 or 18 hours.

POISON: May be fatal or cause blindness if swallowed.

Overexposure may cause dizziness, nausea, muscle weakness, narcosis and respiratory failure.

2.2.2 - Potential Health Effects

Irritating to eyes. (Eye damage/irritation, category 2B)

Irritating to skin. (Skin corrosion/irritation, category 2)

Toxic if absorbed through skin. (Acute toxicity, dermal, category 3)

Irritating to mucous membrane and upper respiratory system.

Harmful if inhaled. (Acute toxicity, inhalation, category 4)

Toxic if swallowed. (Acute toxicity, oral, category 3)

2.2.3 - Routes of Entry

Inhalation, ingestion or skin contact.

2.2.4 - Carcinogenicity

California Proposition 65 Warning: This product contains a component (or components) that may cause birth defects or other reproductive harm in a quantity greater than or equal to 0.1%.

SECTION 3 - COMPOSITION / ANALYTES DATA

Description: Perfluorohexane sulfonic acid in Methanol

SECTION 3 - COMPOSITION / ANALYTES DATA *- continued*

			ACGIH -TLV (mg/m³)			OSHA -PEL (mg/m³)		
Analyte	CAS #	% Concentration	TWA	STEL	Skin	TWA	STEL	Skin
Perfluorohexane sulfonic acid	355-46-4	0.010						
Methanol	67-56-1	99.990				260		

SECTION 4 - FIRST AID MEASURES

4.1 - First Aid Procedures - General

Get medical assistance for all cases of overexposure.

4.2 - Eye Contact

Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. (P338)

4.3 - Skin Contact

Skin contact: Immediately wash skin with soap and plenty of water. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse. (P360)

4.4 - Inhalation

Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Seek immediate medical attention.

4.5 - Ingestion

Ingestion: Do NOT induce vomiting. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person. (P331)

SECTION 5 - FIRE FIGHTING MEASURES

5.1 - Flammable Properties

Dangerous fire and explosive hazard.

Containers can build up pressure if exposed to heat.

Vapors can travel to a source of ignition and flash back.

During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

5.2 - Extinguishing Media

Use alcohol foam, carbon dioxide, dry chemical, or water spray when fighting fires involving this material.

5.3 - Protection of Firefighters

As in any fire, wear self-contained breathing apparatus pressure demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

6.1 - Spill Response

Wear suitable protective equipment listed under Exposure Controls / Personal Protection. Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Dispose as hazardous waste. Comply with Federal, State and local regulations.

SECTION 7 - HANDLING AND STORAGE

Store in a tightly closed container. (P404)

Keep refrigerated.

Avoid breathing vapors or mists.

Use with adequate ventilation.

Do not get in eyes, on skin or clothing. (P262)

Avoid prolonged or repeated exposure.

This product should only by used by persons trained in the safe handling of hazardous chemicals. (P202)

SECTION 8 - EXPOSURE CONTROLS

8.1 - Engineering Controls/PPE

Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available. (P264)

8.2 - General Hygene Considerations

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), or a risk assessment shows air-purifying respirators are appropriate, use of a NIOSH/MSHA approved air supplied respirator is advised. Use a full-face respirator with multi-purpose combination (US) or type ABEK (EN14387) respirator cartridges in absence of proper environmental control. Always use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Engineering and/or administrative controls should be implemented to reduce exposure.

Material should be handled or transferred in an approved fume hood or with adequate ventilation.

Protective gloves must be worn to prevent skin contact. (P280)

(Chloroprene, natural rubber, nitrile, or equivalent)

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

All recommendations are advisory only and must be evaluated by an industrial hygienist and/or safety officer familiar with the specific situation of anticipated use, such as concentration and amount of the substance in the workplace. Any recommendation should not be construed as offering an approval for any specific use of the product.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear liquid

Odor: N/A

Odor Threshold: N/A

pH: N/A

Melting Point: -93.9 °C

Boiling Point: 65 °C

Flash Point: 52 °F (11 °C) (tcc)

Evaporation Rate (Butyl Acetate=1): 5.9

Flammability Class: N/A

Lower Flammability Level: 6.7

Upper Flammability Level: 36.5

Vapor Pressure: 97 mmHg (20 °C)

Vapor Density (Air = 1): 1.1 g/L

Specific Gravity: 0.791 g/cm3

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES *- continued*

Solubility in Water: Very soluble

Partition Coefficient: log Pow: -0.77

Autoignition Temperature: 385 °C

Decomposition Temperature: N/A

Viscosity: N/A

VOC Content: N/A

Percent Volatile: 99.9+

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable

Materials to Avoid: Acids
Oxidizers

Hazardous Decomposition: Oxides of carbon; Formaldehyde

Hazardous Polymerization: Will not occur

Condition to Avoid: Heat; Contact with ignition sources

SECTION 11 - TOXICOLOGICAL INFORMATION

Human Health Toxicity

See section 2 for specific toxicological information for the ingredients of this product.

LD50 (Oral): Human - 143 mg/kg; Rat - 1500 mg/kg

LD50 (Dermal) : Rabbit - >2000 mg/kg

LC50 (Inhalation): Rat - >20 mg/L

WARNING: This product contains chemicals known to the state of California to cause birth defects or other reproductive harm.

No other information related to the toxicological properties of this product is available at this time.

SECTION 12 - ECOLOGICAL INFORMATION

Environmental Toxicity

By complying with sections 6 and 7 there should be no release to the environment.

LC50 (Fish): >1000 mg/L 96H

EC50 (Aquatic Invertebrate): >1000 mg/L 48H

BCF: 1.0

Hydrolyzes readily on contact with water. Readily biodegradable.

No other information related to the ecological properties of this product is available at this time.

SECTION 13 - DISPOSAL CONSIDERATIONS

Recycle or incinerate at any EPA approved facility or dispose in compliance with Federal, State and local regulations. Empty containers must be triple-rinsed prior to disposal.

SECTION 14 - TRANSPORT INFORMATION

Transportation Information (DOT/IATA)

SECTION 14 - TRANSPORT INFORMATION *- continued*

UN Number: UN1230

Class: 3

Packing Group: II

Proper Shipping Name: Methanol

Poison by Inhalation: No

Marine Pollutant: No

SECTION 15 - REGULATORY INFORMATION

WARNING: This product contains chemicals known to the state of California to cause birth defects or other reproductive harm.

This product is subject to SARA section 313 reporting requirements.

All components are listed on the TSCA Inventory.

For laboratory, research and development use only. Not for manufacturing or commercial purposes.

In addition to federal and state regulations, local regulations may apply. Check with your local regulatory authorities.

SECTION 16 - OTHER INFORMATION

This document has been designed to meet the requirements of OSHA, ANSI, GHS and CHIPs regulations. Chemicals are classified using the Globally Harmonized System for Classification and Labeling of Chemicals.

The statements contained herein are offered for informational purposes only and are based on technical data that we believe to be accurate. The manufacturer will not assume any liability for the accuracy and completeness of this information. Final determination of the suitability of the material is the responsibility of the user. Although certain hazards are described herein, the user should not presume that these are the only hazards that exist. Since conditions and manner of use are outside of the manufacturers control, we make

NO WARRANTY OF MERCHANTABILITY, EXPRESSED OR IMPLIED, AND ASSUME NO LIABILITY RESULTING FROM ITS USE.

Legend : N/A = Not Available ND = Not Determined NR = Not Regulated

HMIS/NFPA HAZARD INDEX

0 - Minimal
1 - Slight
2 - Moderate
3 - Serious
4 - Severe

* - Additional Hazard

GHS HAZARD INDEX

Category 1 - Most Severe
Category 5 - Least Severe

**** End of Document ****

SAFETY DATA SHEET

Santa Cruz Biotechnology, Inc.
Revision date 11-Dec-2015
Version 1

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier

Product Name	Perfluorononanoic acid
Product Code	SC-250678

Recommended use of the chemical and restrictions on use

For research use only. Not intended for diagnostic or therapeutic use.

Details of the supplier of the safety data sheet

Santa Cruz Biotechnology, Inc.
10410 Finnell Street
Dallas, TX 75220
831.457.3800
800.457.3801
scbt@scbt.com

Emergency telephone number

Chemtrec
1.800.424.9300 (Within USA)
+1.703.527.3887 (Outside USA)

2. HAZARDS IDENTIFICATION

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

Classification

Skin corrosion/irritation	Category 1 Sub-category C
Serious eye damage/eye irritation	Category 1

Label elements

Signal word	Danger
Hazard statements	Causes severe skin burns and eye damage
Symbols/Pictograms	
Precautionary Statements - Prevention	Do not breathe dust/fume/gas/mist/vapors/spray Wash face, hands and any exposed skin thoroughly after handling Wear protective gloves/protective clothing/eye protection/face protection
Precautionary Statements - Response	Immediately call a POISON CENTER or doctor/physician IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing Immediately call a POISON CENTER or doctor/physician IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower Wash contaminated clothing before reuse IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing Immediately call a POISON CENTER or doctor/physician IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Precautionary Statements - Storage	Store locked up
Precautionary Statements - Disposal	Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Hazards not otherwise classified (HNOC)	Not applicable

Other Information

Unknown acute toxicity	100% of the mixture consists of ingredient(s) of unknown toxicity.

NFPA		
	Health hazards	-
	Flammability	-
	Stability	-
	Physical and chemical properties	-

HMIS		
	Health hazards	3
	Flammability	1
	Physical hazards	1
	Personal protection	-

3. COMPOSITION/INFORMATION ON INGREDIENTS

CAS No	375-95-1
Molecular Weight	464.08
Formula	$C_9HF_{17}O_2$

Chemical Name	CAS No	Weight %	Oral LD50	Dermal LD50	Inhalation LC50
Perfluorononanoic acid	375-95-1	>98	-	-	-

4. FIRST AID MEASURES

First Aid Measures

General advice	Consult a physician if necessary. Remove to fresh air.
Eye contact	Wash with plenty of water.
Skin Contact	Wash skin with soap and water.
Inhalation	Remove to fresh air If breathing is difficult, give oxygen If not breathing, give artificial respiration
Ingestion	Never give anything by mouth to an unconscious person. Clean mouth with water.

Most important symptoms and effects, both acute and delayed

Symptoms	No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	None.

Specific hazards arising from the chemical

Specific hazards arising from the chemical	Thermal decomposition can lead to release of toxic/corrosive gases and vapors.
Hazardous combustion products	Hydrogen fluoride. Carbon oxides. Phosgene.

Explosion data

Sensitivity to Mechanical Impact	No information available.
Sensitivity to Static Discharge	No information available.

Protective equipment and precautions for firefighters

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.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions	Ensure adequate ventilation, especially in confined areas.

Environmental precautions

Environmental precautions	See Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Use personal protective equipment as required. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry. Take up mechanically, placing in appropriate containers for disposal. Avoid creating dust. Clean contaminated surface thoroughly.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Thermal decomposition can lead to release of toxic/corrosive gases and vapors.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place. Store at room temperature.
Incompatible materials	None known based on information supplied.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines	This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin and Body Protection	Wear protective gloves and protective clothing.
Respiratory protection	If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.
General Hygiene Considerations	Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Solid
Appearance	crystalline powder
Odor	No information available

Property	**Values**
pH	No information available
Melting point/freezing point	63 °C
Boiling point	218 °C
Flash point	No information available
Density	No information available
Evaporation rate	No information available
Upper flammability limits	No information available
Lower flammability limit	No information available
Vapor pressure	No information available
Vapor density	No information available
Specific gravity	No information available
Water solubility	No information available
Solubility in other solvents	No information available
Partition coefficient	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Explosive properties	No information available
Oxidizing properties	No information available

10. STABILITY AND REACTIVITY

Reactivity	Not applicable
Chemical stability	Stable under recommended storage conditions.
Possibility of Hazardous Reactions	None under normal processing.
Hazardous polymerization	No information available.
Conditions to avoid	Extremes of temperature and direct sunlight.
Incompatible materials	Strong oxidizing agents.
Hazardous Decomposition Products	Hydrogen fluoride. Carbon oxides. Phosgene.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation	No data available.
Eye contact	No data available.
Skin Contact	No data available.
Ingestion	No data available.

Information on toxicological effects

Symptoms	No information available.

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

Chronic Toxicity	No information available.

Numerical measures of toxicity - Product Information

Unknown acute toxicity	100% of the mixture consists of ingredient(s) of unknown toxicity

12. ECOLOGICAL INFORMATION

Ecotoxicity	May cause long lasting harmful effects to aquatic life

100% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Persistence and degradability	No information available.
Bioaccumulation	No information available.
Mobility	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal of wastes	Disposal should be in accordance with applicable regional, national and local laws and regulations.
Contaminated packaging	Do not reuse container.

14. TRANSPORT INFORMATION

DOT	Not regulated
IMDG	Not regulated
IATA	Not regulated

15. REGULATORY INFORMATION

International Inventories

All of the components in the product are on the following Inventory lists
TSCA (United States): Canada (DSL/NDSL) Europe (EINECS/ELINCS/NLP) ENCS (Japan):

Chemical Name	TSCA	DSL	NDSL	EINECS	ELINCS	ENCS	IECSC	KECL	PICCS	AICS
Perfluorononanoic acid	X	-	X	X	-	X	-	-	-	-

X - Listed
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

Acute health hazard	No
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive hazard	No

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

US State Regulations

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

U.S. State Right-to-Know Regulations
This product does not contain any substances regulated by state right-to-know regulations

16. OTHER INFORMATION

Revision note	No information available

Disclaimer
The information provided in this Material 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 Safety Data Sheet

SAFETY DATA SHEET

Version 6.4
Revision Date 04/18/2021
Print Date 06/19/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluorooctanoic acid

Product Number : 171468
Brand : Aldrich
CAS-No. : 335-67-1

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 1B), H360
Effects on or via lactation, H362
Specific target organ toxicity - repeated exposure (Category 1), Liver, 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)	
H302	Harmful if swallowed.
H314	Causes severe skin burns and eye damage.
H351	Suspected of causing cancer.
H360	May damage fertility or the unborn child.
H362	May cause harm to breast-fed children.
H372	Causes damage to organs (Liver) 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/ vapors/ spray.
P263	Avoid contact during pregnancy/ while nursing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P308 + P313	IF exposed or concerned: 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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Pentadecafluorooctanoic acid Perfluorocaprylic acid Perfluorooctanoic acid
Formula	:	$C_8HF_{15}O_2$
Molecular weight	:	414.07 g/mol
CAS-No.	:	335-67-1
EC-No.	:	206-397-9

Component	Classification	Concentration
pentadecafluorooctanoic acid		
	Acute Tox. 4; Skin Corr.	<= 100 %

	1B; Eye Dam. 1; Carc. 2; Repr. 1B; Lact. ; STOT RE 1; H302, H314, H318, H351, H360, H362, H372	

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

In case of eye contact
After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

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

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen fluoride
Combustible.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
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

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.
Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Tightly fitting safety goggles

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 EC 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
Acid-resistant protective clothing

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: flakes Color: colorless

b)	Odor	stinging
c)	Odor Threshold	No data available
d)	pH	2.6 at 1 g/l at 20 °C (68 °F)
e)	Melting point/freezing point	Melting point/range: 55 - 56 °C (131 - 133 °F) - lit.
f)	Initial boiling point and boiling range	189 °C 372 °F at 981 hPa - 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)	Vapor pressure	0.69 hPa at 25 °C (77 °F)
l)	Vapor density	No data available
m)	Relative density	No data available
n)	Water solubility	3.4 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 6.30 - Potential bioaccumulation, (Lit.)
p)	Autoignition temperature	No data available
q)	Decomposition temperature	> 300 °C (> 572 °F) -
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

SECTION 10: Stability and reactivity

10.1 Reactivity

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Violent reactions possible with:
Strong oxidizing agents
Strong acids
Bases

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 500.1 mg/kg
(Expert judgment)

Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l
(Expert judgment)

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
Causes serious eye damage.

Respiratory or skin sensitization

Germ cell mutagenicity
No data available

No data available
No data available

Carcinogenicity
Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (pentadecafluorooctanoic acid)

NTP: No ingredient 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 on OSHA's list of regulated carcinogens.

Reproductive toxicity
May damage the unborn child.
Studies indicating a hazard to babies during the lactation period

Specific target organ toxicity - single exposure

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure. - Liver

Aspiration hazard

11.2 Additional Information
RTECS: RH0781000

Cough, Shortness of breath, Headache, Nausea, Vomiting
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

gastric pain
Nausea
Vomiting
Drowsiness
somnolence

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity
No data available

Toxicity to daphnia and other aquatic invertebrates	Remarks: No data available (pentadecafluorooctanoic acid)
Toxicity to algae	Remarks: No data available (pentadecafluorooctanoic acid)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil

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
Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 3261 Class: 8 Packing group: III
Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (pentadecafluorooctanoic acid)
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 3261 Class: 8 Packing group: III EMS-No: F-A, S-B
Proper shipping name: CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (pentadecafluorooctanoic acid)

IATA
UN number: 3261 Class: 8 Packing group: III
Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (pentadecafluorooctanoic acid)

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

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

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
pentadecafluorooctanoic acid	335-67-1	2018-02-01

New Jersey Right To Know Components

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

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Version: 6.4 Revision Date: 04/18/2021 Print Date: 06/19/2021

SAFETY DATA SHEET

Version 6.1
Revision Date 09/29/2020
Print Date 07/25/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluorooctanesulfonamide

Product Number : CDS010729
Brand : Aldrich
CAS-No. : 754-91-6

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Long-term (chronic) aquatic hazard (Category 4), H413

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)
H413 May cause long lasting harmful effects 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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Heptadecafluorooctanesulphonamide
Formula	:	$C_8H_2F_{17}NO_2S$
Molecular weight	:	499.14 g/mol
CAS-No.	:	754-91-6
EC-No.	:	212-046-0

No components need to be disclosed according to the applicable regulations.

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Consult a physician. Show this material 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

SECTION 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, Nitrogen oxides (NOx), Sulfur oxides, Hydrogen fluoride

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapors, 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.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
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): 13: Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients 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
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.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	120 °C 248 °F at 3 hPa
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)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available

o)	Partition coefficient: n-octanol/water	log Pow: 5.8
p)	Autoignition 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

SECTION 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, Nitrogen oxides (NOx), Sulfur oxides, Hydrogen fluoride
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
Causes serious eye damage.

Respiratory or skin sensitization

Germ cell mutagenicity
No data available
No data available
No data available

Carcinogenicity
Suspected of causing cancer.

IARC: No ingredient 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 ingredient 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 ingredient 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 on OSHA's list of regulated carcinogens.

Reproductive toxicity
May damage the unborn child.
Studies indicating a hazard to babies during the lactation period

Specific target organ toxicity - single exposure

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

Additional Information
RTECS: RG9701400

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

Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity
No data available

Toxicity to daphnia and other aquatic invertebrates	Remarks: No data available(Heptadecafluorooctanesulphonamide)
Toxicity to algae	Remarks: No data available(Heptadecafluorooctanesulphonamide)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
Accumulation in aquatic organisms is expected.

12.4 Mobility in soil

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.
Discharge into the environment must be avoided.

SECTION 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.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

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

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

SARA 311/312 Hazards
No SARA Hazards

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

Pennsylvania Right To Know Components

Heptadecafluorooctanesulphonamide	CAS-No. 754-91-6	Revision Date

New Jersey Right To Know Components

Heptadecafluorooctanesulphonamide	CAS-No. 754-91-6	Revision Date

California Prop. 65 Components

This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

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Version: 6.1 Revision Date: 09/29/2020 Print Date: 07/25/2021

TCI AMERICA

Material Safety Data Sheet

HAZARD WARNINGS	RISK PHRASES	PROTECTIVE CLOTHING
	**Corrosive to eyes and skin on contact.** **Toxic compound, do not ingest or inhale. Avoid all contact with this material.** **Environmental hazard.** **This material is toxic to aquatic organisms and may cause long term adverse effects to the aquatic environment.** **POSSIBLE MUTAGEN. MINIMIZE EXPOSURE.**	

Section I. Chemical Product and Company Identification

Chemical Name: **Heptadecafluorooctanesulfonic Acid**

Catalog Number	H0781
Synonym	Perfluorooctanesulfonic Acid
Chemical Formula	$C_8HF_{17}O_3S$
CAS Number	1763-23-1

Supplier: TCI America
9211 N. Harborgate St.
Portland OR
1-800-423-8616

In case of Emergency Call: **Chemtrec®**
(800) 424-9300 (U.S.)
(703) 527-3887 (International)

Section II. Composition and Information on Ingredients

Chemical Name	CAS Number	Percent (%)	TLV/PEL	Toxicology Data
Heptadecafluorooctanesulfonic Acid	1763-23-1	Min. 98.0 (T)	This compound is classified as a possible mutagen. There is no acceptable exposure limit for a mutagen.	Rat LD_{50} (oral) 154 mg/kg

Section III. Hazards Identification

Acute Health Effects

Corrosive to skin, eyes, and respiratory system. Liquid or spray mist may produce tissue damage, particularly in mucous membranes of the eyes, mouth and respiratory tract. Skin contact may produce burns. Eye contact can result in corneal damage or blindness. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Corrosive materials may cause serious injury if ingested.
Toxic if ingested or inhaled. Avoid prolonged contact with this material. Overexposure may result in serious illness or death.
Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.

Chronic Health Effects

CARCINOGENIC EFFECTS : Not available.
MUTAGENIC EFFECTS : Not available.
TERATOGENIC EFFECTS : Not available.
DEVELOPMENTAL TOXICITY: Reproductive effects.
Rat TDLo Oral 50 mg/kg, female 19-20 days of pregnancy
TOXIC EFFECTS:
Effects on Newborn - Viability index
Effects on Newborn - Other neonatal measures or effects
Effects on Newborn - Growth statistics
Rat TDLo Oral 100 mg/kg, female 19-20 days of pregnancy
TOXIC EFFECTS:
Effects on Newborn - Stillbirth
Rat TDLo Unreported 50 mg/kg, female 19-20 days of pregnancy
TOXIC EFFECTS:
Specific Developmental Abnormalities - Respiratory system
Effects on Newborn - Live birth index
Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section IV. First Aid Measures

Eye Contact

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

Skin Contact

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Inhalation

If the victim is not breathing, perform mouth-to-mouth resuscitation. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, oxygen can be administered. Seek medical attention if respiration problems do not improve.

Ingestion

DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive.

Continued on Next Page **Emergency phone number (800) 424-9300**

Section V. Fire and Explosion Data

Flammability	May be combustible at high temperature.	Auto-Ignition	Not available.
Flash Points	Not available.	Flammable Limits	Not available.

Combustion Products: These products are toxic carbon oxides (CO, CO_2), halogenated compounds, sulfur oxides (SO_x).
WARNING: Highly toxic HF gas is produced during combustion.

Fire Hazards: Not available.

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

Fire Fighting Media and Instructions: SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet.
Consult with local fire authorities before attempting large scale fire-fighting operations.

Section VI. Accidental Release Measures

Spill Cleanup Instructions: Corrosive material. Toxic material. Environmentally hazardous material. Possibly mutagenic material.
Stop leak if without risk. DO NOT get water inside container. DO NOT touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all sources of ignition. Consult federal, state, and/or local authorities for assistance on disposal.

Section VII. Handling and Storage

Handling and Storage Information: CORROSIVE. TOXIC. ENVIRONMENTAL HAZARD. POSSIBLE MUTAGEN. Keep locked up. Keep container dry. Keep away from heat. Mechanical exhaust required. When not in use, tightly seal the container and store in a dry, cool place. Avoid excessive heat and light. DO NOT ingest. Do not breathe dust. Never add water to this product. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Treat symptomatically and supportively.
Always store away from incompatible compounds such as oxidizing agents, alkalis (bases).

Section VIII. Exposure Controls/Personal Protection

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

Personal Protection: Face shield. Lab coat. Dust respirator. Boots. Gloves. A MSHA/NIOSH approved respirator must be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: This compound is classified as a possible mutagen. There is no acceptable exposure limit for a mutagen.

Section IX. Physical and Chemical Properties

Physical state @ 20°C	Solid. (White crystal ~ powder.)	Solubility	Soluble in water.
Specific Gravity	Not available.		
Molecular Weight	500.13	Partition Coefficient	Not available.
Boiling Point	260°C (500°F)	Vapor Pressure	0.3 Pa (@ 25°C)
Melting Point	90°C (194°F)	Vapor Density	Not available.
Refractive Index	Not available.	Volatility	Not available.
Critical Temperature	Not available.	Odor	Not available.
Viscosity	Not available.	Taste	Not available.

Section X. Stability and Reactivity Data

Stability: This material is stable if stored under proper conditions. (See Section VII for instructions)

Conditions of Instability: Avoid excessive heat and light.

Incompatibilities: Reactive with oxidizing agents, alkalis (bases).

Continued on Next Page Emergency phone number (800) 424-9300

Section XI. Toxicological Information

RTECS Number	RG9701600
Routes of Exposure	Eye Contact. Ingestion. Inhalation. Skin contact.
Toxicity Data	Rat LD_{50} (oral) 154 mg/kg
Chronic Toxic Effects	**CARCINOGENIC EFFECTS** : Not available. **MUTAGENIC EFFECTS** : Not available. **TERATOGENIC EFFECTS** : Not available. **DEVELOPMENTAL TOXICITY**: Reproductive effects. Rat TDLo Oral 50 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Effects on Newborn - Viability index Effects on Newborn - Other neonatal measures or effects Effects on Newborn - Growth statistics Rat TDLo Oral 100 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Effects on Newborn - Stillbirth Rat TDLo Unreported 50 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Specific Developmental Abnormalities - Respiratory system Effects on Newborn - Live birth index Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.
Acute Toxic Effects	Corrosive to skin, eyes, and respiratory system. Liquid or spray mist may produce tissue damage, particularly in mucous membranes of the eyes, mouth and respiratory tract. Skin contact may produce burns. Eye contact can result in corneal damage or blindness. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Corrosive materials may cause serious injury if ingested. Toxic if ingested or inhaled. Avoid prolonged contact with this material. Overexposure may result in serious illness or death. Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.

Section XII. Ecological Information

Ecotoxicity	Not available.
Environmental Fate	Perfluorooctane sulfonic acid's production and use as a precursor for fluorinated surfactants has resulted in its release to the environment through various waste streams. If released to air, an estimated vapor pressure of 2.0X10-3 mm Hg at 25 deg C indicates perfluorooctane sulfonic acid will exist solely as a vapor in the ambient atmosphere. Vapor-phase perfluorooctane sulfonic acid will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 110 days. If released to soil, perfluorooctane sulfonic acid is expected to have no mobility based upon an estimated Koc of 100,000. Perfluorooctane sulfonic acid is essentially nonvolatile. Perfluoro compound recalcitrance can be attributed to the stability conferred by fluorine substitutes and the absence of structures susceptible to electrophilic or nucleophilic attack. Perfluorooctane sulfonic acid reached 0% of its theoretical BOD in four weeks using an activated sludge inoculum in the manometric respirometry test. If released into water, perfluorooctane sulfonic acid is expected to adsorb to suspended solids and sediment based upon the estimated Koc. Volatilization from water surfaces is not expected to be an important fate process as the compound is essentially nonvolatile; an estimated volatilization half-life for a model pond is 3 years if adsorption is considered. An estimated BCF of 56 suggests the potential for bioconcentration in aquatic organisms is moderate. Monitoring studies however would suggest that this compound is highly bioaccumulative. As a class, fluorinated organic compounds are resistant to hydrolysis. Occupational exposure to perfluorooctane sulfonic acid may occur through inhalation and dermal contact with this compound at workplaces where perfluorooctane sulfonic acid is produced or used. Monitoring data indicate that the general population may be exposed to perfluorooctane sulfonic acid via ingestion of contaminated fish and drinking water, and dermal contact with this compound and other products containing perfluorooctane sulfonic acid.

Section XIII. Disposal Considerations

Waste Disposal	Recycle to process, if possible. Consult your local regional authorities. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. Observe all federal, state and local regulations when disposing of the substance.

Section XIV. Transport Information

DOT Classification	DOT CLASS 8: Corrosive material DOT CLASS 6.1: Toxic material
PIN Number	UN2923
Proper Shipping Name	Corrosive solid, toxic, n.o.s.
Packing Group (PG)	II
DOT Pictograms	

Continued on Next Page

Section XV. Other Regulatory Information and Pictograms

TSCA Chemical Inventory (EPA)	This compound is **ON** the EPA Toxic Substances Control Act (TSCA) inventory list.
WHMIS Classification (Canada)	CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS E: Corrosive solid. On NDSL.
EINECS Number (EEC)	217-179-8
EEC Risk Statements	R23/24/25- Toxic by inhalation, in contact with skin and if swallowed. R34- Causes burns. R46- May cause heritable genetic damage. R47- May cause birth defects. R51- Toxic to aquatic organisms. R53- May cause long-term adverse effects in the aquatic environment.
Japanese Regulatory Data	ENCS No. 2-1595

Section XVI. Other Information

Version 1.0
Validated on 1/6/2010.
Printed 1/6/2010.

Notice to Reader

TCI laboratory chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. 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 chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our MSDS sheets are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated MSDS sheets for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, facial mask, fume hood). For proper handling and disposal, always comply with federal, state, and local regulations.

SAFETY DATA SHEET

Version 6.2
Revision Date 04/30/2021
Print Date 06/19/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluoropentanoic acid

Product Number : 396575
Brand : Aldrich
CAS-No. : 2706-90-3

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Serious eye damage (Category 1), H318
Reproductive toxicity (Category 2), H361

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H318 Causes serious eye damage.
H361 Suspected of damaging fertility or the unborn child.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P305 + P351 + P338 +	IF IN EYES: Rinse cautiously with water for several minutes.
P310	Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Nonafluorovaleric acid Perfluoropentanoic acid Nonafluoropentanoic acid
Formula	:	$C_5HF_9O_2$
Molecular weight	:	264.05 g/mol
CAS-No.	:	2706-90-3
EC-No.	:	220-300-7

Component	Classification	Concentration
Perfluorovaleric acid		
	Eye Dam. 1; Repr. 2; H318, H361	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). 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

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen fluoride
Combustible.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
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
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Keep locked up or in an area accessible only to qualified or authorized persons.
Storage class (TRGS 510): 8A: Combustible, corrosive hazardous materials

7.3 Specific end use(s)

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

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). Tightly fitting safety goggles

Skin protection
required

Body Protection
protective clothing

Respiratory protection
required when vapours/aerosols are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: clear, liquid Color: light brown
b)	Odor	No data available

c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	140 °C 284 °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)	Vapor pressure	No data available
l)	Vapor 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)	Autoignition 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

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 2,501 mg/kg
(Expert judgment)

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 sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No ingredient 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 ingredient 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 on OSHA's list of regulated carcinogens.

Reproductive toxicity
Suspected of damaging the unborn child.
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

11.2 Additional Information
Not available

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea

SECTION 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

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

SARA 311/312 Hazards
No SARA Hazards

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

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.2 Revision Date: 04/30/2021 Print Date: 06/19/2021

SAFETY DATA SHEET

Version 6.3
Revision Date 09/17/2020
Print Date 06/19/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluorotetradecanoic acid

Product Number : 446785
Brand : Aldrich
CAS-No. : 376-06-7

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula : $C_{14}HF_{27}O_2$
Molecular weight : 714.11 g/mol
CAS-No. : 376-06-7

EC-No. : 206-803-4

No components need to be disclosed according to the applicable regulations.

SECTION 4: First aid measures

4.1 Description of first-aid measures

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 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 fluoride

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapors, mist or gas.
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

Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Provide appropriate exhaust ventilation at places where dust is formed.Normal measures for preventive fire protection.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
General industrial hygiene practice.

Personal protective equipment

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

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

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
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 130 - 135 °C (266 - 275 °F) - lit.
f)	Initial boiling point and boiling range	270 °C 518 °F at 987 hPa - 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)	Vapor pressure	No data available
l)	Vapor 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)	Autoignition 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

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

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
Causes serious eye damage.

Respiratory or skin sensitization

Germ cell mutagenicity
No data available
No data available
No data available

Carcinogenicity
Suspected of causing cancer.

IARC:	No ingredient 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 ingredient 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 ingredient 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 on OSHA's list of regulated carcinogens.

Reproductive toxicity
May damage the unborn child.
Studies indicating a hazard to babies during the lactation period

Specific target organ toxicity - single exposure

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure. - Liver

Aspiration hazard

Additional Information
RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:
gastric pain, Nausea, Vomiting, Drowsiness, somnolence
Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity

No data available

Toxicity to daphnia and other aquatic invertebrates	Remarks: No data available(Perfluorotetradecanoic acid)
Toxicity to algae	Remarks: No data available(Perfluorotetradecanoic acid)

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

Discharge into the environment must be avoided.

SECTION 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.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

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

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

SARA 311/312 Hazards
No SARA Hazards

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

Pennsylvania Right To Know Components

Perfluorotetradecanoic acid	CAS-No. 376-06-7	Revision Date

New Jersey Right To Know Components

Perfluorotetradecanoic acid	CAS-No. 376-06-7	Revision Date

California Prop. 65 Components
This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the

information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.3 Revision Date: 09/17/2020 Print Date: 06/19/2021

SAFETY DATA SHEET

Version 6.1
Revision Date 04/05/2019
Print Date 06/19/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluorotridecanoic acid

Product Number : 654973
Brand : Aldrich
CAS-No. : 72629-94-8

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula : $C_{13}HF_{25}O_2$
Molecular weight : 664.11 g/mol
CAS-No. : 72629-94-8

EC-No. : 276-745-2

No components need to be disclosed according to the applicable regulations.

SECTION 4: First aid measures

4.1 Description of first aid measures

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 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 fluoride

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Provide appropriate exhaust ventilation at places where dust is formed.Normal measures for preventive fire protection.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)

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

SECTION 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
General industrial hygiene practice.

Personal protective equipment

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

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

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
Do not let product enter drains.

SECTION 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: 112 - 123 °C (234 - 253 °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

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

SECTION 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: 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 on OSHA's list of regulated carcinogens.

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.

SECTION 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

SECTION 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.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

SECTION 15: Regulatory information

SARA 302 Components

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

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

SARA 311/312 Hazards
No SARA Hazards

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

Pennsylvania Right To Know Components

Pentacosafluorotridecanoic acid	CAS-No. 72629-94-8	Revision Date

New Jersey Right To Know Components

Pentacosafluorotridecanoic acid	CAS-No. 72629-94-8	Revision Date

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

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Version: 6.1 Revision Date: 04/05/2019 Print Date: 06/19/2021

SAFETY DATA SHEET

Version 6.2
Revision Date 07/16/2021
Print Date 07/25/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluoroundecanoic acid

Product Number : 446777
Brand : Aldrich
CAS-No. : 2058-94-8

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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 4), H332
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 1B), H360
Effects on or via lactation, H362
Specific target organ toxicity - repeated exposure (Category 1), Liver, 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)

H302 + H332	Harmful if swallowed or if inhaled.
H351	Suspected of causing cancer.
H360	May damage fertility or the unborn child.
H362	May cause harm to breast-fed children.
H372	Causes damage to organs (Liver) 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/ vapors/ spray.
P263	Avoid contact during pregnancy/ while nursing.
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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	$C_{11}HF_{21}O_2$
Molecular weight	:	564.09 g/mol
CAS-No.	:	2058-94-8
EC-No.	:	218-165-4

Component	Classification	Concentration
Henicosafluoroundecanoic acid		
	Acute Tox. 4; Carc. 2; Repr. 1B; Lact. ; STOT RE 1; H302, H332, H351, H360, H362, H372	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). 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

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Nature of decomposition products not known.
Combustible.
Vapors are heavier than air and may spread along floors.
Forms explosive mixtures with air on intense heating.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
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

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.
Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Skin protection
Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Body Protection
protective clothing

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 96 - 101 °C (205 - 214 °F) - lit.
f)	Initial boiling point and boiling range	160 °C 320 °F at 80 hPa - lit.
g)	Flash point	113 °C (235 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid,	No data available

	gas)	
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	No data available
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition 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

SECTION 10: Stability and reactivity

10.1 Reactivity
Forms explosive mixtures with air on intense heating.
A range from approx. 15 Kelvin below the flash point is to be rated as critical.
The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Strong heating.

10.5 Incompatible materials
Oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 500.1 mg/kg
(Expert judgment)
Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l
(Expert judgment)
Dermal: No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
Causes serious eye damage.

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available
No data available
No data available

Carcinogenicity
Suspected of causing cancer.

IARC: No ingredient 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 ingredient 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 on OSHA's list of regulated carcinogens.

Reproductive toxicity
May damage the unborn child.
Studies indicating a hazard to babies during the lactation period

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure. - Liver

Aspiration hazard
No data available

11.2 Additional Information

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

gastric pain
Nausea

Vomiting
Drowsiness
somnolence

Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity

No data available

Toxicity to daphnia and other aquatic invertebrates	Remarks: No data available (Henicosafluoroundecanoic acid)
Toxicity to algae	Remarks: No data available (Henicosafluoroundecanoic acid)

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

Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

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

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

Pennsylvania Right To Know Components

Henicosafluoroundecanoic acid	CAS-No. 2058-94-8	Revision Date

New Jersey Right To Know Components

Henicosafluoroundecanoic acid	CAS-No. 2058-94-8	Revision Date

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

SAFETY DATA SHEET

Creation Date 01-May-2012 **Revision Date** 11-Aug-2014 **Revision Number** 1

1. Identification

Product Name **Phenanthrene**

Cat No. : **AC130090000; AC130090050; AC130090500; AC130095000**

Synonyms No information available

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)

Acute oral toxicity	Category 4

Label Elements

Signal Word
Warning

Hazard Statements
Harmful if swallowed

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth

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 %
Phenanthrene	85-01-8	>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 Obtain medical attention. Wash off immediately with plenty of water for at least 15 minutes.

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 None reasonably foreseeable.
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 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
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
1	1	0	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 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 Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Avoid dust formation.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place.

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.

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	Beige
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	95 - 101 °C / 203 - 213.8 °F
Boiling Point/Range	336 °C / 636.8 °F
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	1 mmHg @ 116 °C
Vapor Density	Not applicable
Relative Density	1.063
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	C14 H10
Molecular Weight	178.23

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation.

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
Phenanthrene	1.8 g/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.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Phenanthrene	85-01-8	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 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

Phenanthrene	Not listed	LC50 = 3.2 mg/L 96h	Not listed	LC50 = 0.35 mg/L 48h

Persistence and Degradability Insoluble in water May persist

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Phenanthrene	4.46

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.
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

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
Phenanthrene	X	X	-	201-581-5	-		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) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Phenanthrene	85-01-8	>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
Phenanthrene	-	-	X	X

Clean Air Act Not applicable

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
Phenanthrene	5000 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
Phenanthrene	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 Non-controlled

16. Other information

Prepared By Regulatory Affairs

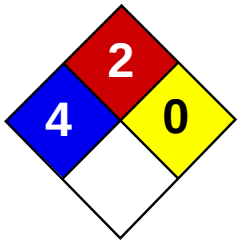
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date	01-May-2012
Revision Date	11-Aug-2014
Print Date	11-Aug-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



Health	3
Fire	2
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Phenol MSDS

Section 1: Chemical Product and Company Identification

Product Name: Phenol

Catalog Codes: SLP4453, SLP5251

CAS#: 108-95-2

RTECS: SJ3325000

TSCA: TSCA 8(b) inventory: Phenol

CI#: Not available.

Synonym: Monohydroxybenzene; Benzenol; Phenyl hyroxide; Phenylic acid

Chemical Name: Carbolic Acid

Chemical Formula: C6H5OH

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Phenol	108-95-2	100

Toxicological Data on Ingredients: Phenol: ORAL (LD50): Acute: 317 mg/kg [Rat]. 270 mg/kg [Mouse]. DERMAL (LD50): Acute: 630 mg/kg [Rabbit]. 669 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (sensitizer, permeator). The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated

exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: 715°C (1319°F)

Flash Points: CLOSED CUP: 79°C (174.2°F). OPEN CUP: 85°C (185°F).

Flammable Limits: LOWER: 1.7% UPPER: 8.6%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Phenol + nitrides results in heat and flammable gas generation. Phenol + mineral oxdizing acids results in fire. Phenol + calcium hypochlorite is an exothermic reaction producing toxic fumes which may ignite.

Special Remarks on Explosion Hazards:
Phenol + sodium nitrite causes explosion on heating. Peroxydisulfuric acid + phenol causes explosion.

Section 6: Accidental Release Measures

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

Large Spill:
Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Air Sensitive. Sensitive to light. Store in light-resistant containers. Moisture sensitive. Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

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

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 5 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 19 (mg/m3) from ACGIH (TLV) [United States] SKIN TWA: 5 from NIOSH [United States] TWA: 19 (mg/m3) from NIOSH [United States] TWA: 5 (ppm) from OSHA (PEL) [United States] TWA: 19 (mg/m3) from OSHA (PEL) [United States] TWA: 5 (ppm) [Canada] TWA: 19 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor:
Distinct, aromatic, somewhat sickening sweet and acrid

Taste: Burning.

Molecular Weight: 94.11 g/mole

Color: Colorless to light pink

pH (1% soln/water): Not available.

Boiling Point: 182°C (359.6°F)

Melting Point: 42°C (107.6°F)

Critical Temperature: 694.2 (1281.6°F)

Specific Gravity: 1.057 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 3.24 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.048 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 1.5

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

Solubility:
Easily soluble in methanol, diethyl ether. Soluble in cold water, acetone. Solubility in water: 1g/15 ml water. Soluble in benzene. Very soluble in alcohol, chloroform, glycerol, petroleum, carbon disulfide, volatile and fixed oils, aqueous alkali hydroxides, carbon tetrachloride, acetic acid, liquid sulfur dioxide. Almost insoluble in petroleum ether. Miscible in acetone. Sparingly soluble in mineral oil.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks), light, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity:
Extremely corrosive in presence of copper. Slightly corrosive in presence of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass, of aluminum.

Special Remarks on Reactivity:
Air and light sensitive. Prone to redden on exposure to light and air. Incompatible with aluminum chloride, peroxydisulfuirc acid, acetaldehyde, sodium nitrite, boron trifluoride diethyl ether + 1,3-butadiene, isocyanates, nitrides, mineral oxidizing acids, calcium hypochlorite, halogens, formaldehyde, metals and alloys, lead, zinc, magnesium and their alloys, plastics, rubber, coatings, sodium nitrate + trifluoroacetic acid. Phenol + isocyanates results in heat generation, and violent polymerization. Phenol + 1,3-butadiene and boron trifluoride diethyl ether complex results in intense exothermic reaction. Phenol + acetaldehyde resultes in violent condensation.

Special Remarks on Corrosivity:
Minor corrosive effect on bronze. Severe corrosive effect on brass.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 270 mg/kg [Mouse]. Acute dermal toxicity (LD50): 630 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant), of ingestion, . Hazardous in case of skin contact (sensitizer, permeator), of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 140 mg/kg LDL [Infant] - Route: Oral; Dose: 10,000 mg/kg

Special Remarks on Chronic Effects on Humans:
Animal: passes through the placental barrier. May cause adverse reproductive effects and birth defects (teratogenic) Embryotoxic and/or foetotoxic in animal. May affect genetic material (mutagenic).

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 125 mg/l 24 hours [Fish (Goldfish)]. >50 mg/l 1 hours [Fish (Fathead minnow)]. >50 mg/l 24 hours [Fish (Fathead minnow)]. >33 mg/l 72 hours [Fish (Fathead minnow)]. >33 ppm 96 hours [Fish (Fathead minnow)].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Phenol, solid UNNA: 1671 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Phenol Illinois toxic substances disclosure to employee act: Phenol Illinois chemical safety act: Phenol New York release reporting list: Phenol Rhode Island RTK hazardous substances: Phenol Pennsylvania RTK: Phenol Minnesota: Phenol Massachusetts RTK: Phenol Massachusetts spill list: Phenol New Jersey: Phenol New Jersey spill list: Phenol Louisiana RTK reporting list: Phenol Louisiana spill reporting: Phenol TSCA 8(b) inventory: Phenol TSCA 4(a) proposed test rules: Phenol TSCA 8(a) IUR: Phenol TSCA 8(d) H and S data reporting: Phenol: effective: 6/1/87; sunset:

6/01/97 SARA 302/304/311/312 extremely hazardous substances: Phenol SARA 313 toxic chemical notification and release reporting: Phenol CERCLA: Hazardous substances.: Phenol: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive solid.

DSCL (EEC):
R24/25- Toxic in contact with skin and if swallowed. R34- Causes burns. R40- Possible risks of irreversible effects. R43- May cause sensitization by skin contact. R52- Harmful to aquatic organisms. S1/2- Keep locked up and out of the reach of children. S24- Avoid contact with skin. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28- After contact with skin, wash immediately with plenty of water S37/39- Wear suitable gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S56- Dispose of this material and its container at hazardous or special waste collection point.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 2

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 4

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 11:17 AM

Last Updated: 05/21/2013 12:00 PM

SAFETY DATA SHEET

Version 3.10
Revision Date 03/03/2015
Print Date 02/07/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Potassium
Product Number	:	244864
Brand	:	Aldrich
CAS-No.	:	7440-09-7

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)
Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260
Skin corrosion (Category 1A), H314
Serious eye damage (Category 1), H318
Carcinogenicity (Category 1A), H350

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)

H260	In contact with water releases flammable gases which may ignite spontaneously.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H350	May cause cancer.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P223	Keep away from any possible contact with water, because of violent reaction and possible flash fire.

P231 + P232	Handle under inert gas. Protect from moisture.
P260	Do not breathe dust or mist.
P264	Wash skin thoroughly after handling.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P281	Use personal protective equipment as required.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
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

Reacts violently with water.
May form explosive peroxides.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula : K
Molecular weight : 39.10 g/mol

Hazardous components

Component		Classification	Concentration
Potassium			
CAS-No. EC-No. Index-No.	7440-09-7 231-119-8 019-001-00-2	Water-react. 1; Skin Corr. 1A; Eye Dam. 1; H260, H314	>= 90 - <= 100 %
Paraffin oils			
CAS-No. EC-No.	8012-95-1 232-384-2	Carc. 1A; H350	>= 1 - < 5 %

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
Take off contaminated clothing and shoes immediately. 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.Continue rinsing eyes during transport to hospital.

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
Dry powder

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Potassium oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. 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.Keep away from sources of ignition - No smoking.
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.
Never allow product to get in contact with water during storage.

Handle and store under inert gas.
Storage class (TRGS 510): Hazardous materials, which set free flammable gases upon contact with water

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
Paraffin oils	8012-95-1	STEL	10.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 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	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation 2014 Adoption Not classifiable as a human carcinogen		
		Upper Respiratory Tract irritation 2014 Adoption Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen		
		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
		Upper Respiratory Tract irritation Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen		
		TWA	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Upper Respiratory Tract irritation Exposure by all routes should be carefully controlled to levels as low as possible. 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
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, Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Fragments 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: 64 °C (147 °F)
f)	Initial boiling point and boiling range	774 °C (1,425 °F) at 1,013 hPa (760 mmHg)
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower	No data available

	flammability or explosive limits	
k)	Vapour pressure	0.12 hPa (0.09 mmHg) at 260 °C (500 °F)
l)	Vapour density	No data available
m)	Relative density	0.860 g/cm3
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
Reacts violently with water.

10.4 Conditions to avoid
Exposure to moisture

10.5 Incompatible materials
Oxidizing agents, Strong oxidizing agents, Carbon oxides, Reacts violently with water., Reacts with water to generate Hydrogen gas.

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 (Paraffin oils)
NTP:	Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Paraffin oils)
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

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

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

12.6 Other adverse effects
No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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: 2257 Class: 4.3 Packing group: I
Proper shipping name: Potassium
Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG
UN number: 2257 Class: 4.3 Packing group: I EMS-No: F-G, S-N
Proper shipping name: POTASSIUM

IATA
UN number: 2257 Class: 4.3 Packing group: I
Proper shipping name: Potassium
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
Reactivity Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-04-24
Paraffin oils	8012-95-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-04-24
Paraffin oils	8012-95-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-04-24
Paraffin oils	8012-95-1	2007-03-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Paraffin oils	8012-95-1	1987-02-27

16. OTHER INFORMATION

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

Carc.	Carcinogenicity
Eye Dam.	Serious eye damage
H260	In contact with water releases flammable gases which may ignite spontaneously.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H350	May cause cancer.
Skin Corr.	Skin corrosion
Water-react.	Substances and mixtures, which in contact with water, emit flammable gases

HMIS Rating
Health hazard: 3

Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	2

NFPA Rating

Health hazard:	3
Fire Hazard:	4
Reactivity Hazard:	2
Special hazard.I:	W

Further information

Preparation Information

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

Version: 3.10 Revision Date: 03/03/2015 Print Date: 02/07/2016

SAFETY DATA SHEET

Version 4.6
Revision Date 02/25/2016
Print Date 03/03/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Propylene
Product Number	:	295663
Brand	:	Aldrich
Index-No.	:	601-011-00-9
CAS-No.	:	115-07-1

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)
Flammable gases (Category 1), H220
Gases under pressure (Liquefied gas), H280
Simple Asphyxiant,

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.
P410 + P403	Protect from sunlight. Store in a well-ventilated place.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Propene
Formula	:	C_3H_6
Molecular weight	:	42.08 g/mol
CAS-No.	:	115-07-1
EC-No.	:	204-062-1
Index-No.	:	601-011-00-9

Hazardous components

Component	Classification	Concentration
Propene		
	Flam. Gas 1; Press. Gas Liquefied gas; SA ; H220, H280,	<= 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

Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Clean up promptly by sweeping or vacuum.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Contents under pressure.
Storage class (TRGS 510): Gases

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
Propene	115-07-1	TWA	500 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Asphyxia Not classifiable as a human carcinogen		
		TWA	500.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Asphyxia Not classifiable as a 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
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: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 60 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: gaseous, 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: -185 °C (-301 °F) - lit.
f)	Initial boiling point and boiling range	-47.7 °C (-53.9 °F) - lit.
g)	Flash point	-107.99 °C (-162.38 °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: 11.1 %(V) Lower explosion limit: 2 %(V)
k)	Vapour pressure	15,604 hPa (11,704 mmHg) at 37.7 °C (99.9 °F)
l)	Vapour density	1.45 - (Air = 1.0)
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

Relative vapour density 1.45 - (Air = 1.0)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents, 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
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 is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Propene)

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: UC6740000

Dizziness, Headache, Central nervous system depression
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
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: 1077 Class: 2.1
Proper shipping name: Propylene

Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG
UN number: 1077 Class: 2.1 EMS-No: F-D, S-U
Proper shipping name: PROPYLENE

IATA
UN number: 1077 Class: 2.1
Proper shipping name: Propylene
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
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Propene	115-07-1	1993-04-24

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Propene	115-07-1	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Propene	115-07-1	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Propene	115-07-1	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

	May displace oxygen and cause rapid suffocation.
Flam. Gas	Flammable gases
H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
Press. Gas	Gases under pressure
SA	Simple Asphyxiant

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	4
Physical Hazard	3

NFPA Rating

Health hazard:	0
Fire Hazard:	4
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 02/25/2016 Print Date: 03/03/2016

Safety data sheet

according to Regulation (EC) No. 1907/2006 (REACH), amended by 2015/830/EU

p-Xylene ≥99 %, for synthesis

article number: **8817**
Version: **3.0 en**
Replaces version of: 04.07.2016
Version: (2)

date of compilation: 11.05.2015
Revision: 11.04.2019

SECTION 1: Identification of the substance/mixture and of the company/ undertaking

1.1 Product identifier

Identification of the substance	**p-Xylene**
Article number	8817
Registration number (REACH)	It is not required to list the identified uses because the substance is not subject to registration according to REACH (< 1 t/a)
Index No	601-022-00-9
EC number	203-396-5
CAS number	106-42-3

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

Identified uses: laboratory chemical
laboratory and analytical use

1.3 Details of the supplier of the safety data sheet

Carl Roth GmbH + Co KG
Schoemperlenstr. 3-5
D-76185 Karlsruhe
Germany

Telephone: +49 (0) 721 - 56 06 0
Telefax: +49 (0) 721 - 56 06 149
e-mail: sicherheit@carlroth.de
Website: www.carlroth.de

Competent person responsible for the safety data sheet : Department Health, Safety and Environment

e-mail (competent person) : sicherheit@carlroth.de

1.4 Emergency telephone number

Emergency information service **Poison Centre Munich: +49/(0)89 19240**

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 (CLP)

Classification acc. to GHS

Section	Hazard class	Hazard class and category	Hazard statement
2.6	flammable liquid	(Flam. Liq. 3)	H226
3.1D	acute toxicity (dermal)	(Acute Tox. 4)	H312
3.1I	acute toxicity (inhal.)	(Acute Tox. 4)	H332
3.2	skin corrosion/irritation	(Skin Irrit. 2)	H315

Classification acc. to GHS			
Section	**Hazard class**	**Hazard class and category**	**Hazard statement**
3.3	serious eye damage/eye irritation	(Eye Irrit. 2)	H319
3.8R	specific target organ toxicity - single exposure (respiratory tract irritation)	(STOT SE 3)	H335
3.10	aspiration hazard	(Asp. Tox. 1)	H304

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008 (CLP)

Signal word **Danger**

Pictograms

GHS02, GHS07, GHS08

Hazard statements

H226	Flammable liquid and vapour
H304	May be fatal if swallowed and enters airways
H312+H332	Harmful in contact with skin or if inhaled
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

Precautionary statements

Precautionary statements - prevention

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statements - response

P301+P310	IF SWALLOWED: Immediately call a doctor.
P302+P352	IF ON SKIN: Wash with plenty of water/...
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P331	Do NOT induce vomiting.

Labelling of packages where the contents do not exceed 125 ml

Signal word: **Danger**

Symbol(s)

H304	May be fatal if swallowed and enters airways.
P301+P310	IF SWALLOWED: Immediately call a doctor.
P331	Do NOT induce vomiting.

2.3 Other hazards

There is no additional information.

SECTION 3: Composition/information on ingredients

3.1 Substances

Name of substance	1,4-Dimethylbenzene
Index No	601-022-00-9
EC number	203-396-5
CAS number	106-42-3
Molecular formula	C_8H_{10}
Molar mass	106,2 $^{g}/_{mol}$

SECTION 4: First aid measures

4.1 Description of first aid measures

General notes

Take off contaminated clothing.

Following inhalation

Provide fresh air. In all cases of doubt, or when symptoms persist, seek medical advice.

Following skin contact

Rinse skin with water/shower. In case of skin irritation, consult a physician.

Following eye contact

Irrigate copiously with clean, fresh water for at least 10 minutes, holding the eyelids apart. In case of eye irritation consult an ophthalmologist.

Following ingestion

Rinse mouth immediately and drink plenty of water. Observe aspiration hazard if vomiting occurs. Call a physician immediately.

4.2 Most important symptoms and effects, both acute and delayed

Irritant effects. Vertigo. Dizziness. Unconsciousness. Aspiration hazard. Headache. Cough. Breathing difficulties. Nausea. Vomiting.

4.3 Indication of any immediate medical attention and special treatment needed

none

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Co-ordinate fire-fighting measures to the fire surroundings

water spray, foam, dry extinguishing powder, carbon dioxide (CO2)

Unsuitable extinguishing media

water jet

5.2 Special hazards arising from the substance or mixture

Combustible. Vapours can form explosive mixtures with air.

Hazardous combustion products

In case of fire may be liberated: carbon monoxide (CO), carbon dioxide (CO2)

5.3 Advice for firefighters

Vapours are heavier than air. Beware of reignition. Fight fire with normal precautions from a reasonable distance. Wear self-contained breathing apparatus.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Use personal protective equipment as required. Avoid contact with skin, eyes and clothes. Do not breathe vapour/spray. Avoidance of ignition sources.

6.2 Environmental precautions

Keep away from drains, surface and ground water. Explosive properties.

6.3 Methods and material for containment and cleaning up

Advices on how to contain a spill

Covering of drains.

Advices on how to clean up a spill

Absorb with liquid-binding material (e.g. sand, diatomaceous earth, acid- or universal binding agents).

Other information relating to spills and releases

Place in appropriate containers for disposal. Ventilate affected area.

6.4 Reference to other sections

Hazardous combustion products: see section 5. Personal protective equipment: see section 8. Incompatible materials: see section 10. Disposal considerations: see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Provide adequate ventilation as well as local exhaustion at critical locations. Avoid exposure. When not in use, keep containers tightly closed.

• Measures to prevent fire as well as aerosol and dust generation


Keep away from sources of ignition - No smoking.

Take precautionary measures against static discharge.

Advice on general occupational hygiene

Wash hands before breaks and after work. Keep away from food, drink and animal feedingstuffs. When using do not smoke.

7.2 Conditions for safe storage, including any incompatibilities

Store in a well-ventilated place. Keep container tightly closed. Protect from sunlight.

Incompatible substances or mixtures

Observe hints for combined storage.

Consideration of other advice

Ground/bond container and receiving equipment.

• Ventilation requirements

Use local and general ventilation.

• Specific designs for storage rooms or vessels

Recommended storage temperature: 15 – 25 °C.

7.3 Specific end use(s)

No information available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

National limit values

Occupational exposure limit values (Workplace Exposure Limits)

Country	Name of agent	CAS No	Identifier	TWA [ppm]	TWA [mg/m³]	STEL [ppm]	STEL [mg/m³]	Source
EU	p-xylene	106-42-3	IOELV	50	221	100	442	2000/39/EC
MT	p-xylene	106-42-3	OELV	50	221	100	442	CAP. 424

Notation

STEL Short-term exposure limit: a limit value above which exposure should not occur and which is related to a 15-minute period (unless otherwise specified)

TWA Time-weighted average (long-term exposure limit): measured or calculated in relation to a reference period of 8 hours time-weighted average (unless otherwise specified)

Relevant DNELs/DMELs/PNECs and other threshold levels

• human health values

Endpoint	Threshold level	Protection goal, route of exposure	Used in	Exposure time
DNEL	221 mg/m³	human, inhalatory	worker (industry)	chronic - systemic effects
DNEL	442 mg/m³	human, inhalatory	worker (industry)	acute - systemic effects
DNEL	221 mg/m³	human, inhalatory	worker (industry)	chronic - local effects
DNEL	442 mg/m³	human, inhalatory	worker (industry)	acute - local effects
DNEL	212 mg/kg bw/day	human, dermal	worker (industry)	chronic - systemic effects

• environmental values

Endpoint	Threshold level	Environmental compartment	Exposure time
PNEC	0,25 mg/l	water	intermittent release
PNEC	0,044 mg/l	freshwater	short-term (single instance)
PNEC	0,004 mg/l	marine water	short-term (single instance)
PNEC	1,6 mg/l	sewage treatment plant (STP)	short-term (single instance)
PNEC	2,52 mg/kg	freshwater sediment	short-term (single instance)
PNEC	0,252 mg/kg	marine sediment	short-term (single instance)
PNEC	0,852 mg/kg	soil	short-term (single instance)

8.2 Exposure controls

Individual protection measures (personal protective equipment)

Eye/face protection

Use safety goggle with side protection.

Skin protection

• hand protection

Wear suitable gloves. Chemical protection gloves are suitable, which are tested according to EN 374. For special purposes, it is recommended to check the resistance to chemicals of the protective gloves mentioned above together with the supplier of these gloves.

• type of material

FKM (fluoro rubber)

• material thickness

0,4 mm.

• breakthrough times of the glove material

>480 minutes (permeation: level 6)

• other protection measures

Take recovery periods for skin regeneration. Preventive skin protection (barrier creams/ointments) is recommended.

Respiratory protection

Respiratory protection necessary at: Aerosol or mist formation. Type: A (against organic gases and vapours with a boiling point of > 65 °C , colour code: Brown).

Environmental exposure controls

Keep away from drains, surface and ground water.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state	liquid (fluid)
Colour	colourless
Odour	characteristic
Odour threshold	No data available

Other physical and chemical parameters

pH (value)	This information is not available.
Melting point/freezing point	13,25 °C at 1.013 hPa
Initial boiling point and boiling range	138,2 °C at 1.013 hPa
Flash point	27 °C at 1.013 hPa
Evaporation rate	no data available
Flammability (solid, gas)	not relevant (fluid)
Explosive limits	
• lower explosion limit (LEL)	0,9 vol%
• upper explosion limit (UEL)	7 vol%
Explosion limits of dust clouds	not relevant
Vapour pressure	8,7 hPa at 20 °C
Density	0,86 $^{g}/_{cm^3}$ at 25 °C
Vapour density	This information is not available.
Bulk density	Not applicable
Relative density	Information on this property is not available.
Solubility(ies)	
Water solubility	170,5 $^{mg}/_{l}$ at 25 °C
Partition coefficient	
n-octanol/water (log KOW)	3,15 (pH value: 7, 20 °C) (ECHA)
Soil organic carbon/water (log KOC)	2,73 (ECHA)
Auto-ignition temperature	528 °C at 1.013 hPa - ECHA
Decomposition temperature	no data available
Viscosity	
• kinematic viscosity	0,7012 $^{mm^2}/_{s}$
• dynamic viscosity	0,603 mPa s at 25 °C
Explosive properties	Shall not be classified as explosive

Oxidising properties	none

9.2 Other information

Surface tension	28,01 $^{mN}/_{m}$ (25 °C)
Temperature class (EU, acc. to ATEX)	T1 (Maximum permissible surface temperature on the equipment: 450°C)

SECTION 10: Stability and reactivity

10.1 Reactivity

Risk of ignition. In case of warming: Vapours can form explosive mixtures with air.

10.2 Chemical stability

The material is stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

10.3 Possibility of hazardous reactions

Violent reaction with: Oxidisers, Nitric acid, Sulphuric acid, Sulphur

10.4 Conditions to avoid

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

10.5 Incompatible materials

Rubber articles, different plastics

10.6 Hazardous decomposition products

Hazardous combustion products: see section 5.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Exposure route	Endpoint	Value	Species	Source
inhalation: vapour	LC50	19,8 $^{mg}/_{l}$/4h	rat	GESTIS
oral	LD50	3.523 $^{mg}/_{kg}$	rat	ECHA
dermal	LD50	12.126 $^{mg}/_{kg}$	rabbit	ECHA

Skin corrosion/irritation

Causes skin irritation.

Serious eye damage/eye irritation

Causes serious eye irritation.

Respiratory or skin sensitisation

Shall not be classified as a respiratory or skin sensitiser.

Summary of evaluation of the CMR properties

Shall not be classified as germ cell mutagenic, carcinogenic nor as a reproductive toxicant

• Specific target organ toxicity - single exposure

May cause respiratory irritation.

• Specific target organ toxicity - repeated exposure

Shall not be classified as a specific target organ toxicant (repeated exposure).

Aspiration hazard

May be fatal if swallowed and enters airways.

Symptoms related to the physical, chemical and toxicological characteristics

• If swallowed

vomiting, aspiration hazard

• If in eyes

Causes serious eye irritation

• If inhaled

irritant effects, cough, breathing difficulties, pulmonary oedema

• If on skin

causes skin irritation, risk of absorption via the skin

Other information

Other adverse effects: Headache, Vertigo, Dizziness, Nausea, Unconsciousness, Liver and kidney damage, Symptoms can occur only after several hours

SECTION 12: Ecological information

12.1 Toxicity

acc. to 1272/2008/EC: Shall not be classified as hazardous to the aquatic environment.

Aquatic toxicity (acute)

Endpoint	Value	Species	Source	Exposure time
LC50	2,6 mg/l	fish	ECHA	96 h
ErC50	4,7 mg/l	algae	ECHA	72 h

Aquatic toxicity (chronic)

Endpoint	Value	Species	Source	Exposure time
EC50	2,2 mg/l	algae	ECHA	73 h
NOEC	1,57 mg/l	aquatic invertebrates	ECHA	21 d
NOEC	0,44 mg/l	algae	ECHA	73 h
growth rate (ErCx) 10%	1,9 mg/l	algae	ECHA	73 h

12.2 Process of degradability

The substance is readily biodegradable.
Theoretical Oxygen Demand: 3,165 mg/mg
Theoretical Carbon Dioxide: 3,316 mg/mg

Process	Degradation rate	Time
carbon dioxide generation	50 %	13 d
oxygen depletion	90 %	28 d

12.3 Bioaccumulative potential

Does not significantly accumulate in organisms.

n-octanol/water (log KOW)	3,15 (pH value: 7, 20 °C)
BCF	>5,5 – <12,2 (ECHA)

12.4 Mobility in soil

Henry's law constant	623 $^{Pa\ m^3}/_{mol}$ at 25 °C
The Organic Carbon normalised adsorption coefficient	2,73

12.5 Results of PBT and vPvB assessment

Data are not available.

12.6 Other adverse effects

Data are not available.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

This material and its container must be disposed of as hazardous waste. Dispose of contents/container in accordance with local/regional/national/international regulations.

Sewage disposal-relevant information

Do not empty into drains.

Waste treatment of containers/packagings

It is a dangerous waste; only packagings which are approved (e.g. acc. to ADR) may be used.

Sewage disposal-relevant information

Do not empty into drains.

Waste treatment of containers/packagings

It is a dangerous waste; only packagings which are approved (e.g. acc. to ADR) may be used.

13.2 Relevant provisions relating to waste

The allocation of waste identity numbers/waste descriptions must be carried out according to the EEC, specific to the industry and process.

13.3 Remarks

Waste shall be separated into the categories that can be handled separately by the local or national waste management facilities. Please consider the relevant national or regional provisions.

SECTION 14: Transport information

14.1	UN number	**1307**
14.2	UN proper shipping name	**XYLENES**
	Hazardous ingredients	p-Xylene
14.3	Transport hazard class(es)	
	Class	3 (flammable liquids)
14.4	Packing group	III (substance presenting low danger)
14.5	Environmental hazards	none (non-environmentally hazardous acc. to the dangerous goods regulations)

14.6 Special precautions for user

Provisions for dangerous goods (ADR) should be complied within the premises.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code

The cargo is not intended to be carried in bulk.

14.8 Information for each of the UN Model Regulations

• Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN)

UN number	1307
Proper shipping name	XYLENES
Particulars in the transport document	UN1307, XYLENES, 3, III, (D/E)
Class	3
Classification code	F1
Packing group	III
Danger label(s)	3

Excepted quantities (EQ)	E1
Limited quantities (LQ)	5 L
Transport category (TC)	3
Tunnel restriction code (TRC)	D/E
Hazard identification No	30

• International Maritime Dangerous Goods Code (IMDG)

UN number	1307
Proper shipping name	XYLENES
Particulars in the shipper's declaration	UN1307, XYLENES, 3, III, 27°C c.c.
Class	3

Marine pollutant	-
Packing group	III
Danger label(s)	3

Special provisions (SP)	223
Excepted quantities (EQ)	E1
Limited quantities (LQ)	5 L
EmS	F-E, S-D
Stowage category	A

• International Civil Aviation Organization (ICAO-IATA/DGR)

UN number	1307
Proper shipping name	Xylenes
Particulars in the shipper's declaration	UN1307, Xylenes, 3, III
Class	3
Packing group	III
Danger label(s)	3

Special provisions (SP)	A3
Excepted quantities (EQ)	E1
Limited quantities (LQ)	10 L

SECTION 15: Regulatory information

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

Relevant provisions of the European Union (EU)

• Regulation 649/2012/EU concerning the export and import of hazardous chemicals (PIC)

Not listed.

• Regulation 1005/2009/EC on substances that deplete the ozone layer (ODS)

Not listed.

• Regulation 850/2004/EC on persistent organic pollutants (POP)

Not listed.

• Restrictions according to REACH, Annex XVII

Name of substance	CAS No	Wt%	Type of registration	Conditions of restriction	No
p-Xylene		100	1907/2006/EC annex XVII	R3	3
p-Xylene		100	1907/2006/EC annex XVII	R40	40

Legend

R3 1. Shall not be used in:
- ornamental articles intended to produce light or colour effects by means of different phases, for example in ornamental lamps and ashtrays,
- tricks and jokes,
- games for one or more participants, or any article intended to be used as such, even with ornamental aspects,

2. Articles not complying with paragraph 1 shall not be placed on the market.
3. Shall not be placed on the market if they contain a colouring agent, unless required for fiscal reasons, or perfume, or both, if they:
- can be used as fuel in decorative oil lamps for supply to the general public, and,
- present an aspiration hazard and are labelled with R65 or H304,

4. Decorative oil lamps for supply to the general public shall not be placed on the market unless they conform to the European Standard on Decorative oil lamps (EN 14059) adopted by the European Committee for Standardisation (CEN).
5. Without prejudice to the implementation of other Community provisions relating to the classification, packaging and labelling of dangerous substances and mixtures, suppliers shall ensure, before the placing on the market, that the following requirements are met:
(a) lamp oils, labelled with R65 or H304, intended for supply to the general public are visibly, legibly and indelibly marked as follows: 'Keep lamps filled with this liquid out of the reach of children'; and, by 1 December 2010, 'Just a sip of lamp oil - or even sucking the wick of lamps - may lead to life-threatening lung damage';
(b) grill lighter fluids, labelled with R65 or H304, intended for supply to the general public are legibly and indelibly marked by 1 December 2010 as follows: 'Just a sip of grill lighter may lead to life threatening lung damage';
(c) lamp oils and grill lighters, labelled with R65 or H304, intended for supply to the general public are packaged in black opaque containers not exceeding 1 litre by 1 December 2010.
6. No later than 1 June 2014, the Commission shall request the European Chemicals Agency to prepare a dossier, in accordance with Article 69 of the present Regulation with a view to ban, if appropriate, grill lighter fluids and fuel for decorative lamps, labelled R65 or H304, intended for supply to the general public.
7. Natural or legal persons placing on the market for the first time lamp oils and grill lighter fluids, labelled with R65 or H304, shall by 1 December 2011, and annually thereafter, provide data on alternatives to lamp oils and grill lighter fluids labelled R65 or H304 to the competent authority in the Member State concerned. Member States shall make those data available to the Commission.

R40 1. Shall not be used, as substance or as mixtures in aerosol dispensers where these aerosol dispensers are intended for supply to the general public for entertainment and decorative purposes such as the following:
- metallic glitter intended mainly for decoration,
- artificial snow and frost,
- 'whoopee' cushions,
- silly string aerosols,
- imitation excrement,
- horns for parties,
- decorative flakes and foams,
- artificial cobwebs,
- stink bombs.

2. Without prejudice to the application of other Community provisions on the classification, packaging and labelling of substances, suppliers shall ensure before the placing on the market that the packaging of aerosol dispensers referred to above is marked visibly, legibly and indelibly with:
'For professional users only'.
3. By way of derogation, paragraphs 1 and 2 shall not apply to the aerosol dispensers referred to Article 8 (1a) of Council Directive 75/324/EEC (2).
4. The aerosol dispensers referred to in paragraphs 1 and 2 shall not be placed on the market unless they conform to the requirements indicated.

• Restrictions according to REACH, Title VIII

None.

• List of substances subject to authorisation (REACH, Annex XIV)/SVHC - candidate list

not listed

• Seveso Directive

2012/18/EU (Seveso III)				
No	**Dangerous substance/hazard categories**	**Qualifying quantity (tonnes) for the application of lower and upper-tier requirements**		**Notes**
P5c	flammable liquids (cat. 2, 3)	5.000	50.000	51)

Notation
51) Flammable liquids, categories 2 or 3 not covered by P5a and P5b

• Directive 75/324/EEC relating to aerosol dispensers

Filling batch
Deco-Paint Directive (2004/42/EC)

VOC content	100 % 860 g/l

Directive on industrial emissions (VOCs, 2010/75/EU)

VOC content	100 %
VOC content	860 g/l

Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) - Annex II

not listed

Regulation 166/2006/EC concerning the establishment of a European Pollutant Release and Transfer Register (PRTR)

not listed

Directive 2000/60/EC establishing a framework for Community action in the field of water policy (WFD)

not listed

Regulation 98/2013/EU on the marketing and use of explosives precursors

not listed

Regulation 111/2005/EC laying down rules for the monitoring of trade between the Community and third countries in drug precursors

not listed

National inventories

Substance is listed in the following national inventories:

Country	National inventories	Status
AU	AICS	substance is listed
CA	DSL	substance is listed
CN	IECSC	substance is listed
EU	ECSI	substance is listed
EU	REACH Reg.	substance is listed
JP	CSCL-ENCS	substance is listed

Country	National inventories	Status
JP	ISHA-ENCS	substance is listed
KR	KECI	substance is listed
MX	INSQ	substance is listed
NZ	NZIoC	substance is listed
PH	PICCS	substance is listed
TR	CICR	substance is listed
TW	TCSI	substance is listed
US	TSCA	substance is listed

Legend

AICS	Australian Inventory of Chemical Substances
CICR	Chemical Inventory and Control Regulation
CSCL-ENCS	List of Existing and New Chemical Substances (CSCL-ENCS)
DSL	Domestic Substances List (DSL)
ECSI	EC Substance Inventory (EINECS, ELINCS, NLP)
IECSC	Inventory of Existing Chemical Substances Produced or Imported in China
INSQ	National Inventory of Chemical Substances
ISHA-ENCS	Inventory of Existing and New Chemical Substances (ISHA-ENCS)
KECI	Korea Existing Chemicals Inventory
NZIoC	New Zealand Inventory of Chemicals
PICCS	Philippine Inventory of Chemicals and Chemical Substances
REACH Reg.	REACH registered substances
TCSI	Taiwan Chemical Substance Inventory
TSCA	Toxic Substance Control Act

15.2 Chemical Safety Assessment

No Chemical Safety Assessment has been carried out for this substance.

SECTION 16: Other information

Abbreviations and acronyms

Abbr.	Descriptions of used abbreviations
2000/39/EC	Commission Directive establishing a first list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC
ADN	Accord européen relatif au transport international des marchandises dangereuses par voies de navigation intérieures (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways)
ADR	Accord européen relatif au transport international des marchandises dangereuses par route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
BCF	bioconcentration factor
CAP. 424	Occupational Health and Safety Authority Act (CAP. 424)
CAS	Chemical Abstracts Service (service that maintains the most comprehensive list of chemical substances)
CLP	Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures
CMR	Carcinogenic, Mutagenic or toxic for Reproduction
DGR	Dangerous Goods Regulations (see IATA/DGR)
DMEL	Derived Minimal Effect Level
DNEL	Derived No-Effect Level
EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of Notified Chemical Substances

Abbr.	Descriptions of used abbreviations
EmS	Emergency Schedule
GHS	"Globally Harmonized System of Classification and Labelling of Chemicals" developed by the United Nations
IATA	International Air Transport Association
IATA/DGR	Dangerous Goods Regulations (DGR) for the air transport (IATA)
ICAO	International Civil Aviation Organization
IMDG	International Maritime Dangerous Goods Code
index No	the Index number is the identification code given to the substance in Part 3 of Annex VI to Regulation (EC) No 1272/2008
IOELV	indicative occupational exposure limit value
MARPOL	International Convention for the Prevention of Pollution from Ships (abbr. of "Marine Pollutant")
NLP	No-Longer Polymer
PBT	Persistent, Bioaccumulative and Toxic
PNEC	Predicted No-Effect Concentration
ppm	parts per million
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RID	Règlement concernant le transport International ferroviaire des marchandises Dangereuses (Regulations concerning the International carriage of Dangerous goods by Rail)
STEL	short-term exposure limit
SVHC	Substance of Very High Concern
TWA	time-weighted average
VOC	Volatile Organic Compounds
vPvB	very Persistent and very Bioaccumulative

Key literature references and sources for data

- Regulation (EC) No. 1907/2006 (REACH), amended by 2015/830/EU
- Regulation (EC) No. 1272/2008 (CLP, EU GHS)
- Dangerous Goods Regulations (DGR) for the air transport (IATA)
- International Maritime Dangerous Goods Code (IMDG)

List of relevant phrases (code and full text as stated in chapter 2 and 3)

Code	Text
H226	flammable liquid and vapour
H304	may be fatal if swallowed and enters airways
H312	harmful in contact with skin
H315	causes skin irritation
H319	causes serious eye irritation
H332	harmful if inhaled
H335	may cause respiratory irritation

Disclaimer

The above information describes exclusively the safety requirements of the product and is based on our present-day knowledge. The information is intended to give you advice about the safe handling of the product named in this safety data sheet, for storage, processing, transport and disposal. The information cannot be transferred to other products. In the case of mixing the product with other products or in the case of processing, the information on this safety data sheet is not necessarily valid for the new made-up material.

SAFETY DATA SHEET

Creation Date 01-Jul-2010 **Revision Date** 10-Feb-2015 **Revision Number** 1

1. Identification

Product Name **Pyrene**

Cat No. : **AC180830000; AC180830250; AC180831000; AC180835000**

Synonyms Benzo[def]phenanthrene

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
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Liver.	

Label Elements

Signal Word
Warning

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause drowsiness or dizziness
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Do not get in eyes, on skin, or on clothing
Response
Get medical attention/advice 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
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
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 with long lasting effects

3. Composition / information on ingredients

Component	CAS-No	Weight %
Pyrene	129-00-0	>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. Obtain medical attention.

Ingestion Do not induce vomiting. Obtain medical attention.

Most important symptoms/effects No information available.
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	210 °C / 410 °F
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
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. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
2	1	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation.
Environmental Precautions	Should not be released into the environment. 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. Avoid dust formation.

7. Handling and storage

Handling	Ensure adequate ventilation. Wear personal protective equipment. Avoid contact with skin, eyes and clothing. Avoid dust formation. Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid ingestion and inhalation.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place.

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	Yellow
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	148 - 152 °C / 298 - 306 °F
Boiling Point/Range	393 °C / 739.4 °F @ 760 mmHg
Flash Point	210 °C / 410 °F
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
Relative Density	No information available
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	C16 H10
Molecular Weight	202.25

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation.

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 No acute toxicity information is available for this product

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Pyrene	2700 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 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
Pyrene	129-00-0	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 Central nervous system (CNS)
STOT - repeated exposure Liver

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available
Endocrine Disruptor Information No information available

Other Adverse Effects Tumorigenic effects have been reported in experimental animals. 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. Do not empty into drains. Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Pyrene	Not listed	Oncorhynchus mykiss: LC50 > 2mg/L 96h	Not listed	EC50 48h 1.8 mg/L EC50 48h 0.002-0.003 mg/L

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

Mobility .

Component	log Pow
Pyrene	4.88

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.

14. Transport information

DOT
- **UN-No** UN3077
- **Proper Shipping Name** Environmentally hazardous substance, solid, n.o.s
- **Proper technical name** Pyrene
- **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
Pyrene	X	X	-	204-927-3	-		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

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Pyrene	-	-	X	X

Clean Air Act Not applicable

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
Pyrene	5000 lb	5000 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
Pyrene	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 01-Jul-2010
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

MATERIAL SAFETY DATA SHEET

(POLYCHLORINATED BIPHENYLS)

COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients Name: polychlorinated biphenyls (PCBs)

HAZARD IDENTIFICATION

Reports of Carcinogenicity: YES

HEALTH HAZARDS ACUTE AND CHRONIC

- **Eyes**: Moderately irritating to eye tissues.
- **Skin**: Can be absorbed through intact skin, may cause de-fatting, potential for chloracne.
- **Inhalation**: Possible liver injury.
- **Ingestion**: Slightly toxic; reasonably anticipated to be carcinogenic.

EFFECTS OF OVER-EXPOSURE

Can cause dermatological symptoms; however, these are reversible upon removal of exposure source.

FIRST AID MEASURES

- **Eyes**: Irrigate immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCBs get into them.
- **Skin:** Contaminated clothing should be removed and the skin washed thoroughly with soap and water. Hot PCBs may cause thermal burns.
- **Inhalation**: Remove to fresh air; if skin rash or respiratory irritation persists, consult a physician (if electrical equipment arcs over, PCBs may decompose to produce hydrochloric acid).
- **Ingestion**: Consult a physician. Do not induce vomiting or give any oily laxatives. (If large amounts are ingested, gastric lavage is suggested).

FIRE FIGHTING MEASURES: Flash Point: >141 ^{o}C (285.8 ^{o}F)

EXTINGUISHING MEDIA: PCBs are fire-resistant compounds.

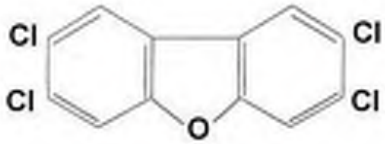
FIRE-FIGHTING PROCEDURES

Standard fire-fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chemical combustion products. Fire fighting equipment should be thoroughly cleaned and decontaminated after use.

UNUSUAL FIRE/EXPLOSION HAZARD

If a PCB transformer is involved in a fire-related incident, the owner of the transformer is required to report the incident. Consult and follow appropriate federal, provincial and local regulations.

***Note**: When askarel liquid becomes involved in a fire, toxic by-products of combustion are typically produced including polychlorinated dibenzofurans and polychlorinated dibenzodioxins, both known carcinogens. The structures of these chemical species are as follows:*

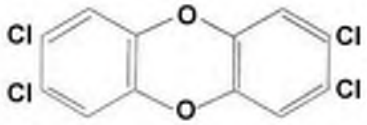


$C_{12}H_{8-n}Cl_nO$

$n = 4 - 8$

TCDF

2,3,7,8-tetrachlorodibenzofuran



$C_{12}H_{8-n}Cl_nO_2$

$n = 4 - 8$

TCDD

2,3,7,8-tetrachloro-dibenzo-p-dioxin

***Note**: 2,3,7,8-tetrachloro-dibenzo-p-dioxin is one of the most potent teratogenic, mutagenic and carcinogenic agents known to man.*

SPILL RELEASE PROCEDURES

Cleanup & disposal of liquid PCBs are strictly regulated by the federal government. Ventilate area. Contain spill/leak. Remove spill by means of absorptive material. Spill clean-up personnel should use proper protective clothing. All wastes and residues containing PCBs should be collected, containerized, marked and disposed of in the manner prescribed by applicable federal, provincial and local laws.

HANDLING AND STORAGE PRECAUTIONS

Care should be taken to prevent entry into the environment through spills, leakage, use, vaporization, or disposal of liquid. Avoid prolonged breathing of vapours or mists. Avoid contact with eyes or prolonged contact with skin. Comply with all federal, provincial and local regulations.

OTHER PRECAUTIONS

Federal regulations require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be appropriately labelled.

RESPIRATORY PROTECTION

Use OHSA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended and, if used, replaces need for face shield and/or chemical splash goggles. The respirator use limitations specified by the manufacturer must be observed.

VENTILATION

Provide natural or mechanical ventilation to control exposure levels below airborne exposure levels.

PROTECTIVE GLOVES: Wear appropriate chemical resistant gloves to prevent skin contact.

EYE PROTECTION: Wear chemical splash goggles and have eye baths available.

OTHER PROTECTIVE EQUIPMENT

Wear appropriate protective clothing. Provide a safety shower at any location where skin contact can occur.

WORK HYGIENIC PRACTICES

Wash thoroughly after handling. Supplemental safety and health : none

PHYSICAL/CHEMICAL PROPERTIES

- **Vapour pressure:** (mm Hg @100 ^{o}F) 0.005 - 0.00006
- **Viscosity:** (CENTISTOKES) 3.6 - 540
- **Stability indicator/materials to avoid:** Yes
- **Stability Condition to Avoid:** PCBs are very stable, fire-resistant compounds.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide, hydrogen chloride, phenolics, aldehydes, furans, dioxins

WASTE DISPOSAL METHODS

Consult the applicable PCB regulations prior to any disposal of PCBs or PCB-contaminated items.

Material Safety Data Sheet

sec-Butylbenzene, 99+%

MSDS# 73785

Section 1 - Chemical Product and Company Identification

MSDS Name:	sec-Butylbenzene, 99+%
Catalog Numbers:	AC107860000, AC107860050, AC107860500, AC107861000, AC107862500, AC107865000 AC107865000
Synonyms:	2-Phenylbutane; Benzene, (1-methylpropyl)-; (1-Methylpropyl)benzene; Benzene, sec-butyl-
Company Identification:	Acros Organics BVBA Janssen Pharmaceuticalaan 3a 2440 Geel, Belgium
Company Identification: (USA)	Acros Organics One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	800-ACROS-01
For information in Europe, call:	+32 14 57 52 11
Emergency Number, Europe:	+32 14 57 52 99
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300
CHEMTREC Phone Number, Europe:	703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#:	135-98-8
Chemical Name:	sec-Butylbenzene
%:	99+
EINECS#:	205-227-0

Hazard Symbols: XI

Risk Phrases: 10 36/37/38

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Warning! Flammable liquid and vapor. May cause central nervous system depression. Causes eye, skin, and respiratory tract irritation. Target Organs: Central nervous system.

Potential Health Effects

Eye:	Causes eye irritation.
Skin:	Causes skin irritation.
Ingestion:	May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Ingestion of large amounts may cause CNS depression.
Inhalation:	Causes respiratory tract irritation.
Chronic:	Prolonged or repeated skin contact may cause dermatitis.

Section 4 - First Aid Measures

Eyes:	Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin:	Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion:	Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation:	Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician:	Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information:	As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Flammable liquid and vapor.
Extinguishing Media:	For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. Use agent most appropriate to extinguish fire. Do NOT use straight streams of water.
Autoignition Temperature:	415 deg C (779.00 deg F)
Flash Point:	45 deg C (113.00 deg F)
Explosion Limits: Lower:	0.80 vol %
Explosion Limits: Upper:	6.90 vol %
NFPA Rating:	health: 2; flammability: 2; instability: 0;

Section 6 - Accidental Release Measures

General Information:	Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks:	Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling:	Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage:	Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
sec-Butylbenzene	none listed	none listed	none listed

OSHA Vacated PELs: sec-Butylbenzene: None listed

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

Exposure Limits

Personal Protective Equipment

Eyes:	Wear chemical splash goggles.
Skin:	Wear appropriate protective gloves to prevent skin exposure.
Clothing:	Wear appropriate protective clothing to prevent skin exposure.
Respirators:	A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State:	Liquid
Color:	clear colorless
Odor:	None reported.
pH:	Not available
Vapor Pressure:	4 mm Hg @ 37.7 deg C
Vapor Density:	4.62
Evaporation Rate:	Not available
Viscosity:	Not available
Boiling Point:	173 - 174 deg C @ 760 mm Hg
Freezing/Melting Point:	-75 deg C (-103.00°F)
Decomposition Temperature:	Not available
Solubility in water:	0.015 g/L water
Specific Gravity/Density:	0.8630 g/cm3
Molecular Formula:	C10H14
Molecular Weight:	134.22

Section 10 - Stability and Reactivity

Chemical Stability:	Stable under normal temperatures and pressures.
Conditions to Avoid:	Ignition sources, excess heat.
Incompatibilities with Other Materials	Strong oxidizing agents.
Hazardous Decomposition Products	Carbon monoxide, carbon monoxide, carbon dioxide.
Hazardous Polymerization	Has not been reported.

Section 11 - Toxicological Information

RTECS#:	CAS# 135-98-8: CY9100000
LD50/LC50:	RTECS: **CAS# 135-98-8:** Draize test, rabbit, eye: 500 mg/24H Mild; Draize test, rabbit, skin: 100 mg/24H Moderate; Oral, mouse: LD50 = 8700 mg/kg; Oral, rat: LD50 = 2240 uL/kg; Oral, rat: LD50 = 6300 mg/kg; Skin, rabbit: LD50 = >16 mL/kg; .
Carcinogenicity:	sec-Butylbenzene - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.
Other:	See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Not available

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: BUTYL BENZENES
Hazard Class: 3
UN Number: UN2709
Packing Group: III
Canada TDG

Shipping Name: Not available
Hazard Class:
UN Number:
Packing Group:

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XI

Risk Phrases:

R 10 Flammable.

R 36/37/38 Irritating to eyes, respiratory system and skin.

Safety Phrases:

S 9 Keep container in a well-ventilated place.

S 16 Keep away from sources of ignition - No smoking.

S 33 Take precautionary measures against static discharges.

WGK (Water Danger/Protection)

CAS# 135-98-8: 1

Canada

CAS# 135-98-8 is listed on Canada's DSL List

Canadian WHMIS Classifications: B3, D2B

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

CAS# 135-98-8 is not listed on Canada's Ingredient Disclosure List.

US Federal

TSCA

CAS# 135-98-8 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 9/02/1997

Revision #9 Date 7/20/2009

SAFETY DATA SHEET

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

1. Identification

Product Name **Selenium**

Cat No. : **AC419270000; AC419271000; AC419275000**

Synonyms None

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

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

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)

Acute oral toxicity	Category 3
Acute Inhalation Toxicity - Dusts and Mists	Category 3
Specific target organ toxicity - (repeated exposure)	Category 2

Label Elements

Signal Word
Danger

Hazard Statements
Toxic if swallowed
Toxic if inhaled
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention

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
Get medical attention/advice 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
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
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)
May cause long lasting harmful effects to aquatic life

3. Composition / information on ingredients

Component	CAS-No	Weight %
Selenium	7782-49-2	> 99.5

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 soap and plenty of water while removing all contaminated clothes and shoes.

Inhalation Remove from exposure, lie down. Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Immediate medical attention is required.

Ingestion Do not induce vomiting. Never give anything by mouth to an unconscious person. Drink plenty of water. Call a physician immediately. If possible drink milk afterwards.

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 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

Vapors may form explosive mixtures with air.

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	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 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. Use only in area provided with appropriate exhaust ventilation.

Storage Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep under nitrogen.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Selenium	TWA: 0.2 mg/m³	(Vacated) TWA: 0.2 mg/m³	IDLH: 1 mg/m³ TWA: 0.2 mg/m³

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Selenium	TWA: 0.2 mg/m³	TWA: 0.2 mg/m³	TWA: 0.2 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 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 A NIOSH/MSHA approved air purifying dust or mist respirator or European Standard EN 149.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Grey
Odor	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	217 - 222 °C / 422.6 - 431.6 °F
Boiling Point/Range	685 °C / 1265 °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 mmHg @ 345 °C
Vapor Density	No information available
Relative Density	4.810
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	Se
Molecular Weight	78.96

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Acids, Strong oxidizing agents, Fluorine, oxygen, Metals

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 No acute toxicity information is available for this product

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Selenium	6700 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.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Selenium	7782-49-2	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 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 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.

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** UN3283
- **Hazard Class** 6.1
- **Packing Group** III

TDG
- **UN-No** UN3283
- **Hazard Class** 6.1
- **Packing Group** III

IATA
- **UN-No** 3283
- **Proper Shipping Name** SELENIUM COMPOUND, SOLID, N.O.S.
- **Hazard Class** 6.1
- **Packing Group** III

IMDG/IMO
- **UN-No** 3283
- **Proper Shipping Name** SELENIUM COMPOUND, SOLID, N.O.S.
- **Hazard Class** 6.1
- **Packing Group** III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Selenium	X	X	-	231-957-4	-		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 %
Selenium	7782-49-2	> 99.5	1.0

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
Selenium	-	-	X	X

Clean Air Act Not applicable

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Selenium	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
Selenium	100 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
Selenium	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 D1A Very toxic materials
D2B 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
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End of SDS

SAFETY DATA SHEET

Version 4.6
Revision Date 12/02/2015
Print Date 02/09/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Silver

Product Number : 327093
Brand : Aldrich

CAS-No. : 7440-22-4

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 # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : Ag
Molecular weight : 107.87 g/mol
CAS-No. : 7440-22-4
EC-No. : 231-131-3

Hazardous components

Component	Classification	Concentration
Silver		
		<= 100 %

4. FIRST AID MEASURES

4.1 Description of first aid measures

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Silver/silver oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions
No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

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

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

Air sensitive. Store under inert gas. 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
Silver	7440-22-4	TWA	0.010000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.010000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Argyria		
		TWA	0.010000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.010000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.010000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Argyria		
		TWA	0.010000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Argyria		
		TWA	0.01 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants

8.2 Exposure controls

Appropriate engineering controls
General industrial hygiene practice.

Personal protective equipment

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
No special environmental precautions required.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 960 °C (1,760 °F) - lit.
f)	Initial boiling point and boiling range	2,212 °C (4,014 °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	10.49 g/cm3
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
Oxygen, Strong acids and strong bases

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - > 5,000 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

Carcinogenicity - Rat - Unreported
Tumorigenic:Tumors at site or application.

Carcinogenicity classification not possible from current data.

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: Not available

May cause argyria (a slate-gray or bluish discoloration of the skin and deep tissues due to the deposit of insoluble albuminate of silver).

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.

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. (Silver)
Reportable Quantity (RQ): 1 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
Silver	7440-22-4	1993-04-24

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Silver	7440-22-4	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date

Silver	7440-22-4	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Silver	7440-22-4	1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

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: 12/02/2015 Print Date: 02/09/2016

SAFETY DATA SHEET

Version 4.11
Revision Date 03/05/2015
Print Date 02/07/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Sodium
Product Number	:	483745
Brand	:	Aldrich
CAS-No.	:	7440-23-5

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Carcinogenicity (Category 1A), H350

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)

H260	In contact with water releases flammable gases which may ignite spontaneously.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H350	May cause cancer.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P223	Keep away from any possible contact with water, because of violent reaction and possible flash fire.

P231 + P232	Handle under inert gas. Protect from moisture.
P260	Do not breathe dust or mist.
P264	Wash skin thoroughly after handling.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P281	Use personal protective equipment as required.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
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

Reacts violently with water.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula : Na
Molecular weight : 22.99 g/mol

Hazardous components

Component		Classification	Concentration
Sodium			
CAS-No. EC-No. Index-No.	7440-23-5 231-132-9 011-001-00-0	Water-react. 1; Skin Corr. 1B; Eye Dam. 1; H260, H314	>= 90 - <= 100 %
Paraffin oils			
CAS-No. EC-No.	8012-95-1 232-384-2	Carc. 1A; H350	>= 90 - <= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
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
Take off contaminated clothing and shoes immediately. 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.Continue rinsing eyes during transport to hospital.

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
Dry powder

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
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. 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.Keep away from sources of ignition - No smoking.
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.
Never allow product to get in contact with water during storage.

Handle and store under inert gas. Air sensitive.
Storage class (TRGS 510): Hazardous materials, which set free flammable gases upon contact with water

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
Paraffin oils	8012-95-1	STEL	10.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 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	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation 2014 Adoption Not classifiable as a human carcinogen		
		Upper Respiratory Tract irritation 2014 Adoption Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen		
		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
		Upper Respiratory Tract irritation Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen		
		TWA	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Upper Respiratory Tract irritation Exposure by all routes should be carefully controlled to levels as low as possible. 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
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, Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Pieces
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 97.8 °C (208.0 °F) - lit.
f)	Initial boiling point and boiling range	883 °C (1,621 °F) - lit.
g)	Flash point	82 °C (180 °F)
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	0.97 g/cm3

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
Reacts violently with water.

10.4 Conditions to avoid
Air Do not allow water to enter container.
Exposure to moisture

10.5 Incompatible materials
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 (Paraffin oils)

NTP: Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Paraffin oils)

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

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Aspiration may lead to:, lipid pneumonia, Effects due to ingestion may include:, laxative effect, Gastrointestinal disturbance, 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
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. 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: 1428 Class: 4.3 Packing group: I
Proper shipping name: Sodium
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1428 Class: 4.3 Packing group: I EMS-No: F-G, S-N
Proper shipping name: SODIUM

IATA
UN number: 1428 Class: 4.3 Packing group: I
Proper shipping name: Sodium
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
Reactivity Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Sodium	7440-23-5	1993-04-24
Paraffin oils	8012-95-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Sodium	7440-23-5	1993-04-24
Paraffin oils	8012-95-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Sodium	7440-23-5	1993-04-24
Paraffin oils	8012-95-1	2007-03-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Paraffin oils	8012-95-1	1987-02-27

16. OTHER INFORMATION

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

Carc.	Carcinogenicity
Eye Dam.	Serious eye damage
H260	In contact with water releases flammable gases which may ignite spontaneously.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H350	May cause cancer.
Skin Corr.	Skin corrosion
Water-react.	Substances and mixtures, which in contact with water, emit flammable gases

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	2

NFPA Rating

Health hazard:	3
Fire Hazard:	4
Reactivity Hazard:	2
Special hazard.I:	W

Further information

Preparation Information

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

Version: 4.11 Revision Date: 03/05/2015 Print Date: 02/07/2016

SAFETY DATA SHEET

Version 3.14
Revision Date 12/02/2015
Print Date 02/18/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Styrene
Product Number	:	240869
Brand	:	Aldrich
Index-No.	:	601-026-00-0
CAS-No.	:	100-42-5

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)
Flammable liquids (Category 3), H226
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - repeated exposure (Category 1), H372
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

Signal word: Danger

Hazard statement(s)

H226	Flammable liquid and vapour.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.

H372	Causes damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ 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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

Lachrymator.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Phenylethylene Vinylbenzene
Formula	:	$C_8H_8C_8H_8$
Molecular weight	:	104.15 g/mol
CAS-No.	:	100-42-5
EC-No.	:	202-851-5
Index-No.	:	601-026-00-0

Hazardous components

Component	Classification	Concentration
Styrene		
	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; Repr. 2; STOT RE 1; Aquatic Acute 2; H226, H315, H319, H332, H351, H361, H372, 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. 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
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
Carbon oxides
Container explosion may occur under fire conditions., Vapours may form explosive mixture with air.

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. Discharge into the environment must be avoided.

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.
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.

Recommended storage temperature 2 - 8 °C

Light sensitive.
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
Styrene	100-42-5	TWA	50.000000 ppm 215.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	100.000000 ppm 425.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
	Remarks	See Table Z-2		
		TWA	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		
		CEIL	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		
		Peak	600.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		
		TWA	20.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Peripheral neuropathy Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	40.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Peripheral neuropathy Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		

		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		
		Peak	600 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Styrene	100-42-5	Mandelic acid plus phenylglyoxylic acid	400mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			
		Styrene	0.2000 mg/l	In venous blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		Mandelic acid plus phenylglyoxylic acid	400mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		Styrene	40 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

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

Personal protective equipment

Eye/face protection
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: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 32 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
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	sweet
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -31 °C (-24 °F) - lit.
f)	Initial boiling point and boiling range	145 - 146 °C (293 - 295 °F) - lit.
g)	Flash point	32.0 °C (89.6 °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: 8.9 %(V) Lower explosion limit: 1.1 %(V)
k)	Vapour pressure	6 hPa (5 mmHg) at 20 °C (68 °F)
l)	Vapour density	3.6
m)	Relative density	0.906 g/cm3 at 25 °C (77 °F)
n)	Water solubility	0.05 g/l at 25 °C (77 °F) - slightly soluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	490.0 °C (914.0 °F) 480.0 °C (896.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Relative vapour density	3.6

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.
Test for peroxide formation before distillation or evaporation. Test for peroxide formation or discard after 1 year.
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.Vapours may form explosive mixture with air.

10.4 Conditions to avoid
May polymerize on exposure to light.
Heat, flames and sparks.

10.5 Incompatible materials
Oxidizing agents, Copper

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 - > 6,000 mg/kg

LC50 Inhalation - Rat - 4 h - 12,000 mg/m3

LD50 Dermal - Rat - male and female - > 2,000 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation - 24 h

Respiratory or skin sensitisation
Maximisation Test (GPMT) - Guinea pig
Does not cause skin sensitisation.
(OECD Test Guideline 406)

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.

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.

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Styrene)
NTP:	Reasonably anticipated to be a human carcinogen (Styrene)
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
Suspected of damaging the unborn child. Suspected human reproductive toxicant

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard
No data available

Additional Information
RTECS: WL3675000

Dermatitis, Central nervous system depression, Nausea, Dizziness, Headache, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Endocrine system. -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	NOEC - Pimephales promelas (fathead minnow) - 4 mg/l - 96 h
	LC50 - Pimephales promelas (fathead minnow) - 32 mg/l - 96 h
	LOEC - Pimephales promelas (fathead minnow) - 7.6 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 4.7 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	IC50 - Pseudokirchneriella subcapitata (green algae) - 1.4 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: > 60 % - Readily biodegradable

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.

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: 2055 Class: 3 Packing group: III
Proper shipping name: Styrene monomer, stabilized
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 2055 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: STYRENE MONOMER, STABILIZED

IATA
UN number: 2055 Class: 3 Packing group: III
Proper shipping name: Styrene monomer, stabilized

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
Styrene	100-42-5	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Styrene	100-42-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Styrene	100-42-5	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Styrene	100-42-5	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.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H226	Flammable liquid and vapour.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 3.14 Revision Date: 12/02/2015 Print Date: 02/18/2016

SAFETY DATA SHEET

Version 4.17
Revision Date 03/03/2015
Print Date 02/18/2016

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 Not classifiable as a human carcinogen		
		C	1,000.000000 ppm 5,600.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1,000.000000 ppm 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 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) 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

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: 02/18/2016

Thallium

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Thallium Solid

Formula: Tl

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

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

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Acute toxicity - oral, category 2.

GHS Label Elements:

Signal Word: Danger

Hazard Statements: H300 Fatal if swallowed.

Precautionary Statements: P264 Wash hands thoroughly after handling, P270 Do not eat, drink or smoke when using this product, P301+P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician, P330 Rinse mouth, P405 Store locked up, P501 Dispose of contents/container in accordance with local, state or federal regulations.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Thallium

CAS#: 7440-28-0

%: 100

EC#: 231-138-1

4 FIRST AID MEASURES

General Measures: Emergency responders should take care to avoid secondary exposure to thallium if it is present. Wear appropriate protective equipment.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek immediate medical attention. If mouth-to-mouth is necessary always use a barrier or bag-valve-mask device.

INGESTION: Rinse mouth with water. Do not induce vomiting. Seek immediate medical attention. Never induce vomiting or give anything by mouth to an unconscious person.

SKIN: Remove contaminated clothing, wash affected area with soap and water taking care not to break the skin and to cover all open wounds. Seek medical attention. Contaminated clothing should be safely contained and properly disposed of.

EYES: Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention immediately.

Most Important Symptoms/Effects, Acute and Delayed: Symptoms are usually delayed and include gastrointestinal distress and neurological symptoms. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other information available.

5 FIREFIGHTING MEASURES

Extinguishing Media: Use extinguishing media suitable for surrounding materials and type of fire.

Unsuitable Extinguishing Media: No further information available.

Specific Hazards Arising from the Material: Under fire conditions, thallium may release highly toxic fumes or gases.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

Methods and Materials for Containment and Cleaning Up: Scoop up or vacuum with a system utilizing a HEPA filtration system and place in properly labeled sealed containers. Special precautions must be taken when changing filters on HEPA vacuum cleaners used to clean up hazardous materials. Avoid creating dusts. Avoid contamination of air and water.

Environmental Precautions: Do not allow to enter drains or to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: Wear appropriate respiratory and protective equipment specified in section 8. Only trained personnel should work with this product. Handle in a well-ventilated area. Avoid exposure to high temperature. Avoid breathing fumes. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking.

Conditions for Safe Storage, Including Any Incompatibilities: Store under dry, inert gas such as argon, or can also be stored under deaerated water. Store in sealed unbreakable containers; the original labeled shipping container when possible. Store in an area that is cool, dry and temperature-controlled, away from direct sunlight, heat and ignition sources or where freezing is possible. Do not store together with acids, halogens or oxidizers. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Thallium (Soluble compounds, as Tl)

OSHA/PEL: 0.1 mg/m^3

ACGIH/TLV: 0.02 mg/m^3(inhalable)

Appropriate Engineering Controls: Handle in an enclosed, controlled process under dry argon. Whenever possible the use of local exhaust ventilation, process enclosure or other engineering controls is the preferred method of controlling exposure to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Clothing worn in areas of exposure to thallium dust or vapor should be restricted to the workplace and stored in special lockers.

Individual Protection Measures, Such as Personal Protective Equipment:

Respiratory Protection: When potential exposures are above the occupational limits, approved respirators must be used.

Eye Protection: Splash goggles or safety glasses.

Skin Protection: Wear impermeable gloves, protective work clothing as necessary.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Rod

Color: Gray metallic

Odor: Odorless

Odor Threshold: Not determined

pH: N/A

Melting Point: 303.5 ^{o}C

Boiling Point: 1457±10 ^{o}C

Flash Point: N/A

Evaporation Rate: N/A

Flammability: No data

Upper Flammable Limit: No data

Lower Flammable Limit: No data

Vapor Pressure: 1 mm Hg @ 825 ^{o}C

Vapor Density: N/A

Relative Density (Specific Gravity): 11.85 g/cc

Solubility in H_2O: Insoluble

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: High temperatures will generate toxic thallium oxide fumes.

Conditions to Avoid: Avoid high temperatures, reacts slowly with moist air.

Incompatible Materials: Oxidizing agents, strong acids, halogens, air and moisture.

Hazardous Decomposition Products: Thallium oxide fume.

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin and eyes.

Symptoms of Exposure: Abdominal pain and vomiting, extreme pain in the extremities, lethargy, hair loss.

Acute and Chronic Effects: Almost all of the available information refers to ingestion of thallium compounds, largely due to accidental ingestion, intentional poisoning and suicide attempts. Adverse reactions are dose dependent and occur in 3 stages. Massive doses may cause gastrointestinal distress (nausea, vomiting and abdominal pain) within 30 minutes but symptoms are usually delayed for 8 hours or longer. Gastrointestinal symptoms from smaller doses may

be delayed 24-48 hours. This is followed by neurological effects 2-5 days or even longer after ingestion, although it may occur as early as 12 hours after massive exposure. Other effects include hair loss, severe pain in the extremities, lethargy, ataxia, back pain, abnormal reflexes, neuropathy, muscle weakness, mental abnormalities, tremors, abnormal vision, headache, coma, convulsion, and death. There was no information available for exposure to thallium metal specifically rather than thallium compounds, and little conclusive information regarding exposure via inhalation.

Acute Toxicity: No data

Carcinogenicity: **NTP**: Not identified as carcinogenic **IARC**: Not identified as carcinogenic

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: LC50 - Cyprinodon variegatus (sheepshead minnow) - 21.0 mg/l - 96.0 h

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Do not allow material to be released to the environment. No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

UN Number: UN3288

UN Proper Shipping Name: Toxic solid, inorganic, n.o.s. (Thallium)

Transport Hazard Class: 6.1

Packing Group: II

Marine Pollutant: Yes

15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): Acute toxicity - oral, category 2, Hazardous to the aquatic environment - acute hazard, category 3, Hazardous to the aquatic environment - chronic hazard, category 3.

Canada WHMIS Classification (CPR, SOR/88-66): Acute toxicity.

HMIS Ratings: **Health**: 3 **Flammability**: 0 **Physical**: 0

NFPA Ratings: **Health**: 3 **Flammability**: 0 **Instability**: 0

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: July 2015

Safety Data Sheets (SDS)

SECTION 1-IDENTIFICATION

Product name: Toluene

Other names:-

Proper shipping name: Toluene

Recommended use of the chemical and restrictions on use:
The major use of toluene is as a mixture added to gasoline to improve octane ratings. Used as a solvent for paint, resins, lacquers inks & adhesives. Component of solvent blends and thinners. Used in the manufacture of chemicals, dyes, explosives, benzoic acid. Some grades of toluene may contain traces of xylene and benzene.
The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.
WARNING: Intentional misuse by concentrating/inhaling contents may be lethal.

Manufacturer/Supplier Name: Taiwan SM Corp., Kaohsiung plant
Address: NO.7, Industrial 1st Rd, Lin-Yuan Kaohsiung County 83203, Taiwan, R.O.C.
Phone No.: 886-7-6414511

Emergency phone No./Fax No.: 886-7-6414511 Ext. 221 (on duty), 886-7-6414517 (off duty)/886-7-6423828

SECTION 2-HAZARDS IDENTIFICATION

GHS Classification:

Flammable Liquid Category 2
Acute Toxicity (Oral) Category 4
Skin Corrosion/ Irritation Category 2
Serious Eye Damage/ Eye Irritation Category 2
Specific Target Organ Toxicity Repeated Exposure Category 2
Hazardous To The Aquatic Environment (Acute) Category 3
Aspiration Hazard Category 1

GHS Label elements:

Hazard symbols

Signal word

Danger

Hazard statements

Highly flammable liquid and vapor
Harmful if inhaled
Causes skin irritation
Causes serious eye irritation
May cause damage to organs through prolonged or repeated exposure.
May cause long lasting harmful effects to aquatic life.
May be fatal if swallowed and enters airways.

Precautionary statements

Use only in well ventilated area.
Control of exposure by mechanical ventilation in an unventilated or confined space.
Avoid breathing vapors and contact with skin and eyes.
Wear breathing apparatus/protective gloves/face protection.
Store in well-ventilated place.
Disposal must be in accordance with applicable federal, state, or local regulations.

Other hazards: —

SECTION 3-COMPOSITION/INFORMATION ON INGREDIENTS

CAS No.	Chemical Name	wt% by weight	EINECS No.
00108-88-3	Toluene	97.0 min.	203-625-9
Synonyms	**Methylbenzol; Methylbenzene; Toluol; Phenylmethane**		

SECTION 4-FIRST AID MEASURES

Description of necessary first aid measures

Eye:

1. Flush immediately with warm water for at least 20 minutes.
2. Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
3. If pain persists or recurs seek medical attention.
4. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin:

1. Removing contaminated clothing, shoes, and leathery wearings, cleaning procedure is available before reused or waste treatment.
2. Washing affected area thoroughly with soap and water for at least 20 minutes.
3. Call a Physician if irritation develops or persists.

Ingestion:

1. If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomits.
2. If victim is conscious and alert, give 2～4 cupfuls of milk/water to dilute the substance in stomach.
3. Never give anything by mouth to an unconscious person.
4. Don’t induce vomiting unless directed to do so by medical person.
5. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
6. Then seek for medical attention.

Inhalation:

1. Remove from further exposure and flush thoroughly with air.
2. Lay patient down. Keep warm and rested.
3. Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
4. If respiratory irritation, seek immediate medical assistance and call a physician.

Most important symptoms/effects, acute and delayed

Headache, fatigue, drowsiness, insomnia, anorexia and pain in limbs, nervousness, impairment of memory.

Indication of immediate medical attention and special treatment needed, if necessary

For acute or short term repeated exposures to toluene:

Inhalation:

1. Inhalation overexposure can produce toxic effects. Monitor for respiratory distress.
2. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Administer supplemental oxygen with assisted ventilation, as required.
3. This material (or a component) sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material.
4. Administration of sympathomimetic drugs should be avoided.

Ingestion:

1. If ingested, this material presents a significant aspiration and chemical pneumonitis hazard.
2. Induction of emesis is not recommended.
3. Consider activated charcoal and/or gastric lavage.
4. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

SECTION 5-FIRE FIGHTING MEASURES

Extinguishing media

Foam、CO_2、Dry chemical、Water fog.

Specific hazards arising from the chemical

1. Liquid and vapor are highly flammable.
2. Severe fire hazard when exposed to heat, flame and/or oxidizers.
3. Vapor may travel a considerable distance to source of ignition.
4. Heating may cause expansion or decomposition leading to violent rupture of containers.
5. On combustion, may emit toxic fumes of carbon monoxide (CO).

Special protective equipment and precautions for fire-fighters

1. Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies.
2. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles.
3. Cover pooling liquid with foam.
4. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out.
5. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines.
6. Be aware that burning liquid will float on water.
7. Notify appropriate authorities of potential fire and explosion hazard if liquid enter sewers or waterways

SECTION 6-ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedure

1. Personal protective equipment (specified in Section 8)
   Eyes : Chemical safety goggles are recommended, and a face shield is added when needed.
   Skin : Wear appropriate protective gloves to avoid skin contact.
   Clothing: When direct contact is likely, use rubberized clothings, apron and boots.
   Respiratory : When limits are exceeded, wear a respirator approved by NIOSH/MSHA for protection against organic dust, mists and vapors.
2. Remove all sources of ignition. No smoking, naked lights or ignition sources. Ventilate area of leak or spill.
3. Keep unnecessary and unprotected personnel from entering. Evacuate personnel from the danger area. Consult with an expert about the emergency procedures.

Environmental precautions

1. Prevent spillage from entering drains, surface, and groundwater.
2. Contain and recover liquid when possible. Use non-sparking tools and equipment.
3. Collect liquid in an appropriate container or absorb with an inert material (e.g. vermiculite, dry sand, earth), and place in a chemical waste container.
4. Report the accidental spill/release to Local/State government.

Methods and materials for containment and cleaning up

Minor spill:

1. Remove all ignition sources.
2. Clean up all spills immediately.
3. Avoid breathing vapors and contact with skin and eyes.
4. Control personal contact by using protective equipment.
5. Contain and absorb small quantities with vermiculite or other absorbent material.
6. Wipe up.
7. Collect residues in a flammable waste container.

Major spill

1. Clear area of personnel and move upwind.
2. Alert emergency responders and tell them location and nature of hazard.
3. May be violently or explosively reactive.
4. Wear breathing apparatus plus protective gloves.
5. Prevent spillage from entering drains or water course.
6. No smoking, naked lights or ignition sources. Increase ventilation.
7. Stop leak if safe to do so.
8. Water spray or fog may be used to disperse/absorb vapor.
9. Contain spill with sand, earth or vermiculite.
10. Use only spark-free shovels and explosion proof equipment.
11. Collect recoverable product into labeled containers for recycling..
12. Absorb remaining product with sand, earth or vermiculite.
13. Collect solid residues and seal in labeled drums for disposal.
14. Wash area and prevent runoff into drains.
15. If contamination of drains or waterways occurs, advise emergency services.

SECTION 7-HANDLING AND STORAGE

Precautions for safe handling

1. Wash thoroughly after handling.
2. Use only in well ventilated area.
3. Ground and bond containers when transferring.
4. Use spark-free tools and explosion proof equipment.
5. Empty containers retain product residue (liquid/vapor), and can be dangerous.
6. Do not pressurize, cut, weld, braze, solder, drill, or expose empty containers to heat, sparks or open flames.

Conditions for safe storage, including any incompatibilities

1. Store in original containers in approved flame-proof area.
2. No smoking, naked lights, heat or ignition sources.
3. DO NOT store in pits, depressions, basements or areas where vapors may be trapped.
4. Keep containers securely sealed.
5. Store away from incompatible materials in a cool, dry well ventilated area.
6. Protect containers against physical damage and check regularly for leaks.
7. Keep containers tightly closed and store in a cool, dry, well-ventilated place, plainly labeled, and out of closed vehicles.
8. Ground all equipment containing this material.
9. Observe manufacturer's storing and handling recommendations.
10. Containers should be able to withstand pressures expected from warming and cooling in storage. This flammable liquid should be stored in a separate safety cabinet or room. A refrigerated room is preferable for materials with a flash point temperature lower than 70°F (21°C).

SECTION 8-EXPOSURE CONTROLS, PERSONAL PROTECTION

OSHA - Final PELs : 200 ppm TWA.
OSHA Ceiling : 300ppm.
ACGIH : 50 ppm, skin -potential forcutaneous absorption.
NIOSH : 100 ppm TWA; 375 mg/m^3 TWA; 500 ppm IDLH.
Taiwan TWA : 100 ppm (skin).
Taiwan STEL : 125 ppm (skin).
Taiwan Ceiling : -------.
Taiwan BEI : 1 mg/l (before on duty).

Engineering control

1. Process should be located at least 17 meter (50 feet) away from open flames and all high temperature operations likely to cause ignition of the styrene monomer vapor.
2. In venting styrene monomer vapors, consideration should be given to possible halogenation of the vapors by low concentrations of free chlorine and bromine with the resultant formation of lacrimations.
3. Process should be designed so that the operator is not exposed to direct contact with Toluene or the vapor. The technical problems of designing equipment, providing adequate ventilation and operating procedures which promise maximum security and economy, can best be handled by competent engineers.
4. It is essential for safety that equipment be used and maintained as recommended by the manufacturer.
5. Tanks used to store or process Toluene should be closed vessels vented to a safe point of discharge in the outside atmosphere away from operating stations, roadways, and at least 17 meter (50 feet) from possible sources of ignitions. All sparks, flames, heated surface, or other sources of ignition should be kept away from all vents. It is advisable, to provide suction on vessels when inspection or observation openings are made, to minimize or eliminate escape of vapors.

Personal protective equipment

Eye Protection:
Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. A suitable emergency eye wash water and safety shower should be located near the work station.

Skin protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Clothing:
Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discard contaminated leather goods.

Respirators:
For known vapor concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator if adequate protection is provided. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134). For airborne vapor concentrations that exceed the recommended protection factors for organic vapor respirators, use a full-face, positive-pressure, supplied air respirator. Due to fire and explosion hazards, do not enter atmospheres containing concentrations greater than 10% of the lower flammable limit of this product.

SECTION 9-PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Transparent liquid	Upper/lower explosive limits : 1.2%～7.1%
Odour : pleasant aromatic petroleum odour	Vapor Pressure : 22 mmHg @20℃/68°F
Odour threshold : 0.16～37 ppm (detect) 1.9～69 ppm (recognition)	Vapor Density : 3.1 (air=1)
PH : Not available	Relative density : 0.86 (water=1)
Melting/Freezing Point : －95 ℃	Solubility in water : 54～58 mg/100 ml
Initial boiling point/boiling range : 110.6 ℃	Partition coefficient : 2.73 (n-octanol/water)
Flash point : 4.4 ℃ (closed cup)	Auto-ignition temperature : 480℃
Evaporation Rate : 2.24 (BuAc=1)	Decomposition temperature : Not available
Flammability (solid/gas) : Not available	Viscosity : 0.6 mPa.s max @20℃
Molecular Formula : $C_6H_5CH_3$	Molecular Weight : 92.056

SECTION 10-STABILITY AND REACTIVITY

Reactivity
Vapor is explosive when exposed to heat or flame

Chemical stability
Stable at room temperature in closed containers under normal storage and handling conditions.

Possibility of hazardous reaction
Has not been reported.

Condition to avoid
Product is highly flammable – Keep away from sources of ignition. Avoid the higher temperatures. Keep away from open fire, heating elements and heat radiating surface and prevent from forming of the vapours mixtures with air in explosion limits.

Incompatible materials
Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetraoxide; will attack some forms of plastics, rubber, coatings.

Hazardous decomposition products
Carbon monoxide, carbon dioxide, hydrocarbons.

SECTION 11-TOXICOLOGICAL INFORMATION

Routes of exposure
Eye, Skin, inhalation, Ingestion.

Symptoms (treatments as indicated in Section 4)
Eye: The liquid produces a high level of eye discomfort and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated. There is evidence that material may produce eye irritation in some persons and produce eye damage 24 hours or more after instillation. Severe inflammation may be expected with pain. There may be damage to the cornea. Unless treatment is prompt and adequate there may be permanent loss of vision. Conjunctivitis can occur following repeated exposure.

Skin: Contact with the material may damage the health of the individual; systemic effects may result following absorption. The material may cause moderate inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterized by redness, swelling and blistering. Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

Ingestion: Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual. Swallowing of the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis; serious consequences may result. (ICSC13733). Considered an unlikely route of entry in commercial/industrial environments. The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Inhalation: Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual. There is some evidence to suggest that the material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage. Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by sleepiness, reduced alertness, loss of reflexes, lack of co-ordination, and vertigo. Inhalation of high concentrations of gas/vapour causes lung irritation with coughing and nausea, central nervous depression with headache and dizziness, slowing of reflexes, fatigue and inco-ordination. If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death. The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.

Chronic exposure: There has been some concern that this material can cause cancer or mutations but there is not enough data to make an assessment. Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.

Toxicity
LD50: <870 mg/kg (rat, oral)
LC50: 6000 ppm/6h (rat, inhalation)

Chronic effect
Carcinogenicity:
ACGIH : A4-Not classifiable as a Human Carcinogen.
OSHA : Possible select carcinogen.
IARC : Group 3 carcinogen.

Epide miology: Not available.

Teratogenicity: Teratogenic effects have occurred in experimental animals.

Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.

Neurotoxicity: Not available.

Mutagenicity: Not available.

SECTION 12-ECOLOGICAL INFORMATION

Ecotoxicity
LC_{50} (96 hr.) Fish: 7.3～22.8 mg/l
EC_{50} (48 hr.) Water flea: －
Biocencentration factor (BCF): 1.67～380

Persistence and degradability

1. The material are expected to form a slick on the surface of waters after release in calm sea conditions. This is expected to evaporate and enter the atmosphere where it will be degraded through reaction with hydroxyl radicals.
2. Some of the material will become associated with benthic sediments, and it is likely to be spread over a fairly wide area of sea floor. Marine sediments may be either aerobic or anaerobic. The material, in probability, is biodegradable, under aerobic conditions. Evidence also suggests that the hydrocarbons may be degradable under anaerobic conditions although such degradation in benthic sediments may be a relatively slow process.
3. Under aerobic conditions the material will degrade to water and carbon dioxide, while under aerobic processes it will produce water, methane, carbon dioxide and carbon dioxide.
4. Based on test results, as well as theoretical considerations, the potential for bioaccumulation may be high. Toxic effects are often observed in species such as blue mussel, daphnia, freshwater green algae, marine copepods and amphipods.

Half-life (Air): 10～104 hr
Half-life (Surface water): 96～528 hr
Half-life (Ground water): 168～672 hr
Half-life (Soil): 96～528 hr

Bioaccumulative potential
This material is not expected to significantly bioaccumulate.

Mobility in soil: －

Other adverse effects: －

SECTION 13-DISPOSAL CONSIDERATIONS

Residues and spilled material are hazardous waste due to ignitability. Disposal must be in accordance with applicable federal, state, or local regulations.
The container for this product can present explosion or fire hazards, even when emptied. To avoid risk of injury, do not cut, puncture, or weld on or near this container. Since the emptied containers retain product residue, follow label warnings even after container is emptied.

SECTION 14-TRANSPORTATION INFORMATION

US DOT	Shipping Name	Toluene	Hazard Labels	
	Hazard Class	3		
	UN Number	1294		
	Packing Group	II		
Sea(IMO/IMDG)	Shipping Name	Toluene	Hazard Labels	
	Hazard Class	3.2		
	UN Number	1294		
	Packing Group	II		
	IMDG Code Page	3285		
	MARPOL	Not a DOT "Marine Pollutant" per 49 CFR 171.8.		
Air(ICAO/IATA)	Shipping Name	Toluene	Hazard Labels	
	Hazard Class	3.2		
	Subsidiary Class	1294		
	Packing Group	II		
RID/ ADR	No information available.			
Canadian TDG	Shipping Name	Toluene	Hazard Labels	
	Hazard Class	3		
	UN Number	1294		
	Packing Group	II		
	Subsidiary Class	9.2		

SECTION 15-REGULATORY INFORMATION

US FEDERAL

TSCA

CAS# 108-88-3 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 108-88-3: Effective Date: 10/4/82; Sunset Date: 10/4/92

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 108-88-3 : final RQ = 1000 pounds (454 kg)

Section 302 (TPQ)

None of the chemicals in this material have a TPQ.

SARA Codes

CAS# 108-88-3 : acute, flammable.

Section 313

This material contains Toluene (CAS# 108-88-3, 99% & 100%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.

Clean Air Act

CAS# 108-88-3 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act

CAS# 108-88-3 is listed as a Hazardous Substance under the CWA.
CAS# 108-88-3 is listed as a Priority Pollutant under the Clean Water Act.
CAS# 108-88-3 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Toluene can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
WARNING: This product contains Toluene, a chemical known to the state of California to cause birth defects or other reproductive harm.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN F
Risk Phrases : R 10 Flammable.
R 20 Harmful by inhalation.
Safety Phrases : S 9 Keep container in a well-ventilated place.
S 16 Keep away from sources of ignition - No smoking.
S 25 Avoid contact with eyes.
S 29 Do not empty into drains.
S 33 Take precautionary measures against static discharges.

WGK (Water Danger/Protection)

CAS# 108-88-3: 2

United Kingdom Occupational Exposure Limits

CAS# 108-88-3: OES-United Kingdom, TWA 50 ppm TWA; 191 mg/m3 TWA.
CAS# 108-88-3: OES-United Kingdom, STEL 150 ppm STEL; 574 mg/m3 STEL.

CANADA

CAS#100-42-5 is listed on Canada's DSL/NDSL list.
This product has a WHMIS classification of B2, D2A (99%)/B3, D2A (100%).
CAS# 105-05-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

- CAS# 108-88-3: OEL-AUSTRALIA:TWA 100 ppm (375 mg/m3);STEL 150 ppm (560 mg/m3)
- OEL-BELGIUM:TWA 100 ppm (377 mg/m3);STEL 150 ppm (565 mg/m3)
- OEL-CZECHOSLOVAKIA:TWA 200 mg/m3;STEL 1000 mg/m3
- OEL-DENMARK:TWA 50 ppm (190 mg/m3);Skin
- OEL-FINLAND:TWA 100 ppm (375 mg/m3);STEL 150 ppm; Skin
- OEL-FRANCE:TWA 100 ppm (375 mg/m3);STEL 150 ppm (560 mg/m3)
- OEL-GERMANY:TWA 100 ppm (380 mg/m3)
- OEL-HUNGARY:TWA 100 mg/m3;STEL 300 mg/m3;Skin
- OEL-JAPAN:TWA 100 ppm (380 mg/m3)
- OEL-THE NETHERLANDS:TWA 100 ppm (375 mg/m3);Skin
- OEL-THE PHILIPPINES:TWA 100 ppm (375 mg/m3)
- OEL-POLAND:TWA 100 mg/m3
- OEL-RUSSIA:TWA 100 ppm; STEL 50 mg/m3
- OEL-SWEDEN:TWA 50 ppm (200 mg/m3);STEL 100 ppm (400 mg/m3);Skin
- OEL-SWITZERLAND:TWA 100 ppm (380 mg/m3);STEL 500 ppm
- OEL-THAILAND:TWA 200 ppm; STEL 300 ppm
- OEL-TURKEY:TWA 200 ppm (750 mg/m3)
- OEL-UNITED KINGDOM:TWA 100 ppm (375 mg/m3);STEL 150 ppm; Skin OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

SECTION 16-OTHER INFORMATION

References and sources

1. CHEMINFO Data Bank, CCINFO CD, 2005-3
2. HAZARD TEXT Data Bank, TOMES PLUS CD, Vol.65, 2005
3. RETECS Data Bank, TOMES CPS CD, Vol.65, 2005
4. HSDB Data Bank, TOMES CPS CD, Vol.65, 2005
5. Hazardous Substance Data Bank, Environment Protection, Administration, Executive Yuan, ROC (Taiwan)
6. Chemwatch Data Bank, 2005-1
7. SDS, GHS in Taiwan, Council of Labor Affairs, Executive Yuan, ROC (Taiwan)

Version	Date	Remark
Version 1	06/01/1998	Original Version.
Version 2	04/20/2001	Updated 10 sections to 16 sections.
Version 3	08/01/2003	Updated “SECTION 9-PHYSICAL AND CHEMICAL PROPERTIES”.
Version 4	01/01/2006	Updated “SECTION 14-TRANSPORTATION INFORMATION”.
Version 5	08/05/2008	Updated each section by GHS SDS.
Prepared by	Safety & Environment Protection Section, Taiwan SM Corporation Kaohsiung Plant.	

SAFETY DATA SHEET

Issuing Date 03-Nov-2015 **Revision Date** 21-Jul-2015 **Revision Number** 1

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier

Product Number	**601**
Product Name	**Total Petroleum Hydrocarbons (TPH) in Water #2**
Synonyms	None

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory use only
Uses advised against	No information available

Details of the supplier of the safety data sheet

Supplier	ERA a Waters Company
Supplier Address	16341 Table Mountain Parkway, Golden, CO 80403 USA
Non-Emergency Telephone Number	+1-303-431-8454
Supplier Email	sdsinfo@waters.com

Emergency telephone number

Company Emergency Phone Number	In case of EMERGENCY call CHEMTREC Day or Night Within USA and Canada: 800-424-9300 International Call Collect: +1-703-527-3887

2. HAZARDS IDENTIFICATION

Classification

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

Skin corrosion/irritation	Category 1
Serious eye damage/eye irritation	Category 1

GHS Label elements, including precautionary statements

Emergency Overview

Signal word **Danger**

Hazard Statements

Causes severe skin burns and eye damage

Appearance Clear, colorless **Physical state** Liquid->Liquid **Odor** Odorless

Precautionary Statements - Prevention

Do not breathe dust/fume/gas/mist/vapors/spray

Wash face, hands and any exposed skin thoroughly after handling

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

Precautionary Statements - Response

Immediately call a POISON CENTER or doctor/physician

Specific treatment (see supplemental first aid instructions on this label)

Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Immediately call a POISON CENTER or doctor/physician
Skin
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Immediately call a POISON CENTER or doctor/physician
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting

Precautionary Statements - Storage
Store locked up
Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Not applicable
Unknown Toxicity
0 % of the mixture consists of ingredient(s) of unknown toxicity
Other information

No information available
Interactions with Other Chemicals
No information available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Note: only the components contributing to the product's GHS hazard classification are listed in this section.

Chemical Name	CAS-No	Percent
Hydrochloric Acid	7647-01-0	0.09

4. FIRST AID MEASURES

First aid measures

General Advice	Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.
Eye contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Do not rub affected area. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention/advice.
Skin contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek immediate medical attention/advice.
Inhalation	Remove to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately. 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. If breathing is difficult, (trained personnel should) give oxygen. Delayed pulmonary edema may occur. Get medical attention immediately if symptoms occur.
Ingestion	Do NOT induce vomiting. Rinse mouth immediately and drink plenty of water. Never give anything by mouth to an unconscious person. Call a physician or poison control center immediately.
Self-protection of the first aider	Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Avoid contact with skin, eyes or clothing. Avoid direct contact with skin. Use barrier to give mouth-to-mouth resuscitation. Use personal protective equipment as required. Wear personal protective clothing (see section 8).

Most important symptoms and effects, both acute and delayed

Most Important Symptoms and Effects Burning sensation.

Indication of any immediate medical attention and special treatment needed

Notes to Physician Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Do not give chemical antidotes. Asphyxia from glottal edema may occur. Marked decrease in blood pressure may occur with moist rales, frothy sputum, and high pulse pressure.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable Extinguishing Media

CAUTION: Use of water spray when fighting fire may be inefficient.

Specific hazards arising from the chemical

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

Uniform Fire Code Corrosive: Other--Liquid

Hazardous Combustion Products

Carbon oxides.

Explosion Data

Sensitivity to Mechanical Impact No.

Sensitivity to Static Discharge No.

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.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Attention! Corrosive material. Avoid contact with skin, eyes or clothing. Ensure adequate ventilation. Use personal protective equipment as required. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.

Other Information Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions Refer to protective measures listed in Sections 7 and 8. Prevent further leakage or spillage if safe to do so. Should not be released into the environment. Do not allow to enter into soil/subsoil. Prevent product from entering drains.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Pick up and transfer to properly labeled containers. Soak up with inert absorbent material.

7. HANDLING AND STORAGE

Precautions for safe handling

Handling Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. In case of insufficient ventilation, wear suitable respiratory equipment. Use only with adequate ventilation and in closed systems. Do not eat, drink or smoke when using this product. Take off contaminated clothing and wash before reuse.

Conditions for safe storage, including any incompatibilities

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture. Store locked up. Keep out of the reach of children. Store away from other materials.

Incompatible Products Acids. Bases. Oxidizing agent.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Hydrochloric Acid 7647-01-0	Ceiling: 2 ppm	(vacated) Ceiling: 5 ppm (vacated) Ceiling: 7 mg/m^3 Ceiling: 5 ppm Ceiling: 7 mg/m^3	IDLH: 50 ppm Ceiling: 5 ppm Ceiling: 7 mg/m^3

Other Exposure Guidelines Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992)

Appropriate engineering controls

Engineering Measures Showers
Eyewash stations
Ventilation systems

Individual protection measures, such as personal protective equipment

Eye/face protection Face protection shield.
Skin and body protection Wear protective gloves and protective clothing. Long sleeved clothing. Chemical resistant apron. Impervious gloves.
Respiratory protection No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hygiene Measures Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. Regular cleaning of equipment, work area and clothing is recommended. Wash hands before breaks and immediately after handling the product. For environmental protection, remove and wash all contaminated protective equipment before re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical Properties

Physical state Liquid->Liquid
Appearance Clear, colorless
Color No information available
Odor Odorless
Odor Threshold No information available

Property	Values	Remarks Method
pH	<=2	None known
Melting / freezing point	no data available	None known
Boiling point / boiling range	no data available	None known
Flash Point	no data available	None known
Evaporation Rate	no data available	None known
Flammability (solid, gas)	no data available	None known
Flammability Limit in Air		None known
Upper flammability limit	no data available	
Lower flammability limit	no data available	
Vapor pressure	no data available	None known
Vapor density	no data available	None known
Specific Gravity	1	None known
Water Solubility	Soluble in water	None known
Solubility in other solvents	no data available	None known
Partition coefficient: n-octanol/water	no data available	None known
Autoignition temperature	no data available	None known
Decomposition temperature	no data available	None known
Kinematic viscosity	no data available	None known
Dynamic viscosity	no data available	None known

Explosive properties no data available
Oxidizing properties no data available

Other Information

Softening Point no data available
Particle Size no data available
Particle Size Distribution

10. STABILITY AND REACTIVITY

Reactivity

no data available.

Chemical stability
Stable under recommended storage conditions.
Possibility of Hazardous Reactions
None under normal processing.
Hazardous Polymerization
Hazardous polymerization does not occur.
Conditions to avoid
Exposure to air or moisture over prolonged periods.
Incompatible materials
Acids. Bases. Oxidizing agent.
Hazardous Decomposition Products
Carbon oxides.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information .

Inhalation Specific test data for the substance or mixture is not available. Corrosive by inhalation. (based on components). Inhalation of corrosive fumes/gases may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate. Inhaled corrosive substances can lead to a toxic edema of the lungs. Pulmonary edema can be fatal. May cause irritation of respiratory tract.

Eye contact Specific test data for the substance or mixture is not available. Causes burns. (based on components). Corrosive to the eyes and may cause severe damage including blindness. Causes serious eye damage. May cause irreversible damage to eyes.

Skin contact Specific test data for the substance or mixture is not available. May cause irritation. Prolonged contact may cause redness and irritation.

Ingestion Specific test data for the substance or mixture is not available. Causes burns. (based on components). Ingestion causes burns of the upper digestive and respiratory tracts. May cause severe burning pain in the mouth and stomach with vomiting and diarrhea of dark blood. Blood pressure may decrease. Brownish or yellowish stains may be seen around the mouth. Swelling of the throat may cause shortness of breath and choking. May cause lung damage if swallowed. May be fatal if swallowed and enters airways. Ingestion may cause irritation to mucous membranes. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Component Information

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Hydrochloric Acid 7647-01-0	238 - 277 mg/kg (Rat)	> 5010 mg/kg (Rabbit)	= 1.68 mg/L (Rat) 1 h

Information on toxicological effects

Symptoms Erythema (skin redness). Burning. May cause blindness. Coughing and/ or wheezing.

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

Sensitization No information available.
Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Chemical Name	ACGIH	IARC	NTP	OSHA
Hydrochloric Acid 7647-01-0		Group 1 Group 3		X

Reproductive toxicity No information available.
STOT - single exposure No information available.
STOT - repeated exposure No information available.
Chronic toxicity No known effect based on information supplied. Chronic exposure to corrosive fumes/gases may cause erosion of the teeth followed by jaw necrosis. Bronchial irritation with chronic cough and frequent attacks of pneumonia are common. Gastrointestinal disturbances may also be seen.
Target Organ Effects Respiratory system. Eyes. Skin. Gastrointestinal tract (GI).
Aspiration Hazard No information available.

Numerical measures of toxicity Product Information
The following values are calculated based on chapter 3.1 of the GHS document
Not applicable

12. ECOLOGICAL INFORMATION

Ecotoxicity
Harmful to aquatic life.

Chemical Name	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Hydrochloric Acid 7647-01-0		96h LC50: = 282 mg/L (Gambusia affinis)		

Persistence and Degradability
No information available.
Bioaccumulation
No information available

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal methods This material, as supplied, is a hazardous waste according to federal regulations (40 CFR 261).
Contaminated Packaging Dispose of contents/containers in accordance with local regulations.
US EPA Waste Number D002

California Hazardous Waste Codes 791

14. TRANSPORT INFORMATION

DOT Not regulated
Proper Shipping Name NON REGULATED
Hazard Class N/A

TDG Not regulated

MEX Not regulated

ICAO Not regulated

IATA Not regulated
Proper Shipping Name NON REGULATED
Special Provisions None

IMDG Not regulated
Special Provisions None
Marine Pollutant Not applicable

RID Not regulated
Special Provisions None

ADR Not regulated
Special Provisions None

ADN Not regulated

15. REGULATORY INFORMATION

International Inventories

TSCA Complies
DSL All components are listed either on the DSL or NDSL.
ENCS Contact supplier for inventory compliance status
KECL Contact supplier for inventory compliance status
PICCS Contact supplier for inventory compliance status
AICS Contact supplier for inventory compliance status

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical Name	CAS-No	Percent	SARA 313 - Threshold Values %
Hydrochloric Acid - 7647-01-0	7647-01-0	0.09	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard Yes
Chronic Health Hazard No
Fire Hazard No
Sudden release of pressure hazard No
Reactive Hazard No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical Name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Hydrochloric Acid 7647-01-0	5000 lb			X

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level

pertaining to releases of this material

Chemical Name	Hazardous Substances RQs	Extremely Hazardous Substances RQs	RQ
Hydrochloric Acid 7647-01-0	5000 lb	5000 lb	RQ 5000 lb final RQ RQ 2270 kg final RQ

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

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International Regulations

Component	Carcinogen Status	Exposure Limits
Hydrochloric Acid 7647-01-0 (0.09)		Mexico: Ceiling 5 ppm Mexico: Ceiling 7 mg/m³

Canada

WHMIS Hazard Class

Not determined

16. OTHER INFORMATION

NFPA	**Health Hazards** 3	**Flammability** 0	**Instability** 0	**Physical and Chemical Hazards** -
HMIS	**Health Hazards** 3	**Flammability** 0	**Physical Hazard** 0	**Personal Protection** X

Prepared By Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Issuing Date 03-Nov-2015

Revision Date 21-Jul-2015

Revision Note No information available

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 Safety Data Sheet

SAFETY DATA SHEET

Version 4.6
Revision Date 03/02/2015
Print Date 02/18/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Trichloroethylene
Product Number	:	251402
Brand	:	Sigma-Aldrich
Index-No.	:	602-027-00-9
CAS-No.	:	79-01-6

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

Identified uses	:	Laboratory chemicals, 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)
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear eye protection/ face protection.
P280	Wear protective gloves.
P281	Use personal protective equipment as required.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	TCE Trichloroethene
Formula	:	C_2HCl_3
Molecular weight	:	131.39 g/mol
CAS-No.	:	79-01-6
EC-No.	:	201-167-4
Index-No.	:	602-027-00-9

Hazardous components

Component	Classification	Concentration
Trichloroethylene Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Skin Irrit. 2; Eye Irrit. 2A; Muta. 2; Carc. 1B; STOT SE 3; Aquatic Acute 3; Aquatic Chronic 3; H315, H319, H336, H341, H350, H412	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

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

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

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

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

Light sensitive. Handle and store under inert gas.
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
Trichloroethylene	79-01-6	TWA	10.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment cognitive decrement Renal toxicity Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		STEL	25.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment cognitive decrement Renal toxicity Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		Potential Occupational Carcinogen See Appendix C See Appendix A		
		See Table Z-2		
		TWA	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		CEIL	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		Peak	300.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Trichloroethylene	79-01-6	Trichloroacetic acid	15.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		Trichloroethanol	0.5000 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Trichloroethylene		In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Trichloroethylene		In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

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

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

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -84.8 °C (-120.6 °F) - lit.
f)	Initial boiling point and boiling range	86.7 °C (188.1 °F) - lit.
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower	Upper explosion limit: 10.5 %(V)

	flammability or explosive limits	Lower explosion limit: 8 %(V)
k)	Vapour pressure	81.3 hPa (61.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.463 g/mL at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 2.29log Pow: 5
p)	Auto-ignition temperature	410.0 °C (770.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Oxidizing agents, Strong bases, Magnesium

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 4,920 mg/kg

LC50 Inhalation - Mouse - 4 h - 8450 ppm

LD50 Dermal - Rabbit - > 20,000 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Severe skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation - 24 h

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.
In vitro tests showed mutagenic effects

Carcinogenicity

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

Possible human carcinogen

IARC:	1 - Group 1: Carcinogenic to humans (Trichloroethylene)
NTP:	Reasonably anticipated to be a human carcinogen (Trichloroethylene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: KX4550000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., Gastrointestinal disturbance, Kidney injury may occur., narcosis
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 41 mg/l - 96.0 h
	LOEC - other fish - 11 mg/l - 10.0 d
	NOEC - Oryzias latipes - 40 mg/l - 10.0 d
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 18.00 mg/l - 48 h
Toxicity to algae	IC50 - Pseudokirchneriella subcapitata (green algae) - 175.00 mg/l - 96 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
Does not bioaccumulate.

12.4 Mobility in soil
No data available

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

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

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

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
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: 1710 Class: 6.1 Packing group: III
Proper shipping name: Trichloroethylene
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1710 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TRICHLOROETHYLENE

IATA
UN number: 1710 Class: 6.1 Packing group: III
Proper shipping name: Trichloroethylene

15. REGULATORY INFORMATION

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

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Trichloroethylene	79-01-6	2011-09-01
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	79-01-6	2011-09-01

Trichloroethylene

16. OTHER INFORMATION

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

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H402	Harmful to aquatic life.

HMIS Rating

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

NFPA Rating

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

Further information

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: 03/02/2015 Print Date: 02/18/2016

SAFETY DATA SHEET

Version 4.17
Revision Date 03/03/2015
Print Date 02/19/2016

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 Not classifiable as a human carcinogen		
		C	1,000.000000 ppm 5,600.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1,000.000000 ppm 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 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) 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

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: 02/19/2016

MATERIAL SAFETY DATA SHEET
SIFCO Process Trivalent Chromium Conversion

HEALTH *	3
FLAMMABILITY	0
PHYSICAL HAZ.	0
PPE	X

Flammability 0, Instability, Health 3, Special 0

Printed: 12/03/2010
Revision: 12/03/2010
Supercedes Revision: 11/02/2010
Date Created: 07/13/2009

1. Product and Company Identification

Product Code: 3007
Product Name: SIFCO Process Trivalent Chromium Conversion
Manufacturer Information
Company Name: SIFCO Applied Surface Concepts
Division of SIFCO Industries, Inc.
5708 E. Schaaf Road
Independence, OH 44131
Phone Number: (216)524-0099
Fax Number: (216)524-6331
Emergency Contact: CHEMTREC (United States) (800)424-9300
Information: CHEMTREC (International-Collect) +1 (703)527-3887
Web site address: http://www.SIFCOASC.com
Email address: info@sifcoasc.com

2. Hazards Identification

Emergency Overview

Blue liquid with no characteristic odor.
Caution! May cause eye and skin burns. May be harmful if swallowed.
Contains materials that can cause target organ damage. Contains materials which can cause cancer. Emergency Response Guide #171

Route(s) of Entry: Inhalation? Yes Skin? Yes Eyes? Yes Ingestion? Yes

Health Hazards (Acute and Chronic)

INHALATION: May give off gas, vapor or dust that is irritating to the respiratory system. Exposure to decomposition products may cause a health hazard.
INGESTION: Harmful if swallowed. May cause burns to mouth, throat and stomach.
EYE: May be corrosive to eyes. May cause burns.
SKIN CONTACT: May be corrosive to the skin. May cause burns.
CHRONIC EFFECTS: Contains material that may cause target organ damage.

Signs and Symptoms Of Exposure

Dependant on route(s) of entry. See section above for details.

3. Composition/Information on Ingredients

Hazardous Components (Chemical Name)	CAS #	Concentration	Formula	RTECS #
1. Sodium nitrate	7631-99-4	1.0 -3.0 %	NaNO3	WC5600000
2. Chromium hydroxide sulphate (Cr(OH)(SO4))	12336-95-7	1.0 -3.0 %	CrHO5S	GB6240000
3. Cobalt sulfate heptahydrate	10026-24-1	0.3 -1.0 %	CoSO4.7H2O	GG3200000
4. Ammonium bifluoride	1341-49-7	0.3 -1.0 %	F2H5N	BQ9200000
5. Water	7732-18-5	92.0 -97.4 %	H2O	ZC0110000

4. First Aid Measures

Emergency and First Aid Procedures

First aid providers must take proper precautions for their own safety before entering contaminated areas to assist chemical accident victims and handling their contaminated clothing and equipment. Another person should immediately call the Emergency Medical Service, 911-Operator, Hospital, Physician, Ophthalmologist or Poison Control Center, as applicable. Give the following information: Location of the accident, your phone number, description of the accident, name of chemical agent and product, number and condition of casualties, what is

being done for the victims.

Stay on the phone until the other party hangs up! Remove victim from contaminated area to a clean, quiet, ventilated area. Keep them calm and warm.
EYES: Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes.
SKIN: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Thoroughly decontaminate (or discard) clothing and shoes.
INHALATION: Remove to fresh air. Lay victim down, legs raised. Loosen tight clothing, cover with a blanket. If not breathing, give artificial respiration.
INGESTION: DO NOT induce vomiting, unless advised by EMS. Give large quantities of water. Never give anything by mouth to an unconscious person.

5. Fire Fighting Measures

Flammability Classification: Material will not burn
Flash Pt:
Explosive Limits: LEL: UEL:

Special Fire Fighting Procedures

Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Unusual Fire and Explosion Hazards

Suitable Extinguishing Media

Use an extinguishing agent suitable for the surrounding fire.

Unsuitable Extinguishing Media

None known.

6. Accidental Release Measures

Steps To Be Taken In Case Material Is Released Or Spilled

Do not touch or walk through spilled material. Isolate hazard area and keep people away. Notify your facility emergency coordinator. Eliminate all sources of ignition. Provide maximum ventilation. Do not release into soil, sewers, or natural bodies of water. Wear proper personal protective equipment (PPE). Carefully mop up or vacuum spill and triple rinse with water into suitable plastic container. Release of a reportable quantity (RQ) requires notification of proper authorities. Dispose of according to local, state, and federal regulations.

7. Handling and Storage

Precautions To Be Taken in Handling

Put on appropriate personal protective equipment. 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.

Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. 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.

Precautions To Be Taken in Storing

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. 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.

8. Exposure Controls/Personal Protection

Hazardous Components (Chemical Name)	CAS #	OSHA PEL	ACGIH TLV	Other Limits
1. Sodium nitrate	7631-99-4		10 mg/m3	
2. Chromium hydroxide sulphate (Cr(OH)(SO4))	12336-95-7			
3. Cobalt sulfate heptahydrate	10026-24-1			
4. Ammonium bifluoride	1341-49-7			
5. Water	7732-18-5			

Respiratory Equipment (Specify Type)

If engineering controls are not feasible, the respiratory protection program must comply with OSHA 29 CFR 1910.134

Eye Protection

Face shield and safety glasses w/side shields or splash-proof chemical goggles. Do not wear contact lenses. Eye wash station, safety shower, washing facilities near work area.

Protective Gloves

Nitrile gloves.

Ventilation

If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Work/Hygienic/Maintenance Practices

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.

9. Physical and Chemical Properties

Physical States: [ ] Gas [X] Liquid [ ] Solid

Explosive Limits: LEL: UEL:

Specific Gravity (Water = 1): 1.045 - 1.050

Density: 1.03 - 1.07

pH: 2.0 - 2.5

Appearance and Odor

Blue liquid with no characteristic odor.

10. Stability and Reactivity

Stability: Unstable [ ] Stable [X]

Conditions To Avoid - Instability

Incompatibility - Materials To Avoid

Hazardous Decomposition Or Byproducts

Possibility of Hazardous Reactions: Will occur [ ] Will not occur [X]

Conditions To Avoid - Hazardous Reactions

Avoid exposure - obtain special instructions before use.

11. Toxicological Information

Inhalation : May give off gas, vapor or dust that is irritating or corrosive to the respiratory system. Exposure to decomposition products may cause a health hazard.

Ingestion : Harmful if swallowed. May cause burns to mouth, throat and stomach.

Skin : May be corrosive to the skin. May cause burns.

Eyes : May be corrosive to eyes. May cause burns.

Carcinogenicity/Other Information

Hazardous Components (Chemical Name)	CAS #	NTP	IARC	ACGIH	OSHA
1. Sodium nitrate	7631-99-4				
2. Chromium hydroxide sulphate (Cr(OH)(SO4))	12336-95-7				
3. Cobalt sulfate heptahydrate	10026-24-1		2B	A3	
4. Ammonium bifluoride	1341-49-7				
5. Water	7732-18-5				

Carcinogenicity: NTP? Unknown IARC Monographs? Unknown OSHA Regulated? Unknown

12. Ecological Information

No known significant effects or critical hazards.

13. Disposal Considerations

Waste Disposal Method

Ship to approved treatment/disposal facility. Dispose of according to local, state, and federal regulations. Follow the applicable regulations for disposal of empty containers and rinsate. The disposal information applies to the material as manufactured. Contamination may affect the disposal requirements. The responsibility for proper waste disposal is with the generator of the waste.

14. Transport Information

LAND TRANSPORT (US DOT)

DOT Proper Shipping Name UN3082, Environmentally hazardous substances, liquid, n.o.s. (Chromium Sulphate) PG III - ERG 171

DOT Hazard Class: 9

DOT Hazard Label: CLASS 9

UN/NA Number: UN3082

Packing Group: III

LAND TRANSPORT (Canadian TDG)

UN Number: 3082

Packing Group: III

LAND TRANSPORT (European ADR/RID)

UN Number: 3082

Packing Group: III

AIR TRANSPORT (ICAO/IATA)

UN Number: 3082

Packing Group: III

IATA Classification: 9

MARINE TRANSPORT (IMDG/IMO)

UN Number: 3082

Packing Group: III

Marine Pollutant: No

15. Regulatory Information

US EPA SARA Title III

Hazardous Components (Chemical Name)	CAS #	Sec.302 (EHS)	Sec.304 RQ	Sec.313 (TRI)	Sec.110
1. Sodium nitrate	7631-99-4	No	No	Yes-Cat. N511	No
2. Chromium hydroxide sulphate (Cr(OH)(SO4))	12336-95-7	No	No	Yes-Cat. N090	No
3. Cobalt sulfate heptahydrate	10026-24-1	No	No	No	No
4. Ammonium bifluoride	1341-49-7	No	Yes 100 LB	No	No

Hazardous Components (Chemical Name)	CAS #	Sec.302 (EHS)	Sec.304 RQ	Sec.313 (TRI)	Sec.110
5. Water	7732-18-5	No	No	No	No

US EPA CAA, CWA, TSCA

Hazardous Components (Chemical Name)	CAS #	EPA CAA	EPA CWA NPDES	EPA TSCA	CA PROP 65
1. Sodium nitrate	7631-99-4	HAP, ODC ()	No	Inventory, 8A CAIR	No
2. Chromium hydroxide sulphate (Cr(OH)(SO4))	12336-95-7	HAP, ODC ()	No	Inventory	No
3. Cobalt sulfate heptahydrate	10026-24-1	HAP, ODC ()	No	No	Yes
4. Ammonium bifluoride	1341-49-7	HAP, ODC ()	No	Inventory	No
5. Water	7732-18-5	HAP, ODC ()	No	Inventory	No

SARA (Superfund Amendments and Reauthorization Act of 1986) Lists:

Sec.302: EPA SARA Title III Section 302 Extremely Hazardous Chemical with TPQ. * indicates 10000 LB TPQ if not volatile.

Sec.304: EPA SARA Title III Section 304: CERCLA Reportable + Sec.302 with Reportable Quantity. ** indicates statutory RQ.

Sec.313: EPA SARA Title III Section 313 Toxic Release Inventory. Note: -Cat indicates a member of a chemical category.

Sec.110: EPA SARA 110 Superfund Site Priority Contaminant List

TSCA (Toxic Substances Control Act) Lists:

Inventory: Chemical Listed in the TSCA Inventory.

5A(2): Chemical Subject to Significant New Rules (SNURS)

6A: Commercial Chemical Control Rules

8A: Toxic Substances Subject To Information Rules on Production

8A CAIR: Comprehensive Assessment Information Rules - (CAIR)

8A PAIR: Preliminary Assessment Information Rules - (PAIR)

8C: Records of Allegations of Significant Adverse Reactions

8D: Health and Safety Data Reporting Rules

8D TERM: Health and Safety Data Reporting Rule Terminations

12(b): Notice of Export

Other Important Lists:

CWA NPDES: EPA Clean Water Act NPDES Permit Chemical

CAA HAP: EPA Clean Air Act Hazardous Air Pollutant

CAA ODC: EPA Clean Air Act Ozone Depleting Chemical (1=CFC, 2=HCFC)

CA PROP 65: California Proposition 65

International Regulatory Lists:

EPA Hazard Categories:

This material meets the EPA 'Hazard Categories' defined for SARA Title III Sections 311/312 as indicated:

[X] Yes [ ] No Acute (immediate) Health Hazard
[X] Yes [ ] No Chronic (delayed) Health Hazard
[ ] Yes [X] No Fire Hazard
[ ] Yes [X] No Sudden Release of Pressure Hazard
[ ] Yes [X] No Reactive Hazard

Regulatory Information

U.S. FEDERAL REGULATIONS:

1. Supplier Notification about toxic Chemicals.

SIFCO Applied Surface Concepts is required to inform you, that this product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372, if specified annual thresholds are met or exceeded.

Toxic Chemical	CAS #	Wt.% (Maximum)
Chromium Sulphate	12336-95-7	3%

Your other suppliers of trade name products or mixtures containing section 313 chemicals must also notify you. If you repackage or otherwise redistribute this product to industrial customers you are required to furnish similar notification to them.

2. CERCLA and EPCRA:
Threshold Planning Quantity: N/A
(Release) Reportable Quantity: N/A
Extremely Hazardous Substance: None

3. EPCRA Hazard Categories:
Immediate (Acute) Health: Yes
Delayed (Chronic) Health: Yes
Fire: No
Sudden release of Pressure: No
Reactivity: No

4. TSCA Statement.
All ingredients of this product are listed under the Toxic Substances Control Act (TSCA).

5. ODS Certification.
This product does not contain and is not manufactured with Ozone Depleting Substances (ODS).

6. VOC Certification.
This product does not contain any Volatile Organic Compounds (VOC).

7. PCB Certification.
This product does not contain any polychlorinated biphenyls (PCB).

STATE REGULATIONS:
California Prop. 65:
WARNING! This product contains chemicals known to the state of California to cause cancer, birth defects, or other reproductive harm.

INTERNATIONAL REGULATIONS:
WHMIS Classification.
Class D-2B

16. Other Information

Company Policy or Disclaimer

DISCLAIMER:
This information is believed to be accurate and represents the best information currently available to us. However, we make no warrenty 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.

SAFETY DATA SHEET

Version 5.8
Revision Date 03/13/2015
Print Date 01/29/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Vanadium(V) oxide
Product Number	:	204854
Brand	:	Aldrich
Index-No.	:	023-001-00-8
CAS-No.	:	1314-62-1

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

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 4), H332
Serious eye damage (Category 1), H318
Germ cell mutagenicity (Category 2), H341
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Specific target organ toxicity - repeated exposure (Category 1), H372
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

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 + H332	Harmful if swallowed or if inhaled
H318	Causes serious eye damage.
H335	May cause respiratory irritation.
H341	Suspected of causing genetic defects.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.

H411	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.
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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
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	:	O_5V_2
Molecular weight	:	181.88 g/mol
CAS-No.	:	1314-62-1
EC-No.	:	215-239-8
Index-No.	:	023-001-00-8

Hazardous components

Component	Classification	Concentration
Vanadium pentoxide		
	Acute Tox. 4; Eye Dam. 1; Muta. 2; Repr. 2; STOT SE 3; STOT RE 1; Aquatic Acute 2; Aquatic Chronic 2; H302 + H332, H318, H335, H341, H361, H372, H411	<= 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
Vanadium/vanadium 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.
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
Vanadium pentoxide	1314-62-1	C	0.100000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		C	0.500000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Ceiling limit is to be determined from breathing-zone air samples.		
		TWA	0.050000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Lower Respiratory Tract irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		TWA	0.05 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Lower Respiratory Tract irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		C	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		C	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		C	0.100000 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	0.500000 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	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		C	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		C	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		C	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Vanadium pentoxide	1314-62-1	Vanadium	0.0500 mg/g	In urine	
	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
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: 690 °C (1,274 °F) - lit.
f)	Initial boiling point and boiling range	No data available
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	3.35 g/mL at 25 °C (77 °F)
n)	Water solubility	904 g/l at 20 °C (68 °F) - OECD Test Guideline 105
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	The substance or mixture is not classified as oxidizing.

9.2 Other safety information

Solubility in other solvents	Ethanol - insoluble

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong acids

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
Harmful if swallowed. Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

LC50 Inhalation - Rat - female - 4 h - 2.21 mg/l
(OECD Test Guideline 403)

LC50 Dermal - Rat - > 2,500 mg/kg
(OECD Test Guideline 402)

No data available

Skin corrosion/irritation
Skin - in vitro assay
Result: No skin irritation

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Risk of serious damage to eyes.
(OECD Test Guideline 405)

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.
In vitro tests showed mutagenic effects

Carcinogenicity

No data available

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Vanadium pentoxide)
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
Possible risk of congenital malformation in the fetus.
Suspected human reproductive toxicant

No data available

Specific target organ toxicity - single exposure
May cause respiratory irritation.
Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure.

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

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 5.2 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	LC50 - Daphnia magna (Water flea) - 1.52 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
Toxic to aquatic life with long lasting effects.
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

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: 2862 Class: 6.1 Packing group: III
Proper shipping name: Vanadium pentoxide
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 2862 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: VANADIUM PENTOXIDE
Marine pollutant:yes
IATA
UN number: 2862 Class: 6.1 Packing group: III
Proper shipping name: Vanadium pentoxide

15. REGULATORY INFORMATION

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-07-01

SARA 313 Components

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-07-01

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-07-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	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
Vanadium pentoxide	1314-62-1	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
Eye Dam.	Serious eye damage
H302	Harmful if swallowed.
H302 + H332	Harmful if swallowed or if inhaled
H318	Causes serious eye damage.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H341	Suspected of causing genetic defects.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

HMIS Rating

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

NFPA Rating

Health hazard:	3
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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: 03/13/2015 Print Date: 01/29/2016

SAFETY DATA SHEET
Xylene

SECTION 1: Identification of the substance/mixture and of the company/undertaking

Date issued	11.11.2013

1.1. Product identifier

Product name	Xylene
Chemical name	Xylene
Synonyms	Xylol, dimethyl benzene, xylenol
REACH Reg No.	01-2119488216-32-0000
CAS no.	1330-20-7
EC no.	215-535-7
Index no.	601-022-00-9
Article no.	13000000

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

Use of the substance/preparation	For the preparation of paints and as a solvent. General purpose cleaner.

1.3. Details of the supplier of the safety data sheet

Manufacturer

Company name	Fred Holmberg & Co AB
Office address	Geijersgatan 8
Postal address	Box 60056
Postcode	S-216 10
City	Limhamn
Country	Sweden
Tel	+46 (0)40 15 79 20
Fax	+46 (0)40 16 22 95
E-mail	info@holmberg.se
Website	http://www.holmberg.se/en/

1.4. Emergency telephone number

Emergency telephone	112 (Europe)

SECTION 2: Hazards identification

2.1. Classification of substance or mixture

Classification according to 67/548/EEC or 1999/45/EC	Xi; R38 Xn; R20/21 R10
Classification according to Regulation (EC) No 1272/2008 [CLP/GHS]	Flam. Liq. 3; H226; Acute tox. 4; H312; Skin Irrit. 2; H315; Acute tox. 4; H332;

2.2. Label elements

Hazard Pictograms (CLP)

Signal word	Danger
Hazard statements	H226 Flammable liquid and vapour. H312 Harmful in contact with skin. H315 Causes skin irritation. H332 Harmful if inhaled.
Precautionary statements	P210 Keep away from heat/sparks/open flames/hot surfaces. – No smoking. P233 Keep container tightly closed. P243 Take precautionary measures against static discharge. P280 Wear protective gloves/protective clothing/eye protection/face protection. P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P303 + P361 + P353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. P331 Do NOT induce vomiting. P403 + P235 Store in a well-ventilated place. Keep cool.

2.3. Other hazards

Other hazards	Not known.

SECTION 3: Composition/information on ingredients

3.2. Mixtures

Substance	Identification	Classification	Contents
Xylene	CAS no.: 1330-20-7 EC no.: 215-535-7 Index no.: 601-022-00-9	R10 Xn; R20/21 Xi; R38 Flam. Liq. 3; H226 Acute tox. 4; H332 Acute tox. 4; H312 Skin Irrit. 2; H315 Note : C	75 - 90 %
Ethylbenzene	CAS no.: 100-41-4 EC no.: 202-849-4 Index no.: 601-023-00-4 Synonyms: Ethylbenzene	F; R11 Xn; R20 Flam. Liq. 2; H225 Acute tox. 4; H332	10 - 25 %

Column headings	CAS no. = Chemical Abstracts Service; EU (Einecs or Elincs number) = European inventory of Existing Commercial Chemical Substances; Ingredient name = Name as specified in the substance list (substances that are not included in the substance list must be translated, if possible). Contents given in; %, %wt/wt, %vol/wt, %vol/vol, mg/m3, ppb, ppm, weight%, vol%
HH/HF/HE	T+ = Very toxic, T = Toxic, C = Corrosive, Xn = Harmful, Xi = Irritating, E = Explosive, O = Oxidizing, F+ = Extremly flammable, F = Very flammable, N = Environmental hazard

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation	Move the exposed person to fresh air at once. Get medical attention if any discomfort continues.
Skin contact	Remove contaminated clothes and rinse skin thoroughly with water.
Eye contact	Immediately flush with plenty of water for up to 15 minutes. Remove any contact lenses and open eyes wide apart. Get medical attention if any discomfort continues.
Ingestion	NEVER MAKE AN UNCONSCIOUS PERSON VOMIT OR DRINK FLUIDS! Do not induce vomiting. Rinse mouth with water. Get medical attention.

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

Information for health personnel	Treat Symptomatically. Do not give victim anything to drink if he is

unconscious.

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

Specific details on antidotes	No recommendation given.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	Extinguish with alcohol-resistant foam, carbon dioxide, dry powder or water fog.

5.2. Special hazards arising from the substance or mixture

Fire and explosion hazards	Solvent vapours may form explosive mixtures with air.
Hazardous combustion products	Fire creates: Carbon monoxide (CO). Carbon dioxide (CO_2).

5.3. Advice for firefighters

Fire fighting procedures	No specific fire fighting procedure given.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal protection measures	Ensure suitable personal protection (including respiratory protection) during removal of spillages in a confined area. Ventilate well. Stop leak if possible without risk. Avoid contact with skin and eyes. Do not breathe vapour.

6.2. Environmental precautions

Environmental precautionary measures	Avoid discharge into drains, water courses or onto the ground.

6.3. Methods and material for containment and cleaning up

Cleaning method	Dam and absorb spillages with sand, earth or other non-combustible material.

6.4. Reference to other sections

Other instructions	No recommendation given.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Handling	Keep away from heat, sparks and open flame. Take precautionary measures against static discharges. Mechanical ventilation may be required.

Protective Safety Measures

Advice on general occupational hygiene	Provide easy access to water supply and eye wash facilities.

7.2. Conditions for safe storage, including any incompatibilities

Storage	Keep away from heat, sparks and open flame. Ground container and transfer equipment to eliminate static electric sparks. Store in a cool and well-ventilated place.

7.3. Specific end use(s)

Specific use(s)	Not entered.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

DNEL / PNEC

Method of testing	Contents
DNEL	Group: Industrial Exposure route: Inhalation Exposure frequency: Short term (acute) Critical Component: Etylbenzen Value: 289 mg/kg/dag

DNEL	Group: Industrial Exposure route: Inhalation Exposure frequency: Long term (repeated) Critical Component: Etylbenzen Type of effect: Systemic effect Value: 77 mg/kg/dag
DNEL	Group: Industrial Exposure route: Dermal Exposure frequency: Long term (repeated) Critical Component: Etylbenzen Type of effect: Systemic effect Value: 180 mg/kg/dag
DNEL	Group: Consumer Exposure route: Inhalation Exposure frequency: Long term (repeated) Critical Component: Etylbenzen Type of effect: Systemic effect Value: 14,8 mg/kg/dag
DNEL	Group: Consumer Exposure route: Dermal Exposure frequency: Long term (repeated) Critical Component: Etylbenzen Type of effect: Systemic effect Value: 108 mg/kg/dag
DNEL	Group: Consumer Exposure route: Oral Exposure frequency: Long term (repeated) Critical Component: Etylbenzen Type of effect: Systemic effect Value: 1,6 mg/kg/dag
DNEL	Group: Industrial Exposure route: Inhalation Exposure frequency: Short term (acute) Critical Component: xylen Value: 442 mg/kg/dag
DNEL	Group: Industrial Exposure route: Inhalation Exposure frequency: Long term (repeated) Critical Component: xylen Type of effect: Systemic effect Value: 221 mg/kg/dag
DNEL	Group: Industrial Exposure route: Dermal Exposure frequency: Long term (repeated) Critical Component: xylen Type of effect: Systemic effect Value: 3182 mg/kg/dag
DNEL	Group: Consumer Exposure route: Inhalation Exposure frequency: Short term (acute) Critical Component: xylen Value: 260 mg/kg/dag
DNEL	Group: Consumer Exposure route: Inhalation Exposure frequency: Long term (repeated) Critical Component: xylen Type of effect: Systemic effect

	Value: 65,3 mg/kg/dag
DNEL	Group: Consumer Exposure route: Dermal Exposure frequency: Long term (repeated) Critical Component: xylen Type of effect: Systemic effect Value: 1872 mg/kg/dag
DNEL	Group: Consumer Exposure route: Oral Exposure frequency: Long term (repeated) Critical Component: xylen Type of effect: Systemic effect Value: 12,5 mg/kg/dag
Exposure guidelines	Country of origin: Sverige Limit value type: NGV 200 mg/m3 OEL Short Term Value: 450 mg/m3 Source: Nationella hygieniska gränsvärden, AFS 2005:17
Other Information	Ovanstående NGV resp. KTV gäller både xylen och etylbenzen

8.2. Exposure controls

Occupational exposure limits	Provide adequate ventilation. Observe Occupational Exposure Limits and minimise the risk of inhalation of vapours. Protective gloves and goggles are recommended. Provide eyewash, quick drench.

Safety signs

Respiratory protection

Respiratory protection	Respiratory protection must be used if air contamination exceeds acceptable level. Use respiratory equipment with gas filter, type A2.

Hand protection

Hand protection	Use protective gloves. Chemical resistant gloves required for prolonged or repeated contact. Gloves of nitrile rubber, PVA or Viton are recommended.

Eye / face protection

Eye protection	Use safety goggles or face shield in case of splash risk.

Skin protection

Skin protection (except hands)	Wear appropriate clothing to prevent any possibility of skin contact.

Hygiene / Environmental

Specific hygiene measures	Wash hands after contact.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	Fluid.
Colour	Colourless.
Odour	Aromatic.
Comments, pH (as supplied)	Not relevant.
Melting point/melting range	Value: < -48 °C
Boiling point / boiling range	Value: 136-145 °C
Flash point	Value: 27 °C
Evaporation rate	Value: 13,5
Explosion limit	Value: 1-7,1 %
Vapour pressure	Value: 1 kPa Test temperature: 20 °C

Vapour density	Value: 3,7
Specific gravity	Value: 0,870 kg/m3 Test temperature: 20 °C
Solubility description	Soluble in: Organic solvents. Not soluble in water.
Partition coefficient: n-octanol/water	Value: 3,15
Spontaneous combustability	Value: > 432-530 °C
Viscosity	Value: < 0,90 mPas Method of testing: Kinematisk Test temperature: 25 °C

9.2. Other information

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity	Heating may cause a fire.

10.2. Chemical stability

Stability	Stable under the prescribed storage conditions.

10.3. Possibility of hazardous reactions

Possibility of hazardous reactions	Not known.

10.4. Conditions to avoid

Conditions to avoid	Avoid heat, flames and other sources of ignition.

10.5. Incompatible materials

Materials to avoid	Avoid contact with oxidising agents (e.g. nitric acid, peroxides and chromates). Strong acids.

10.6. Hazardous decomposition products

Hazardous decomposition products	Fire creates: Carbon monoxide (CO). Carbon dioxide (CO2).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Toxicological Information:

Other toxicological data	Acute Toxicity (Oral LD50): mg/kg (oral rat) > 2000 Acute Toxicity (Inhalation LC50): mg/l (vapours) (4h) > 20 Acute Toxicity (Dermal LD50): mg/kg Rabbit > 2000

Toxicological data for substances

Potential acute effects

Inhalation	In high concentrations, vapours are narcotic and may cause headache, fatigue, dizziness and nausea. Icke klassificerad som aspirationstoxisk (Not classified as asp. tox.)
Skin contact	Prolonged or frequent contact may cause redness, itching, eczema and skin cracking. Defats the skin.
Eye contact	May irritate and cause redness and pain.
Ingestion	Ingestion of large amounts may cause unconsciousness. However, ingestion may cause nausea, headache, dizziness and intoxication. Ingestion may cause irritation of the gastrointestinal tract, vomiting and diarrhoea. May cause irritation to the mouth and throat.

Delayed effects / repeated exposure

Sensitisation	Not known.
Chronic effects	None known.

Carcinogenic, Mutagenic or Reprotoxic

Carcinogenicity	None.
Mutagenicity	Not known.
Teratogenic properties	Suspected of damaging the unborn child

Reproductive toxicity	Not known.

SECTION 12: Ecological information

12.1. Toxicity

Acute aquatic, fish	Value: 2 mg/l Method of testing: LC50 Fish, species: Roccus saxatilis Duration: 96h
Acute aquatic, algae	Value: > 3,2 mg/l Method of testing: IC50 Algae, species: Selenastrum Capricornum Duration: 72h
Acute aquatic, Daphnia	Value: 8,5 mg/l Method of testing: EC50 Daphnia, species: Daphnia magna Duration: 48h

12.2. Persistence and degradability

Persistence and degradability description	Lättnedbrytbar av biologiska organismer.
Chemical oxygen demand (COD)	Value: 5 Method of testing: COD
Biological oxygen demand (BOD)	Value: 0,55 Method of testing: BOD

12.3. Bioaccumulative potential

Bioaccumulative potential	Will not bio-accumulate.
Bioconcentration factor (BCF)	Value: 22 Method of testing: BCF

12.4. Mobility in soil

Mobility	The product is insoluble in water and will spread on the water surface.

12.5. Results of PBT and vPvB assessment

PBT assessment results	This substance is not classified as PBT or vPvB.

12.6. Other adverse effects

Other adverse effects / Remarks	None known.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Specify the appropriate methods of disposal	Confirm disposal procedures with environmental engineer and local regulations. Absorb in vermiculite or dry sand and dispose of at a licenced hazardous waste collection point. Liquid components can be disposed of by incineration.
Product classified as hazardous waste	Yes
Packaging classified as hazardous waste	Yes

SECTION 14: Transport information

14.1. UN number

ADR	1307
RID	1307
IMDG	1307
ICAO/IATA	1307

14.2. UN proper shipping name

ADR	XYLENES

RID	XYLENES
IMDG	XYLENES
ICAO/IATA	XYLENES

14.3. Transport hazard class(es)

ADR	3
Hazard no.	30
RID	3
ADN	33
IMDG	3
ICAO/IATA	3

14.4. Packing group

ADR	III
RID	III
IMDG	III
ICAO/IATA	III

14.5. Environmental hazards

Comment	Not relevant.

14.6. Special precautions for user

EmS	F-E, S-D

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

SECTION 15: Regulatory information

EC no.	215-535-7

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

Other Label Information	Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 with amendments.
Legislation and regulations	Dangerous Substance Directive 67/548/EEC. The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (S.I 2009 No. 716). The List of Wastes (England) (Amendment) Regulations 2005. (SI 2005 No. 895). Avfallsförordningen (2011:927).

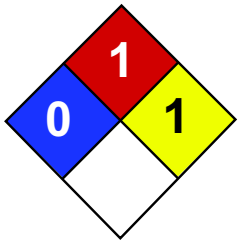
15.2. Chemical safety assessment

SECTION 16: Other information

Hazard symbol

R-phrases	R10 Flammable. R38 Irritating to skin. R20/22 Harmful by inhalation and if swallowed. R38 Irritating to skin.
S-phrases	S7 Keep container tightly closed. S16 Keep away from sources of ignition - No smoking.
Classification according to Regulation (EC) No 1272/2008 [CLP/GHS]	Flam. Liq. 3; H226; Acute tox. 4; H312; Skin Irrit. 2; H315;

	Acute tox. 4; H332;
List of relevant R-phrases (under headings 2 and 3).	R38 Irritating to skin. R11 Highly flammable. R10 Flammable. R20/21 Harmful by inhalation and in contact with skin. R20 Harmful by inhalation.
List of relevant H-phrases (Section 2 and 3).	H332 Harmful if inhaled. H312 Harmful in contact with skin. H225 Highly flammable liquid and vapour. H226 Flammable liquid and vapour. H315 Causes skin irritation.
Responsible for safety data sheet	Fred Holmberg & Co AB



Health	1
Fire	1
Reactivity	1
Personal Protection	E

Material Safety Data Sheet
Zinc Metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Zinc Metal

Catalog Codes: SLZ1054, SLZ1159, SLZ1267, SLZ1099, SLZ1204

CAS#: 7440-66-6

RTECS: ZG8600000

TSCA: TSCA 8(b) inventory: Zinc Metal

CI#: Not applicable.

Synonym: Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips

Chemical Name: Zinc Metal

Chemical Formula: Zn

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Zinc Metal	7440-66-6	100

Toxicological Data on Ingredients: Zinc Metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

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

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials, of acids, of alkalis, of moisture. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Zinc + NaOH causes ignition. Oxidation of zinc by potassium proceeds with incandescence. Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper. Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined. When hydrazine mononitrate is heated in contact with zinc, a flamming decomposition occurs at temperatures a little above its melting point. Contact with acids and alkali hydroxides (sodium hydroxide, postasium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas. Zinc foil ignites if traces of moisture are present. It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or moist air.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

Section 8: Exposure Controls/Personal Protection

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

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid. Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 65.39 g/mole

Color: Bluish-grey

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

Boiling Point: 907°C (1664.6°F)

Melting Point: 419°C (786.2°F)

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials, moisture

Incompatibility with various substances:
Reactive with oxidizing agents, acids, alkalis. Slightly reactive to reactive with moisture. The product may react violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with acids, halogenated hydrocarbons, NH_4NO_3, barium oxide, $Ba(NO_3)_2$, Cadmium, CS_2, chlorates, Cl_2, CrO_3, F_2, Hydroxylamine, $Pb(N_3)_2$, $MnCl_2$, HNO_3, performic acid, $KClO_3$, KNO_3, N_2O_2, Selenium, $NaClO_3$, Na_2O_2, Sulfur, Te, water, $(NH_4)_2S$, As_2O_3, CS_2, $CaCl_2$, chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide, HCl, H_2SO_4, (Mg +$Ba(NO_3)_2$ +BaO_2), (ethyl acetoacetate +tribromoneopentyl alcohol. Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen. Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide. May react with water.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss. Eyes: May cause eye irritation. Ingestion: May be harmul if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills.
May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizzness, irritability, muscular stiffness, and pain. May also affect blood.
Inhalation: Inhalation of zinc dust or fumes may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis. The toxicological properties of this substance have not been fully investisgated.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: Not available.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
New York release reporting list: Zinc Metal Rhode Island RTK hazardous substances: Zinc Metal Pennsylvania RTK: Zinc Metal Florida: Zinc Metal Michigan critical material: Zinc Metal Massachusetts RTK: Zinc Metal New Jersey: Zinc Metal California Director's List of Hazardous Substances: Zinc Metal TSCA 8(b) inventory: Zinc Metal TSCA 12(b) one time export: Zinc Metal SARA 313 toxic chemical notification and release reporting: Zinc Metal CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not Available

DSCL (EEC):
R15- Contact with water liberates extremely flammable gases. R17- Spontaneously flammable in air. S7/8- Keep container tightly closed and dry.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 1

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 12:18 AM

Last Updated: 11/06/2008 12:00 PM

ATTACHMENT F

JOBSITE SAFETY INSPECTION CHECKLIST

Jobsite Safety Inspection Checklist

Date: _____ **Inspected By:** _____

Location: _____ **Project #:** _____

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

	A	NA	D	Remark
1. HASP available onsite for inspection?				
2. Health & Safety Compliance agreement (in HASP) appropriately signed by Langan employees and contractors?				
3. Hospital route map with directions posted on site?				
4. Emergency Notification List posted on site?				
5. First Aid kit available and properly stocked?				
6. Personnel trained in CPR/First Aid on site?				
7. MSDSs readily available, and all workers knowledgeable about the specific chemicals and compounds to which they may be exposed?				
8 Appropriate PPE being worn by Langan employees and contractors?				
9. Project site safe practices ("Standing Orders") posted?				
10. Project staff have 40-hr./8-hr./Supervisor HAZWOPER training?				
11. Project staff medically cleared to work in hazardous waste sites and fit-tested to wear respirators, if needed?				
12. Respiratory protection readily available?				
13. Health & Safety Incident Report forms available?				
14. Air monitoring instruments calibrated daily and results recorded on the Daily Instrument Calibration check sheet?				
15. Air monitoring readings recorded on the air monitoring data sheet/field log book?				
16. Subcontract workers have received 40-hr./8-hr./Spvsr. HAZWOPER training, as appropriate?				
17. Subcontract workers medically cleared to work on site, and fit-tested for respirator wear?				
18. Subcontract workers have respirators readily available?				
19. Mark outs of underground utilities done prior to initiating any subsurface activities?				
20. Decontamination procedures being followed as outlined in HASP?				
21. Are tools in good condition and properly used?				
22. Drilling performed in areas free from underground objects including utilities?				

23. Adequate size/type fire extinguisher supplied?				
24. Equipment at least 20 feet from overhead power lines?				
25. Evidence that drilling operator is responsible for the safety of his rig.				
26. Trench sides shored, layer back, or boxed?				
27. Underground utilities located and authorities contacted before digging?				
28. Ladders in trench (25-foot spacing)?				
29. Excavated material placed more than 2 feet away from excavation edge?				
30. Public protected from exposure to open excavation?				
31. People entering the excavation regarding it as a permit-required confined space and following appropriate procedures?				
32. Confined space entry permit is completed and posted?				
33. All persons knowledgeable about the conditions and characteristics of the confined space?				
34. All persons engaged in confined space operations have been trained in safe entry and rescue (non-entry)?				
35. Full body harnesses, lifelines, and hoisting apparatus available for rescue needs?				
36. Attendant and/or supervisor certified in basic first aid and CPR?				
37. Confined space atmosphere checked before entry and continuously while the work is going on?				
38. Results of confined space atmosphere testing recorded?				
39. Evidence of coordination with off-site rescue services to perform entry rescue, if needed?				
40. Are extension cords rated for this work being used and are they properly maintained?				
41. Are GFCIs provided and being used?				

Unsafe Acts: _____

_____

_____

_____

Notes: _____

_____

_____

_____

ATTACHMENT G

JOB SAFETY ANALYSIS FORM

LANGAN	Job Safety Analysis (JSA) Health and Safety
JSA Title: COVID-19 Awareness – Site Work **JSA Number: JSA046-00**	
A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.	

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Boots	☐ Long Sleeves	☐ Safety Vest (Class 2)	☐ Hard Hat	☐ Hearing Protection
☐ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☐ Nitrile Gloves	☐ PVC Gloves
☐ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Alcohol-based hand sanitizer, disinfectant wipes/spray				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
1. All Activities	1. Transmittal/exposure of COVID-19	1. Ask yourself and your managers – is this work essential? Can this be done remotely? 2. Stay home if sick or showing symptoms of COVID-19 (e.g. fever, cough, etc.). 3. Carry nitrile gloves, alcohol-based hand sanitizer, face coverings and disinfectant wipes/spray during field work. 4. Check federal, state, and/or local travel restrictions **prior** to travel. Many states, counties, and cities are passing strict "shelter-in-place" or business restrictions in response to COVID-19. 5. Immediately notify Beverly Williams or Rory Johnston (Supervisor if employee chooses) if you display symptoms of COVID-19. Symptoms include fever (over 100.4 F), cough, and shortness of breath. 6. Notify Beverly Williams or Rory Johnston, Supervisor and Coronavirus Task Force if you had close contact with an individual who tested positive or displayed symptoms of COVID-19. 7. Do not touch your face, to the extent possible. 8. Wear face coverings when around other worker to minimize spread of COVID-19. (May be required in certain states or locations.)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		9. Practice social distancing, maintaining at least 6 feet of distance between yourself and others. Avoid gatherings of more than 10 people. Limit, to the extent possible, contact with public items/objects. 10. Clean your hands frequently with soap and water for at least 20 seconds especially after you have been in a public place, or after blowing your nose, coughing, sneezing, or using the rest room. 11. If soap and water are not readily available, use a hand sanitizer that contains at least 60% alcohol. Cover all surfaces of your hands and rub them together until they feel dry. 12. Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. 13. Clean and disinfect frequently touched surfaces daily, for example, cell phones, computer equipment, headsets, tables, doorknobs, light switches, countertops, handles, desks, toilets, faucets, and sinks.
2. Travel to Jobsite	1. Transmittal/exposure of COVID-19 between passengers 2. Transmittal/exposure of COVID-19 from previous occupants (rental and fleet vehicles) 3. Transmittal/exposure of COVID-19 while refueling	1. Limit the number of occupants to each vehicle to 2 people. Employees should sit as far away from each other as possible. 2. Disinfect high “hand-traffic” areas of the vehicle: Door handles, steering wheel, turn signal and control rods, dashboard controls, seatbelts, armrests, etc. To the extent possible, do not use recycled air for heat/AC and travel with the windows open. 3. Use hand sanitizer before and after pumping gas and only return to the inside of the vehicle after refueling is complete. 4. Wear nitrile gloves if available or disinfect the key pad, pump handle, and fuel grade button prior to use. 5. Recommend face coverings are worn to minimize spread of COVID-19.
3. Conduct Tailgate Safety Meeting & Complete H&S Paperwork	1. Transmittal/exposure of COVID-19 between meeting participants	1. Practice social distancing, maintaining at least 6 feet of distance between yourself and others. 2. Recommend face coverings are worn when around other workers to minimize spread of COVID-19, 3. Hold meetings outside and keep in mind wind direction. To the extent possible, remain cross-wind from other people. 4. Designate a single person to maintain sign-in sheets/permits throughout the day to limit the passing of pens/clipboards between people. 5. Each person should complete their own JSA, even if they are completing similar tasks as others in order to limit the passing of paper/pens/clipboards between people. 6. Include COVID-19 topics and prevention measures in safety meetings.
4. Conduct Site Work	1. Transmittal/exposure of COVID-19 between site workers and public.	1. Practice social distancing maintaining 6 feet of distance between yourself and others. 2. Recommend face coverings are worn when around other workers to minimize spread of COVID-19, 3. To the extent possible, do not interact with the public. If it is necessary, politely explain you are practicing social distance and request they stay at least 6 feet away and they do not attempt to pass objects to you. 4. Wear nitrile gloves during site work underneath the appropriate gloves for your task. Utilize appropriate decontamination procedures, securely bag all waste (including nitrile gloves) generated during site work and dispose of.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		5. Do not share tools. Each person should be equipped with the tools to complete their task or tasks should be divided to remove the need to share tools. If tools must be shared, surfaces should be disinfected. 6. Clean and disinfect surfaces of rental tools and equipment upon receipt. To the extent possible rent equipment from Langan's internal equipment reservation center, where cleaning/disinfecting procedures can be verified.
5. Use of Construction Trailers	1. Transmittal/exposure of COVID-19 between site workers and others.	1. Avoid use of shared trailers, if possible. Minimize trailer use to essential personnel. 2. Practice social distancing; maintaining 6 feet of distance between yourself and others in trailer. 3. Clean and disinfect areas including desks, phones, chairs and other common areas, before and after use.
6. Purchasing Food from a Restaurant	1. Transmittal/exposure of COVID-19 from other customers, staff, surfaces.	1. To the extent possible, bring your own food. 2. If you must visit a restaurant, call ahead for take-out or "contactless delivery". Do not dine in. When picking up food, follow guidelines for Job Step #8: Purchasing Supplies at Retail/Shipping Centers. 3. Wash hands before and after eating.
7. Smoking Cigarettes	1. Transmittal/exposure of COVID-19 by touching mouth with hands	1. Cigarette smokers maybe at greater risk of complications arising from COVID-19. Nicotine patches/lozenges/gum, smoking cessation programs, and prescription medications may aid in "kicking the habit" if you decide to quit. 2. Wash hands thoroughly before and after smoking. 3. Discard cigarette butts properly. Do not light cigarettes from others and do not give cigarettes to others.
8. Hotel Stay	1. Transmittal/exposure of COVID-19 from previous occupants, hotel staff, common areas.	1. Verify the hotel chain/brand has modified cleaning procedures to reflect risk of COVID-19. Most hotel companies have issued statements on their websites and in email blasts reflecting these new procedures. 2. Use the front door, and not peripheral entrances. Front doors of hotels are generally automatic. 3. Request ground floor room to avoid elevator use and a room that has not be utilized in 48-72 hours. 4. If elevator use is required, do not directly touch elevator buttons with your hands. Do not ride elevators with other people, to the extent possible. 5. Bring disinfecting wipes or sanitizing spray. Upon arrival, disinfect high "hand-traffic" areas of the hotel room: Door handles, light switches, shower/sink faucet handles, TV remote, curtain/blind handles. Clean these surfaces daily. 6. Place the "Do Not Disturb" Sign on your door to prevent people (housekeeping) from entering your room. 7. Avoid common spaces and hotel sponsored events where crowds will be present. 8. Confirm hotel cleaning procedures have been modified to address COVID-19. Confirm no COVID-19 cases have occurred in hotel
9. Purchasing Supplies at Retail/Shipping Centers	1. Transmittal/exposure of COVID-19 from other customers, staff, surfaces.	1. Plan your travel to limit the need to visit retail/shipping centers. 2. Practice social distancing, maintaining at least 6 feet of distance between yourself and others. If the store is too crowded/small, consider visiting another store or returning at a different time. 3. Avoid high "hand-traffic" items/areas like door handles (i.e. use your shoulder, hip/butt, or open with a disposable napkin/paper towel), credit cards terminals (i.e. use Apple/Android pay if available), shopping carts/baskets (i.e. bring your own shopping

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		bags), counter tops (i.e. ask clerk if you can hold the items while they are scanned) and bulk/buffet items (i.e. just avoid them). 4. Disinfect your hands before and after visiting a retail/shipping center.

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Environmental Sampling**
JSA Number: **JSA021-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☐ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☐ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☒ Fire Resistant Clothing	☐ Rubber Boots
☒ Insect/Animal Repellent	☒ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Tyvek Sleeves				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
1. Drive to sample location	1. Rough/Off Road terrain	1. Pay attention to road conditions such as road erosion, unprotected embankments, and soft road conditions.
2. Sample Collection (Walking)	1. Slip/Trips/Falls 2. Back strains 3. Wildlife (Insects, Stray animals, rodents) 4. Poisonous vegetation	1. Minimize distance to sample area/ Plan route and check surface prior to carrying heavy equipment/ Locate safest access point/ Follow good housekeeping procedures/ Mark significant below grade hazards (holes, trenches) with spray paint or cones/ Wear foot protection with ankle support and gripping soles. 2. Use proper lifting techniques/ Use wheeled transport/ Obtain assistance where and when needed/ Consider load weight when evaluating what is safe and unsafe to carry. 3. Be aware of surroundings for the presence of wildlife. Do not approach stray animals. Carry and use animal repellant when needed/ Use bug spray when needed. 4. Keep skin covered/ Identify and avoid poisonous vegetation/ Clean areas after contact with suspected vegetation.
3. Sample Collection (Water)	1. Drowning Hazards 2. Chemical burns (when adding acid preservative to sample) 3. Back Strains 4. Ergonomic issues 5. Slip/Trips/Falls	1. Use buddy system/ Wear flotation vest if water is deeper than 2 feet or swift moving/ Select working area with stable footing. Do not attempt to cross or stand in swift moving water. 2. Wear proper PPE (Nitrile gloves, Tyvek Sleeves) 3. Use proper lifting techniques/ Use wheeled transport/ Obtain assistance where and when needed/ Consider load weight when evaluating what is safe or unsafe to carry. 4. When possible avoid bending over for long periods of time/ Use a small stool for sitting or knee pad for kneeling.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		5. Minimize distance to sample area/ Plan route and check surface prior to carrying heavy equipment/ Locate safest access point/ Follow good housekeeping procedures/ Mark significant below grade hazards (holes, trenches) with spray paint or cones/ Wear foot protection with ankle support and gripping soles/ Avoid standing water or slippery terrain.
4. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. Back injuries 5. Traffic 6. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 7. High Noise levels 8. Overhead hazards 9. Heat Stress/ Cold Stress 10. Eye Injuries	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 5. Wear high visibility clothing & vest / Use cones or signs to designate work area 6. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 7. Wear hearing protection 8. Wear hard hat / Avoid areas were overhead hazards exist. 9. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 10. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Subsurface Investigation**
JSA Number: **JSA030-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop**, what has changed?*
T – ***Think** about the task*
E – ***Evaluate** potential hazards*
P – ***Plan** safe approach*
S - ***Start** task / **Stop** & regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☒ Safety Goggles	☐ Face Shield	☐ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Dielectric Overshoes, Sun Block				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
5. Transport equipment to work area	2. Back/strain 3. Slip/Trip/Falls 4. Traffic 5. Cuts/abrasions/contusions from equipment 6. Accidents due to vehicle operations	1. Use proper lifting techniques/Use wheeled transport 2. Minimize distance to work area/unobstructed path to work area/follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes) 5. Observe posted speed limits/ Wear seat belts at all times
6. Traffic	1. Hit by moving vehicle	1. Use traffic cones and signage/ Use High visibility traffic vests and clothing/ Caution tape when working near active roadways.
7. Field Work (drilling, resistivity testing, and inspection)	1. Biological Hazards: insects, rats, snakes, poisonous plants, and other animals 2. Heat stress/injuries 3. Cold Stress/injuries 4. High Energy Transmission Lines 5. Underground Utilities 6. Electrical (soil resistivity testing)	1. Inspect work area to identify biological hazards. Wear light colored long sleeve shirt and long pants/ Use insect repellant as necessary/ Beware of tall grass, bushes, woods and other areas where ticks may live/ Avoid leaving garbage on site to prevent attracting animals/ Identify and avoid contact with poisonous plants/Beware of rats, snakes, or stray animals. 2. Wear proper clothing (light colored)/ drink plenty of water/ take regular breaks/use sun block 3. Wear proper clothing/ dress in layers/ take regular breaks. 4. Avoid direct contact with high energy transmission lines/ position equipment at least 15 feet or as required by PSE&G from the transmission lines/ wear proper PPE (dielectric overshoes 15 kV minimum rating).

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		5. Call one-call service before performing intrusive field work/ Review utility mark-outs and available utility drawings (with respect to proposed work locations)/ Follow Underground Utility Guidelines 6. See AGI Sting R1 operating manual for specific concerns during operating instrument
8. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. Back injuries 5. Traffic 6. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 7. High Noise levels 8. Overhead hazards 9. Heat Stress/ Cold Stress 10. Eye Injuries	7. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 8. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 9. Wear Langan approved safety shoes 10. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 11. Wear high visibility clothing & vest / Use cones or signs to designate work area 12. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 13. Wear proper hearing protection 14. Wear hard hat / Avoid areas were overhead hazards exist. 15. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 16. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Field Sampling**
JSA Number: **JSA022-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task /* ***Stop*** *& regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☐ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
9. Unpack/Transport equipment to work area.	7. Back Strains 8. Slip/Trips/Falls 9. Cuts/Abrasions from equipment 10. Contusions from dropped equipment	6. Use proper lifting techniques/Use wheeled transport 7. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 8. Wear proper PPE (leather gloves, long sleeves). 9. Wear proper PPE (Langan approved safety shoes).
10. Initial Site Arrival-Site Assessment	5. Traffic	5. Situational awareness (be alert of your surroundings). Secure area from through traffic.
11. Surface Water Sampling	6. Contaminated media. Skin/eye contact with biological agents and/or chemicals.	6. Wear appropriate PPE (Safety glasses, appropriate gloves). Review (M)SDS for all chemicals being.
12. Sampling from bridges	1. Struck by vehicles	1. Wear appropriate PPE (Safety Vest). Use buddy system and orange safety cones.
13. Icing of Samples/ Transporting coolers/equipment from work area.	11. Back Strains 12. Slips/Trips/Falls 13. Cuts/Abrasions from equipment 14. Pinch/Crushing Hazards.	17. Drain coolers of water. Use proper lifting techniques. Use wheeled transport. 18. Have unobstructed path from work area. Aware of surroundings. 19. Wear proper PPE (Leather gloves, long sleeves) 20. Wear proper PPE (Leather gloves, long sleeves)
14. Site Departure	1. Contaminated PPE/Vehicle	1. Contaminated PPE should be disposed of on-site. Remove boots and soiled clothing for secure storage in trunk. Wash hands promptly.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
15. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. Back injuries 15. Traffic 16. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 17. High Noise levels 18. Overhead hazards 19. Heat Stress/ Cold Stress 20. Eye Injuries	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 21. Wear high visibility clothing & vest / Use cones or signs to designate work area 22. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 23. Wear hearing protection 24. Wear hard hat / Avoid areas were overhead hazards exist. 25. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 26. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN	Job Safety Analysis (JSA) Health and Safety
JSA Title: Equipment Transportation and Set-up **JSA Number:** JSA012-01	
A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.	

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☐ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
16. Transport equipment to work area	11. Back Strain 12. Slips/ Trips/ Falls 13. Traffic 14. Cuts/abrasions from equipment 15. Contusions from dropped equipment	1. Use proper lifting techniuqes / Use wheeled transport 2. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves) 5. Wear proper PPE (safety shoes)
17. Moving equipment to its planned location	6. Pinch Hazard 7. Slips/ Trips/ Falls	1. Wear proper PPE (leather gloves) 2. Be aware of potential trip hazards / Practice good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint
18. Equipment Set-up	7. Pinch Hazard 8. Cuts/abrasions to knuckles/hands 9. Back Strain	1. Wear proper PPE (leather gloves) 2. Wear proper PPE (leather gloves) 3. Use proper lifting techniques / Use wheeled transport
19. All activities	21. Slips/ Trips/ Falls 22. Hand injuries, cuts or lacerations during manual handling of materials 23. Foot injuries 24. Back injuries 25. Traffic 26. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.)	27. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 28. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 29. Wear Langan approved safety shoes

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
4. All activities (cont'd)	27. High Noise levels 28. Overhead hazards 29. Heat Stress/ Cold Stress 30. Eye Injuries	30. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 31. Wear high visibility clothing & vest / Use cones or signs to designate work area 32. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 33. Wear hearing protection 34. Wear hard hat / Avoid areas were overhead hazards exist. 35. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 36. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	Sign Name	Date
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **55-gallon Drum Sampling**
JSA Number: **JSA043-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – *Stop, what has changed?*
T – *Think about the task*
E – *Evaluate potential hazards*
P – *Plan safe approach*
S - *Start task / Stop & regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☐ Hearing Protection
☒ Safety Glasses	☒ Safety Goggles	☒ Face Shield	☒ Nitrile Gloves	☒ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: All Drums are required to be labeled. Langan employees do not open or move undocumented drums or unlabeled drums without proper project manager authorization.				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
20.Unpack/Transport equipment to work area.	16.Back Strains 17.Slip/Trips/Falls 18.Cuts/Abrasions from equipment 4. Contusions from dropped equipment	10. Use proper lifting techniques/Use wheeled transport 11. Minimize distance to work area/Unobstructed path to work area/follow good housekeeping procedures. Mark slip/trip/fall hazards with orange safety cones. 12. Wear proper PPE (leather gloves, long sleeves). 4. Wear proper PPE (Langan approved safety shoes).
21.Open Drums	1. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid. 2. Pressure from drums.	1. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches. 2. Open drum slowly to relieve pressure. Wear proper PPE: face shield and goggles; correct gloves; and over garments.
22.Collecting Soil/Fluid Sample	8. Irritation to eye from vapor, soil dust, or splashing 9. Irritation to exposed skin	6. Wear proper eye protection including safety glasses/ face shield/googles and when necessary, splash guard. If dust or vapor phase is present, wear appropriate safety breathing gear (1/2 mask or full face mask with correct filter) 7. Wear proper skin protection including nitrile gloves.
23.Closing Drums	1. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid.	7. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
24.Moving Drums	2. Hand Injuries, cuts or lacerations when untightening drum locking bolt, removing drum lid strap, or removing lid. 3. Back Strains	2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves. Use non-metallic mallet and non-sparking tools/wrenches. 3. Use proper lifting techniques/Use wheeled transport
25. All activities	31. Slips/ Trips/ Falls 32. Hand injuries, cuts or lacerations during manual handling of materials 33. Foot injuries 34. Back injuries 35. Traffic 36. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 37. High Noise levels 38. Overhead hazards 39. Heat Stress/ Cold Stress 40. Eye Injuries	37. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 38. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 39. Wear Langan approved safety shoes 40. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 41. Wear high visibility clothing & vest / Use cones or signs to designate work area 42. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 43. Wear hearing protection 44. Wear hard hat / Avoid areas were overhead hazards exist. 45. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 46. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Groundwater Sampling**
JSA Number: **JSA008-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☒ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Tyvek sleeves, Dermal Protection, PID				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
26. Transport equipment to work area	1. Back Strain 2. Slips/ Trips/ Falls 3. Traffic 4. Cuts/abrasions from equipment 5. Contusions from dropped equipment	1. Use proper lifting techniques / Use wheeled transport 2. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 3. Wear proper PPE (high visibility vest or clothing) 4. Wear proper PPE (leather gloves, long sleeves) 5. Wear proper PPE (safety shoes)
27. Remove well cover	10. Scrape knuckles/hand 11. Strain wrist/bruise palm 12. Pinch fingers or hand	3. Wear proper PPE (leather gloves) 4. Using a hammer, tap the end of the wrench to loosen grip of bolts 5. Wear proper PPE (leather gloves)
28. Remove well cap and lock	10. Well can pops from pressure 11. Exposure to hazardous substances through inhalation or dermal exposure 12. Scrape knuckles/hand 13. Strain write/bruise palm	5. Remove cap slowly to relieve pressure / Do not place face over well when opening / Wear proper PPE (safety glasses) 6. Use direct air monitoring/reading instrument (i.e. PID) / Be familiar with and follow actions prescribed in the HASP / Wear proper PPE (nitrile gloves) 7. Wear proper PPE (leather gloves) 8. Using hammer, tap the end of the wrench to loosen grip
29. Measure head-space vapor levels	1. Exposure to hazardous substances through inhalation	1. Do not place face over well when collecting measurement
30. Remove dedicated tubing (if necessary)	1. Exposure to hazardous substances through inhalation or dermal exposure 2. Tubing swings around after removal	1. Wear proper PPE (nitrile gloves, Tyvek sleeves) 2. Wear proper PPE (safety glasses)
31. Set-up plastic sheeting for work site around the well	1. Lacerations when cutting plastic sheeting	1. Use scissors to cut plastic sheeting / Cut motions should always be away from body and body parts

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
32. Measure depth to water	1. Exposure to hazardous substances through inhalation or dermal exposure 2. Pinch fingers or hand in water level instrument	1. Wear proper PPE (nitrile gloves) 2. Wear proper PPE (leather gloves)
33. Calibrate monitoring equipment	1. Skin or eye contact with calibration chemicals 2. Pinch fingers or hand in monitoring equipment	1. Wear proper PPE (safety glasses, nitrile gloves) 2. Wear proper PPE (leather gloves) / Avoid pinch points
34. Install sampling pump in well	1. Hand injuries during installation of pump 2. Lacerations when cutting tubing 3. Back strain during installation of pump 4. Physical hazards associated with manual lifting of heavy equipment 5. Back strain from starting generator 6. Burns from hot exhaust from generator 7. Electrical shock from improper use of generator and pump 8. Contaminated water spray from loose connections	1. Wear proper PPE (leather gloves, nitrile gloves) 2. Use safety tubing cutter 3. Use proper lifting techniques 4. Use proper lifting techniques / Use wheeled transport for heavy equipment 5. Use arm when starting generator / Do not over-strain if generator does not start 6. Do not touch generator near exhaust / Use proper handle to carry / Allow generator to cool down before moving 7. Properly plug in pump to generator / Do not allow the pump or generator to contact water / Check for breaks in the cord 8. Check all tubing connections to ensure they are tight and secure

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
10. Purge water	1. Contact with potentially contaminated groundwater 2. Back strain from lifting buckets of water 3. Tripping potential on sample discharge lines and pump electric line	1. Wear proper PPE (safety glasses, nitrile gloves) 2. Use proper lifting techniques / Use wheeled transport 3. Organize discharge of electric line to keep out of way as much as possible / Mark potential tripping hazards with caution tape or safety cones
11. Sample water collection	1. Contact with potentially contaminated groundwater through dermal exposure 2. Contact with and burns from acid used for sample preservation 3. Tripping potential on sample discharge lines and pump electric line 4. Lacerations from broken sample bottles 5. Back strain when transporting coolers full of collected samples 6. Slips/ Trips/ Falls	1. Wear proper PPE (safety glasses, nitrile gloves) 2. Wear proper PPE (safety glasses, nitrile gloves) / Ensure sample bottle lids are secure before use and after sample collection 3. Organize line to keep out of the way as much as possible / Mark potential tripping hazards with caution tape or safety cones 4. Do not over-tighten bottle caps / Handle bottles safely to prevent breakage / Wrap glass bottles in bubble wrap, if possible 5. Use proper lifting techniques / Use wheeled transport / Seek assistance if coolers weight exceeds 50lbs. / Minimize distance to vehicle 6. Have unobstructed path to vehicle or collection point / Follow good housekeeping procedures / Do not lift/walk with coolers that are too heavy/difficult to lift
12. Remove pump and pack up equipment	1. Back strain when removing pump or lifting heavy equipment	1. Use proper lifting technique / Use wheeled transport for heavy equipment
13. Replace well cap and lock	1. Scrape fingers/hand 2. Strain wrist/bruise palm	1. Wear proper PPE (leather gloves) 2. Using hammer, tap the end of the well cap to tighten grip
14. Replace well cover	1. Scrape knuckles/hand 2. Strain write/bruise palm 3. Pinch fingers or hand	1. Wear proper PPE (leather gloves) 2. Using hammer, tap the end of the wrench to tighten the grip of the bolts 3. Wear proper PPE (leather gloves)
15. Transport drums to disposal staging location	1. Back, arm or shoulder strain from moving drums 2. Pinch hazard 3. Contact with potentially contaminated groundwater when moving improperly sealed drums 4. Slips/ Trips/ Falls when moving drum 5. Drop drum on feet/toes	1. Use drum cart for moving drums / Use proper lifting techniques / Obtain assistance, if needed 2. Wear proper PPE (leather gloves) 3. Wear proper PPE (nitrile gloves under leather gloves) / Properly seal drum to prevent leak 4. Ensure route to move drum to storage space is dry and free from obstructions 5. Wear proper PPE (safety shoes)
16. Place used PPE in designated disposal drum	1. Pressure build-up inside drum 2. Pinch hazard	1. Remove cap from bung hole in drum to relieve pressure 2. Wear proper PPE (leather gloves)
17. Decontaminate equipment	1. Splashing water/soap from decontamination 2. Contact with potentially contaminated groundwater through dermal exposure 3. Electrical shock from broken electric cords	1. Wear proper PPE (safety glasses) 2. Wear proper PPE (safety glasses, dermal protection) 3. Properly plug in pump to generator / Do not allow the pump or generator to contact water / Check for breaks in the cord
18. All activities	41. Slips/ Trips/ Falls 42. Hand injuries, cuts or lacerations during manual handling of materials 43. Foot injuries 44. Back injuries 45. Traffic 46. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.)	47. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 48. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 49. Wear Langan approved safety shoes

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	47. High Noise levels 48. Overhead hazards 49. Heat Stress/ Cold Stress 50. Eye Injuries	50. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 51. Wear high visibility clothing & vest / Use cones or signs to designate work area 52. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 53. Wear hearing protection 54. Wear hard hat / Avoid areas were overhead hazards exist. 55. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 56. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Well Installation**
JSA Number: **JSA019-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop**, what has changed?*
T – ***Think** about the task*
E – ***Evaluate** potential hazards*
P – ***Plan** safe approach*
S - ***Start** task / **Stop** & regroup*

PERSONAL PROTECTIVE EQUIPMENT REQUIRED:				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: PID, Tyvek sleeves				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
35. Move equipment to work site	19. Back strain when lifting equipment 20. Slips/ Trips/ Falls while moving equipment 21. Traffic (if applicable) 22. Pinched fingers or running over toes during geoprobe set-up 23. Overturn drilling rig while transporting to loading dock on flat-bed tow truck	13. Use proper lifting technique (use legs for bending and lifting and not the back)/ Use wheeled transport for heavy equipment / Get assistance when handling loads greater than 50 lbs. / Minimize distance to vehicle 14. Use proper lifting technique (use legs for bending and lifting and not the back) / Use wheeled transport for heavy equipment / Get assistance when handling loads greater than 50 lbs. / Minimize distance to vehicle / Have unobstructed path to vehicle or collection point / Do not lift/walk with boxes that are heavy/difficult to lift 15. Wear high visibility safety vests or clothing / Exercise caution 16. Wear proper PPE (cut-resistant gloves) / Stay alert, be aware of geoprobe rig at all times 17. Drill rig should be parked in center of flat-bed tow truck / Emergency brake shall be used at all times during transport on the flat-bed truck/ All unnecessary personnel should stay away from the flat-bed truck during moving activities
36. Calibration of monitoring equipment	13. Skin or eye contact with calibration chemicals 14. Pinch fingers in monitoring equipment	8. Wear proper PPE (safety glasses/ goggles) 9. Wear proper PPE (leather gloves)
10. Set-up geoprobe rig	14. Geoprobe rig movement	8. All field personnel should stay clear of the geoprobe rig while moving / Use a spotter when backing up the geoprobe
11. Advance geoprobe rods below ground surface to desired depth	4. Underground utilities 5. High noise levels	4. Clean all subsurface soil borings to a minimum of 5 feet below grade 5. Wear proper PPE (hearing protection)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
12. Remove and open acetate liner 5. Remove and open acetate liner (cont'd)	51. Pinched fingers while removing macrocore 52. Cuts/lacerations when cutting acetate liner open 53. Exposure to hazardous vapors 54. Skin contact with contaminated soil	1. Wear proper PPE (nitrile gloves, cut-resistant or leather gloves 2. Wear proper PPE (cut-resistant or leather gloves) 3. Do not place face over acetate liner when opening / Monitor hazardous vapors in air with PID / Upgrade PPE as necessary based on levels contained in the Health and Safety Plan 4. Wear proper PPE (nitrile gloves)
6. Remove excess soil from acetate liner and place in 55-gallon drum (IF NOT PERFORMED BY LANGAN, REMOVE!)	1. Cuts/lacerations from acetate liner 2. Pinched fingers/hand while opening/closing drum 3. Skin contact with contaminated soil 4. Soil debris in eyes	1. Wear proper PPE (cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Wear proper PPE (nitrile gloves) 4. Wear proper PPE (safety glasses)
7. Attach hollow-stem augers to the geoprobe rig; Advance augers and attach additional augers until desired depth is reached	1. Strain wrist/bruise palm 2. Pinched fingers 3. Back Strain 4. Clothing entanglement 5. Carbon monoxide poisoning 6. Bruise toes/foot 7. High noise levels 8. Skin contact with contaminated soil	1. Wear proper PPE (cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Use proper lifting techniques 4. Wear proper work attire(no loose clothing/strings) 5. Properly ventilate work area 6. Wear proper PPE (safety shoes) 7. Wear proper PPE (hearing protection) 8. Wear proper PPE (Tyvek sleeves, nitrile gloves)
8. Install monitoring well	1. Pinched fingers 2. Lacerations/abrasions 3. Back Strain	1. Wear proper PPE (cut-resistant or leather gloves) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Use proper lifting techniques
9. Tremie-grout annulus space above bentonite seal	1. Back strain 2. Pinched fingers	1. Use proper lifting techniques 2. Wear proper PPE (cut-resistant or leather gloves)
10. Install flush-mount monitoring well pad	1. Splashed concrete 2. Pinched fingers 3. Cuts/lacerations	1. Wear proper PPE (safety glasses) 2. Wear proper PPE (cut-resistant or leather gloves) 3. Wear proper PPE (cut-resistant or leather gloves)
11. Decontaminate equipment	1. Splashing water/soap 2. Contact with potentially contaminated groundwater/soil through dermal exposure 3. Electrical shock from broken electric cords	1. Wear proper PPE (safety glasses) 2. Wear proper PPE (safety glasses, dermal protection) 3. Properly plug in pump to generator / Do not allow the pump or generator to contact water / Check for breaks in the cord
12. Transport drums to central staging location (IF NOT PERFORMED BY LANGAN, REMOVE!)	1. Back, arm or shoulder strain from moving drums 2. Pinch fingers/hand in drum cart when moving drums 3. Pinch fingers/hand when operating lift-gate on vehicle 4. Contact with potentially contaminated groundwater when moving improperly sealed drums 5. Slips when moving drums 6. Drop drum on feet/toes	57. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance 58. Wear proper PPE (cut-resistant or leather gloves) 59. Wear proper PPE (cut-resistant or leather gloves) 60. Wear proper PPE (nitrile gloves underneath work gloves) 61. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions 62. Wear proper PPE (safety shoes) / Work in a safe manner to prevent dropped drum

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
13. All activities 13. All activities (cont'd)	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 4. Back injuries 5. Traffic 6. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 7. High Noise levels 8. Overhead hazards 9. Heat Stress/ Cold Stress 10. Eye Injuries	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 5. Wear high visibility clothing & vest / Use cones or signs to designate work area 6. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 7. Wear hearing protection 8. Wear hard hat / Avoid areas were overhead hazards exist. 9. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 10. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Monitoring Well Development**
JSA Number: **JSA026-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

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E – ***Evaluate** potential hazards*
P – ***Plan** safe approach*
S - ***Start** task / **Stop** & regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☐ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☒ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Tyvek Sleeves				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
37.Transport equipment to work area	24.Back Strains 25.Slips/Trips/Falls 26.Traffic 27.Cuts/Abrasions/Contusions from equipment	18. Use proper lifting techniques/ Use wheeled transport/ use buddy system when lifting equipment. 19. Minimize distance from work area/ unobstructed path to collection points and vehicle/ Follow good housekeeping procedures. 20. Wear high-visibility vest or clothing/Exercise caution/ Use traffic cones or signage if needed. 21. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
38.Measure depth of water	15.Exposure to hazardous substances 16.Pinched fingers	13. Wear proper PPE (Nitrile gloves, Safety glasses/Face shield). 14. Wear proper PPE (cut-resistant gloves).
39.Install Tremie pipe in the monitoring well and connect to water source.	15. Hand injuries during installation (pinched fingers/hands). 16. Back strain from holding Tremie pipe. 17. High pressure water spray.	9. Wear proper PPE (Nitrile gloves/cut-resistant gloves). 10. Use proper lifting techniques/ Use two personnel when lowering pump greater than 80 feet. 11. Ensure all hose connections are tight and secure/ Use proper PPE (face shield and safety glasses).
40.Install pump in to well a. Connect pump to sample tubing. b. Lower pump to desired depth in well. c. Connect sample tubing to flow cell d. Connect pump to power source	6. Hand injuries during pump installation and sample tubing cutting. 7. Back strain 8. Electric shock 9. Exhaust gases from generator 10. Burns from hot equipment	6. Wear proper PPE when installing pump and cutting sample tubing (Nitrile and cut-resistant gloves)/ Use tubing cutter. 7. Proper lifting techniques/ Two personnel when installing pump at depths greater than 80 feet/ Use buddy when lifting heavy loads (pump, generator)/Use wheeled transport. 8. Ensure equipment is (LO/TO: locked out/tagged out) prior to preforming any electrical connections/ Inspect wires for frays or cuts/Ensure generator is properly grounded prior to starting.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
(generator) e. Turn on power source (generator)		9. Position generator so that exhaust is flowing away from work area. 10. Do not touch exhaust or any hot part of generator/ Allow equipment time to cool down prior to carrying/ Use proper PPE (long sleeves, leather gloves)
41. Develop monitoring well a. Jet water into well using Tremie pipe b. Turn pump on and adjust to desired flow rate. c. Surge pump up and down well to remove sediment from screen d. Containerize all purge water from well.	55. Hand injuries 56. Face injuries 57. Contaminated spray from water	63. Wear proper PPE (cut-resistant gloves and nitrile gloves). 64. Wear proper PPE (face shield and safety glasses)/do not stand over well opening. 65. Wear proper PPE (Face shield and safety goggles)/Tyvek over garments/ Ensure all connections are secure and tight/ Tubing outlet is contained in an overflow container.
42. Drum staging area.	1. Back, Arm, and shoulder strain. 2. Pinch points 3. Cross contamination 4. Slip/Trips/Falls	1. Use proper lifting techniques/ Use drum carts when moving drums/ use buddy system for moving of drums if needed/Move drums shortest distance needed. 2. Keep fingers and feet away from pinch points/ Use proper PPE (cut-resistant gloves, Langan approved safety shoes) 3. Use proper PPE (Nitrile gloves, Tyvek sleeves) 4. Ensure pathway is clear prior to moving equipment/ Mark all hazards/ Use additional person as a spotter if needed.
43. Equipment pack-up	1. Back Strains 2. Slips/Trips/Falls 3. Traffic 4. Cuts/Abrasions/Contusions from equipment.	1. Use proper lifting techniques/ Use wheeled transport/ use buddy system when lifting equipment. 2. Minimize distance from work area/ Unobstructed path to collection points and vehicle/ Follow good housekeeping procedures. 3. Wear high-visibility vest or clothing/Exercise caution/ Use traffic cones or signage if needed. 66. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes).
44. All activities	1. Slips/ Trips/ Falls 2. Hand injuries, cuts or lacerations during manual handling of materials 3. Foot injuries 58. Back injuries 59. Traffic 60. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 61. High Noise levels 62. Overhead hazards 63. Heat Stress/ Cold Stress 64. Eye Injuries	1. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 2. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 3. Wear Langan approved safety shoes 4. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 5. Wear high visibility clothing & vest / Use cones or signs to designate work area 6. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 7. Wear hearing protection 8. Wear hard hat / Avoid areas were overhead hazards exist. 9. Wear proper attire for weather conditions (sunscreen or protective clothing

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 10. Wear safety glasses.
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Groundwater/Product Purging/Sampling with Bailer**
JSA Number: **JSA053**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop**, what has changed?*
T – ***Think** about the task*
E – ***Evaluate** potential hazards*
P – ***Plan** safe approach*
S - ***Start** task / **Stop** & regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☒ Safety Goggles	☒ Face Shield	☒ Nitrile Gloves	☒ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☒ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Tyvek sleeves, Dermal Protection, PID, absorbent pads				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
45. Transport equipment to work area	6. Back Strain 7. Slips/ Trips/ Falls 8. Traffic 9. Cuts/abrasions from equipment 10. Contusions from dropped equipment	6. Use proper lifting techniques / Use wheeled transport 7. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 8. Wear proper PPE (high visibility vest or clothing) 9. Wear proper PPE (leather gloves, long sleeves) 10. Wear proper PPE (safety shoes)
46. Remove well cover	17. Scrape knuckles/hand 18. Strain wrist/bruise plan 19. Pinch fingers or hand	6. Wear proper PPE (leather gloves) 7. Using a hammer, tap the end of the wrench to loosen grip of bolts 8. Wear proper PPE (leather gloves)
47. Remove well cap and lock	18. Well can pops from pressure 19. Exposure to hazardous substances through inhalation or dermal exposure 20. Scrape knuckles/hand 21. Pinch points 22. Strain write/bruise palm	9. Remove cap slowly to relieve pressure / Do not place face over well when opening / Wear proper PPE (safety glasses, face shield, hand protection) 10. Use direct air monitoring/reading instrument (i.e. PID) / Be familiar with and follow actions prescribed in the HASP / Wear proper PPE (nitrile gloves) 11. Wear proper PPE (leather gloves) 12. Using hammer, tap the end of the wrench to loosen grip
48. Measure head-space vapor levels	2. Exposure to hazardous substances through inhalation	2. Do not place face over well when collecting measurement
49. Set-up plastic sheeting/absorbent pads	2. Lacerations when cutting plastic sheeting/absorbent pads	2. Use scissors to cut plastic sheeting/absorbent pads / Cut motions should always be away from body and body parts

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
for work site around the well		
50. Lower Bailer sleeve into well	7. Repetitive motion injury (pulled arm/back muscles) 8. Dehydration	7. Take breaks while lowering bailer into well/ Use a mechanical device to lower bailer into well/ Rotate employees (take turns conducting the manual labor portion) 8. Take breaks and drink water.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
7. Purge/Sample water/product collection	1. Contact with potentially contaminated groundwater or product through dermal exposure 2. Contact with and burns from acid used for sample preservation 9. Tripping potential on sampling lanyard 10. Lacerations from broken sample bottles 11. Back strain when transporting coolers full of collected samples 12. Slips/ Trips/ Falls	1. Wear proper PPE (safety glasses, nitrile gloves, safety shield, Tyvek) 2. Ensure sample bottle lids are secure before use and after sample collection 3. Organize lanyard to keep out of the way as much as possible / Mark potential tripping hazards with caution tape or safety cones 9. Do not over-tighten bottle caps / Handle bottles safely to prevent breakage / Wrap glass bottles in bubble wrap, if possible 10. Use proper lifting techniques / Use wheeled transport / Seek assistance if coolers weight exceeds 50lbs. / Minimize distance to vehicle 11. Have unobstructed path to vehicle or collection point / Follow good housekeeping procedures / Do not lift/walk with coolers that are too heavy/difficult to lift
8. Retrieval of bailer	9. Repetitive motion injury (pulled arm/back muscles) 10. Dehydration	9. Take breaks while retrieving bailer out of the well/ Use a mechanical device to raise bailer out of well/ Rotate employees (take turns conducting the manual labor portion) 10. Take breaks and drink water.
9. Pack-up equipment	2. Back strain when removing or lifting heavy equipment	2. Use proper lifting technique / Use wheeled transport for heavy equipment
10. Replace well cap and lock	3. Scrape fingers/hand 4. Strain wrist/bruise palm	3. Wear proper PPE (leather gloves) 4. Using hammer, tap the end of the well cap to tighten grip
11. Replace well cover	4. Scrape knuckles/hand 5. Strain write/bruise palm 6. Pinch fingers or hand	4. Wear proper PPE (leather gloves) 5. Using hammer, tap the end of the wrench to tighten the grip of the bolts 6. Wear proper PPE (leather gloves)
12. Place used PPE in designated disposal drum	3. Pressure build-up inside drum 4. Pinch hazard	3. Remove cap from bung hole in drum to relieve pressure 4. Wear proper PPE (leather gloves) 5. Product drums may require additional spill protection/electrical grounding, check local regulations
13. Decontaminate equipment	4. Splashing water/soap from decontamination 5. Contact with potentially contaminated groundwater through dermal exposure	4. Wear proper PPE (safety glasses) 5. Wear proper PPE (safety glasses, dermal protection)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
14. All activities	65. Slips/ Trips/ Falls 66. Hand injuries, cuts or lacerations during manual handling of materials 67. Foot injuries 68. Back injuries 69. Traffic 70. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 71. High Noise levels 72. Overhead hazards 73. Heat Stress/ Cold Stress 74. Eye Injuries	67. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 68. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 69. Wear Langan approved safety shoes 70. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 71. Wear high visibility clothing & vest / Use cones or signs to designate work area 72. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 73. Wear hearing protection 74. Wear hard hat / Avoid areas were overhead hazards exist. 75. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 76. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Direct-Push Soil Borings**
JSA Number: **JSA004-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – *Stop, what has changed?*
T – *Think about the task*
E – *Evaluate potential hazards*
P – *Plan safe approach*
S - *Start task / Stop & regroup*

PERSONAL PROTECTIVE EQUIPMENT REQUIRED:				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Half-face respirator, dust cartridges, PID (if applicable)				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
51. Move equipment to work site	28. Back strain when lifting equipment 29. Slips/ Trips/ Falls while moving equipment 30. Traffic (if applicable) 31. Pinched fingers or running over toes during geoprobe set-up 32. Overturn drilling rig while transporting to loading dock on flat-bed tow truck	22. Use proper lifting technique (use legs for bending and lifting and not the back)/ Use wheeled transport for heavy equipment / Get assistance when handling loads greater than 50 lbs. / Minimize distance to vehicle 23. Use proper lifting technique (use legs for bending and lifting and not the back) / Use wheeled transport for heavy equipment / Get assistance when handling loads greater than 50 lbs. / Minimize distance to vehicle / Have unobstructed path to vehicle or collection point / Do not lift/walk with boxes that are heavy/difficult to lift 24. Wear high visibility safety vests or clothing / Exercise caution 25. Wear proper PPE (cut-resistant gloves) / Stay alert, be aware of geoprobe rig at all times 26. Drill rig should be parked in center of flat-bed tow truck / Emergency brake shall be used at all times during transport on the flat-bed truck/ All unnecessary personnel should stay away from the flat-bed truck during moving activities
52. Calibration of monitoring equipment	20. Skin or eye contact with calibration chemicals 21. Pinch fingers in monitoring equipment	15. Wear proper PPE (safety glasses/ goggles) 16. Wear proper PPE (leather gloves)
53. Set-up geoprobe rig	23. Geoprobe rig movement	12. All field personnel should stay clear of the geoprobe rig while moving / Use a spotter when backing up the geoprobe
54. Advance geoprobe rods below ground surface to desired depth	11. Underground utilities 12. High noise levels	11. Clean all subsurface soil borings to a minimum of 5 feet below grade 12. Wear proper PPE (hearing protection)
55. Remove and open acetate liner	75. Pinched fingers while removing macrocore	5. Wear proper PPE (nitrile gloves, cut-resistant or leather gloves 6. Wear proper PPE (cut-resistant or leather gloves)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
5. Remove and open acetate liner (cont'd)	76. Cuts/lacerations when cutting acetate liner open 77. Exposure to hazardous vapors 78. Skin contact with contaminated soil	7. Do not place face over acetate liner when opening / Monitor hazardous vapors in air with PID / Upgrade PPE as necessary based on levels contained in the Health and Safety Plan 8. Wear proper PPE (nitrile gloves)
56. Sample Collections a) Monitor parameters b) Prepare sample containers and labels	1. Contact with potentially contaminated soil 2. Lacerations from broken sample bottles 3. Back strain while transporting full coolers 4. Internal exposure to contaminants and metals through inhalation of dust 5. Slips/ Trips/ Falls	1. Use monitoring devices / Wear proper PPE (safety glasses, nitrile gloves) 2. Do not over-tighten bottle caps / Handle bottles safely to prevent breakage 13. Use proper lifting techniques / Do not lift heavy loads without assistance 14. Avoid creating dust / If necessary, wear a half mask respirator with applicable dust cartridge / Inspect respirator for damage and cleanliness prior to use / Clean respirator after each use and store in a clean, secure location 15. Be alert / Follow good housekeeping procedures
57. Remove excess soil from acetate liner and place in 55-gallon drum (IF NOT PERFORMED BY LANGAN, REMOVE!)	5. Cuts/lacerations from acetate liner 6. Pinched fingers/hand while opening/closing drum 7. Skin contact with contaminated soil 8. Soil debris in eyes	5. Wear proper PPE (cut-resistant or leather gloves) 6. Wear proper PPE (cut-resistant or leather gloves) 7. Wear proper PPE (nitrile gloves) 8. Wear proper PPE (safety glasses)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
8. Transport drums to central staging location (IF NOT PERFORMED BY LANGAN, REMOVE!)	7. Back, arm or shoulder strain from moving drums 8. Pinch fingers/hand in drum cart when moving drums 9. Pinch fingers/hand when operating lift-gate on vehicle 10. Contact with potentially contaminated groundwater when moving improperly sealed drums 11. Slips when moving drums 12. Drop drum on feet/toes	77. Use drum cart for moving drums / Use proper lifting techniques / Do not lift heavy loads without assistance 78. Wear proper PPE (cut-resistant or leather gloves) 79. Wear proper PPE (cut-resistant or leather gloves) 80. Wear proper PPE (nitrile gloves underneath work gloves) 81. Follow good housekeeping procedures / Ensure route to move drum and storage space is free from obstructions 82. Wear proper PPE (safety shoes) / Work in a safe manner to prevent dropped drum
9. All activities 9. All activities (cont'd)	11. Slips/ Trips/ Falls 12. Hand injuries, cuts or lacerations during manual handling of materials 13. Foot injuries 14. Back injuries 15. Traffic 16. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 17. High Noise levels 18. Overhead hazards 19. Heat Stress/ Cold Stress 20. Eye Injuries	11. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 12. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 13. Wear Langan approved safety shoes 14. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 15. Wear high visibility clothing & vest / Use cones or signs to designate work area 16. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 17. Wear hearing protection 18. Wear hard hat / Avoid areas were overhead hazards exist. 19. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 20. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**

Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: Geophysical Investigation
JSA Number: JSA023-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task /* ***Stop*** *& regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☒ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☐ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
58. Transport equipment to work area	33. Back/strain 34. Slip/Trip/Falls 35. Traffic 36. Cuts/abrasions/contusions from equipment	27. Use proper lifting techniques/Use wheeled transport 28. Minimize distance to work area/unobstructed path to work area/follow good housekeeping procedures 29. Wear proper PPE (high visibility vest or clothing) 30. Wear proper PPE (leather gloves, long sleeves, Langan approved safety shoes)
59. Supervision of subcontractor and all other activities	22. Slip/Trips/Falls 23. Hand injuries 24. Foot injuries 25. Back injuries/Strains 26. Traffic 27. Wildlife a. Wildlife b. Mice/rats c. Vectors (i.e. mosquitoes, bees, etc.) 7. Heat/Cold Stress	17. Be aware of potential trip hazards/follow good housekeeping procedures/mark significant below-grade hazards (i.e. holes, trenches, wires, ropes) with safety cones or spray paint. 18. Wear proper PPE (leather gloves)/watch wear you place your hands/inspect material or equipment for jagged, rough or slippery surfaces/ watch for pinch points/ wipe off slippery, wet, or dirty items prior to handling. 19. Wear proper PPE (Langan approved safety shoes)/ Be aware of uneven terrain) 20. Use proper lifting techniques/ Buddy system when lifting/ use wheeled transport. 21. Wear proper PPE (high-visibility shirts and vests)/ use cones if appropriate/ notify equipment operators of work area. 22. Be aware of surroundings at all times for the presence of wildlife. a. Do not approach stray animals b. Carry animal repellant/ use if situation arises. c. Use bug spray when needed. 7. Wear proper attire for weather conditions (sunscreen, protective clothing in

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		sunlight or layer clothing in cold weather)/ drink plenty of fluids/ take regular breaks.
60. All activities	79. Slips/ Trips/ Falls 80. Hand injuries, cuts or lacerations during manual handling of materials 81. Foot injuries 82. Back injuries 83. Traffic 84. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 85. High Noise levels 86. Overhead hazards 87. Heat Stress/ Cold Stress 88. Eye Injuries	83. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 84. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 85. Wear Langan approved safety shoes 86. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 87. Wear high visibility clothing & vest / Use cones or signs to designate work area 88. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 89. Wear proper hearing protection 90. Wear hard hat / Avoid areas were overhead hazards exist. 91. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 92. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Sub-slab soil gas temporary point installation and sampling**
JSA Number: **JSA037-01**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop**, what has changed?*
T – ***Think** about the task*
E – ***Evaluate** potential hazards*
P – ***Plan** safe approach*
S - ***Start** task / **Stop** & regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☐ Hearing Protection
☒ Safety Glasses	☒ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☒ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: Tyvek Sleeves				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
61. Transport equipment to work site	37. Back injuries 38. Slips/Trips/Falls 39. Traffic 40. Hand injuries	31. Use proper lifting techniques/ Use wheeled transport/ Get assistance when need with moving equipment/ Minimize distance from vehicle 32. Minimize distance from vehicle/ Have unobstructed pathway to vehicle and collection points/ Mark tripping hazards with spray paint, cones, or caution tape/ Observe good housekeeping procedures. 33. Wear proper PPE (High Visibility vest and clothing)/ Exercise caution (stay alert-stay alive) 34. Wear proper PPE (leather gloves)/ Keep finger and hands clear of pinch points.
62.Mark area for drilling	28.Slips/Trips/Falls	23. Minimize distance from vehicle/ Have unobstructed pathway to vehicle and collection points/ Mark tripping hazards with spray paint, cones, or caution tape/ Observe good housekeeping procedures
63.Drill sampling points with hammer drill	24. Eye injuries 25. Dust exposure 26. Hand injuries 27. Catch items (clothing) 28. Electric shock 29. Chemical atmosphere hazard (vapor) 30. Slips/Trips/Falls	13. Wear proper PPE (safety glasses) 14. Wear proper PPE (dust mask) 15. Wear proper PPE (leather gloves)/ Keep hands and fingers out of pinch points/ Avoid drill catching on ground and twisting wrist or hand/ Release drill grip if drill becomes caught/ Ensure drill is unplugged prior to inserting bit. 16. Tie up or tuck-in all loose clothing/ Maintain distance from drill 17. Inspect power cable for cuts or nicks before use/ Use GFCI outlet on power cord/ Do not use in wet conditions 18. Monitor air, vapors with Photo-ionization detector (PID)

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
		19. Minimize distance from vehicle/ Have unobstructed pathway to vehicle and collection points/ Mark tripping hazards with spray paint, cones, or caution tape/ Observe good housekeeping procedures
64. Measure vapor content and depth to bottom of hole	1. Chemical atmosphere hazard (vapors)	1. Monitor air, vapors with Photo-ionization detector (PID)/ Keep face away from opening of hole while collecting measurements
65. Set-up of shroud and sampling canister system	1. Hand injuries 2. Chemical atmosphere hazard (vapors) 3. Slips/Trips/Falls	1. Wear proper PPE (leather gloves, nitrile gloves)/ Keep fingers away from pinch points when installing pump/ Do not use open blades, use tubing cutter 2. Monitor air, vapors with Photo-ionization detector (PID)/ Keep face away from opening of hole while collecting measurements 3. Minimize distance from vehicle/ Have unobstructed pathway to vehicle and collection points/ Mark tripping hazards with spray paint, cones, or caution tape/ Observe good housekeeping procedures
66. Purge soil gas	1. Chemical atmosphere hazard (vapors)	1. Monitor air, vapors with Photo-ionization detector (PID)/ Keep face away from exhaust port of pump
67. Sample collection (opening and closing valves)	1. Hand injuries	1. Wear proper PPE (leather gloves)/ Keep fingers away from pinch points
68. Sealing sampling holes	1. Back injuries 2. Concrete dust 3. Eye injuries	1. Use proper lifting techniques for lifting of cement bags 2. Wear proper PPE (dust mask) 3. Wear proper PPE (safety glasses)
69. All activities	89. Slips/ Trips/ Falls 90. Hand injuries, cuts or lacerations during manual handling of materials 91. Foot injuries 92. Back injuries 93. Traffic 94. Wildlife: Stray animals, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 95. High Noise levels 96. Overhead hazards 97. Heat or cold injuries 98. Eye Injuries	93. Be aware of potential trip hazards/ Follow good housekeeping procedures/ Mark significant hazards 94. Inspect for jagged/sharp edges, and rough or slippery surfaces/ Keep fingers away from pinch points/ Wipe off greasy, wet, slippery or dirty objects before handling/ Wear leather/ cut-resistant gloves Wear proper PPE (Langan approved safety shoes) 95. Use proper lifting techniques/ Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift/ Obtain assistance when possible 96. Wear high visibility clothing & vest/ Use cones or signs to designate work area 97. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray animals/ Carry and use animal repellant when needed/ Use bug spray when needed 98. Wear hearing protection 99. Wear hard hat/ Avoid areas were overhead hazards exist. 100. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather)/ Drink plenty of fluids to avoid dehydration/ Takes breaks as necessary to avoid heat/cold stress 101. Wear safety glasses

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: Indoor Air Sampling
JSA Number: JSA007-01

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – *Stop, what has changed?*
T – *Think about the task*
E – *Evaluate potential hazards*
P – *Plan safe approach*
S - *Start task / Stop & regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☐ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☒ Other: PID, Respiratory Protection (if necessary)				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
70. Building walkthrough and background contaminant removal	41. Slips / Trips/ Falls 42. Exposure to substances/vapors during removal	6. Be aware of potential trip hazards / Follow good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint 7. Monitor indoor air concentrations with a PID / Wear proper PPE (nitrile gloves) / Wear proper respiratory protection if necessary
71. Transport equipment to work area	11. Back Strain 12. Slips/ Trips/ Falls 13. Traffic 14. Cuts/abrasions from equipment 15. Contusions from dropped equipment	11. Use proper lifting techniques / Use wheeled transport 12. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 13. Wear proper PPE (high visibility vest or clothing) 14. Wear proper PPE (leather gloves, long sleeves) 15. Wear proper PPE (safety shoes)
72. Mark out areas for indoor air sampling	29. Slips/ Trips/ Falls	9. Be aware of potential trip hazards / Follow good housekeeping procedures / Mark significant below-grade hazards (i.e. holes, trenches) with safety cones or spray paint
73. Set-up canisters and begin indoor air sampling	31. Dropping crates or canisters 32. Pinch hazard	13. Exercise caution when moving crates and canisters / Use proper housekeeping of materials during sample events / Do not carry too many items at one time / Perform several trips, if necessary 14. Wear proper PPE (leather gloves)
74. Sample collection	3. Dropping crates or canisters 4. Pinched fingers from opening valves	3. Exercise caution when moving crates and canisters / Use proper housekeeping of materials during sample events / Do not carry too many items at one time / Perform several trips, if necessary 4. Wear proper PPE (leather gloves) / Keep fingers away from pinch points
75. Pack up equipment	3. Back strain	3. Use proper lifting techniques / Use wheeled transport

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
	4. Slips/ Trips/ Falls 5. Traffic	4. Be aware of potential trip hazards / Follow good housekeeping procedures / Minimize distance to vehicle 5. Wear proper PPE (safety vest)
76. All activities	99. Slips/ Trips/ Falls 100. Hand injuries, cuts or lacerations during manual handling of materials 101. Foot injuries 102. Back injuries 103. Traffic 104. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 105. High Noise levels 106. Overhead hazards 107. Heat Stress/ Cold Stress 108. Eye Injuries	102. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 103. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 104. Wear Langan approved safety shoes 105. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 106. Wear high visibility clothing & vest / Use cones or signs to designate work area 107. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 108. Wear hearing protection 109. Wear hard hat / Avoid areas were overhead hazards exist. 110. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 111. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

LANGAN

Job Safety Analysis (JSA)
Health and Safety

JSA Title: **Hammer Drill**
JSA Number: **JSA049**

A Job Safety Analysis (JSA) must identify all job steps required to complete the task, the potential hazards employees could be exposed to while performing the job step and the preventative/corrective actions required to reduce/mitigate the identified potential hazards. Employees must certify that they have either prepared the JSA or have reviewed the JSA and are aware of the potential hazards associated with this task and will follow the provided preventive/corrective actions. Prior to the start of any work "TAKE 5" and conduct a Last Minute Risk Assessment.

S – ***Stop,*** *what has changed?*
T – ***Think*** *about the task*
E – ***Evaluate*** *potential hazards*
P – ***Plan*** *safe approach*
S - ***Start*** *task / **Stop** & regroup*

PERSONAL PROTECTIVE EQUIPMENT (Required or to be worn as needed):				
☒ Safety Shoes	☒ Long Sleeves	☒ Safety Vest (Class 2)	☒ Hard Hat	☒ Hearing Protection
☒ Safety Glasses	☐ Safety Goggles	☒ Face Shield	☒ Nitrile Gloves	☐ PVC Gloves
☒ Leather Gloves	☐ Cut Resist. Gloves	☐ Fall Protection	☐ Fire Resistant Clothing	☐ Rubber Boots
☐ Insect/Animal Repellent	☐ Ivy Blocker/Cleaner	☒ Traffic Cones/Signs	☐ Life Vest/Jacket	
☐ Other:				

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
77.Transport equipment to work area	43.Back Strain 44.Slips/ Trips/ Falls 45.Traffic 46.Cuts/abrasions from equipment 47.Contusions from dropped equipment	8. Use proper lifting techniques / Use wheeled transport 9. Minimize distance to work area / Have unobstructed path to work area / Follow good housekeeping procedures 10. Wear proper PPE (high visibility vest or clothing) 11. Wear proper PPE (leather gloves, long sleeves) 12. Wear proper PPE (safety shoes)
78.Electrical Connection	30.Inpsect electrical cord to drill 31.Inspect hammer drill 32.Inspect extension cord 33.Test GFCI	10. Check the plug, insure all connections are in place, check cord for frayed sections. If plug or cord are worn, do not use equipment until repaired 11. Inspect chuck for proper grasping and holding of bit, check that plastic housing is not cracked or missing pieces. Do not use if chuck doesn't work properly or housing is compromised. 12. Inspect extension cord, if worn or stripped pull from service and replace 13. Test GFCI, replace if GFCI fails
79.Drill Bit	1. Inspect drill bit	1. Replace if worn 2. Wear proper PPE (leather gloves) when installing and removing drill bit. 3. Ensure equipment is unplugged from electrical power when removing and installing drill bit.
80.Use of Hammer Drill	1. Hazards associated with using hammer drill, flying objects, heavy equipment, ground level hazards and dust 2. Slips/ Trips/ Falls 3. Hazards associated drilling into concrete slab	1. Maintain a safe distance from other site operations / Wear proper PPE (hard hat, safety glasses, safety shoes, safety vest, ear protection and leather gloves) 2. Be aware of potential trip hazards / Follow good housekeeping procedures / Mark extension chord pathway with safety cones 3. Do not push hammer drill during use.

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE / CORRECTIVE ACTION
81. All activities 4. All activities (cont’d)	109. Slips/ Trips/ Falls 110. Hand injuries, cuts or lacerations during manual handling of materials 111. Foot injuries 112. Back injuries 113. Traffic 114. Wildlife: Stray dogs, Mice/rats, Vectors (i.e. mosquitoes, bees, etc.) 115. High Noise levels 116. Overhead hazards 117. Heat Stress/ Cold Stress 118. Eye Injuries	112. Be aware of potential trip hazards / Follow good housekeeping procedures/ Mark significant hazards 113. Inspect for jagged/sharp edges, and rough or slippery surfaces / Keep fingers away from pinch points / Wipe off greasy, wet, slippery or dirty objects before handling / Wear leather/ cut-resistant gloves 114. Wear Langan approved safety shoes 115. Use proper lifting techniques / Consider load location, task repetition, and load weigh when evaluating what is safe or unsafe to lift / Obtain assistance when possible 116. Wear high visibility clothing & vest / Use cones or signs to designate work area 117. Be aware of surroundings at all times, including the presence of wildlife/ Do not approach stray dogs / Carry/use dog/animal repellant / Use bug spray when needed 118. Wear hearing protection 119. Wear hard hat / Avoid areas were overhead hazards exist. 120. Wear proper attire for weather conditions (sunscreen or protective clothing in sunlight, layers for cold weather) / Drink plenty of fluids to avoid dehydration / Takes breaks as necessary to avoid heat/cold stress 121. Wear safety glasses
Additional items.		
Additional Items identified while in the field. (Delete row if not needed.)		

Print Name	**Sign Name**	**Date**
Prepared by:		
Reviewed by:		

ATTACHMENT H

TAILGATE SAFETY BRIEFING FORM

LANGAN TAILGATE SAFETY BRIEFING

Date:_____ Time: _____

Leader:_____ Location:_____

Work Task:

_____

_____

SAFETY TOPICS (***provide some detail of discussion points***)

Chemical Exposure Hazards and Control:_____

_____

Physical Hazards and Control: _____

Air Monitoring: _____

PPE: _____

_____

Communications:_____

Safe Work Practices: _____

_____

Emergency Response: _____

Hospital/Medical Center Location: _____

Phone Nos.: _____

Other: _____

FOR FOLLOW-UP (the issues, responsibilities, due dates, etc.**)**

_____

_____

_____

ATTENDEES

PRINT NAME	COMPANY	SIGNATURE

APPENDIX F

COMMUNITY AIR MONITORING PLAN

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

Overview

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

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

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

Community Air Monitoring Plan

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

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

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

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

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

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

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

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

December 2009

APPENDIX G

SITE MANAGEMENT FORM

SITE INSPECTION CHECKLIST

Site Name: 475 Bay Street and 31 Wa\ Location: Staten Island, New York Project Number: 170610601

Inspector Name: _____ Date: _____ Weather Conditions: _____

Reason for Inspection (i.e., routine, severe condition, etc.): _____

Check one of the following:
(Y: Yes N: No N/A: Not Applicable)

		Y	N	N/A	Normal Situation	Remarks
	General					
1	What are the current site conditions?	-	-	-		
2	Are all applicable site records (e.g., documentation of construction activity, SMD system maintenance and repair, most current easement, etc.) complete and up to date?					
	Environmental Easement					
3	Has site use (restricted residential) remained the same?					
4	Does it appear that all environmental easement restrictions have been followed?					
	Impermeable Cap					
5	Are there any indications of a breach in the capping system at the time of this inspection?					
6	Are there any cracks in the building slabs?					
7	Are there any cracks in the building walls?					
8	Is there any construction activity, or indication of any construction activity within the past certification year (including any tenant improvements), that included the breaching of the capping system, on-site at the time of this inspection?					
9	If YES to number 7, is there documentation that the Soil Management Plan, HASP, and CAMP for the site was/is being followed?					

***** If the answer to any of the above questions indicate non-compliance with any Institutional Controls/Engineering Controls (ICs/ECs) for the site, additional remarks must be provided and, where applicable, documentation attached to this checklist detailing additional inspection and repair activities.**

Additional remarks: _____

Minimum Inspection Schedule:
- Site-wide inspections will be conducted annually, per certification year, at a minimum.
- Additional inspections will also be conducted at times of severe weather condition events.
- All inspection events will use this checklist.